Commissioners:
RONALD E. SKAGEN
MOLLY SIMPSON
AARON J. VIEBROCK

General Manager:
GARY R. IVORY

Public Utility District No. 1 of Douglas County

1151 Valley Mall Parkway · East Wenatchee, Washington 98802-4497 · 509/884-7191 · FAX 509/884-0553 · www.douglaspud.org

Via Electronic Filing May 21, 2025

Honorable Debbie-Anne Reese
Secretary
Federal Energy Regulatory Commission
888 First Street N.E.
Washington, D.C. 20426

Subject: **Wells Hydroelectric Project – FERC Project No. 2149**
Consolidated 2024 Aquatic Settlement Agreement Annual Report

Dear Secretary Reese:

Public Utility District No. 1 of Douglas County, Washington (Douglas PUD), licensee for the Wells Hydroelectric Project No. 2149 (Wells Project) respectfully submits the attached Annual Report of activities conducted during calendar year 2024 in compliance with Article 406 of the Federal Energy Regulatory Commission (FERC) license for the Wells Project, sections 6.4, 6.6 and 7(b) of the Clean Water Act section 401 Water Quality Certification (401 Certification), and section 11.7 of the Aquatic Settlement Agreement (ASA).

Article 406 of the license requires Douglas PUD to file with the FERC an Annual Report documenting the results of studies and measures completed during the previous calendar year pursuant to the Aquatic Settlement Agreement's White Sturgeon Management Plan (WSMP), Bull Trout Management Plan (BTMP), Pacific Lamprey Management Plan (PLMP), Resident Fish Management Plan (RFMP), Aquatic Nuisance Species Management Plan (ANSMP), and Water Quality Management Plan (WQMP) as required in whole or in part by Ordering Paragraph F and Appendix C, Ordering Paragraph G and Appendix D, and Ordering Paragraph H and Appendix E. The final ASA Annual Report and the final ASA Management Plan reports for 2024 are attached in Exhibit A to this letter.

License Article 401(b) and Section 6.7(3)(b) of Douglas PUD's 401 Water Quality Certification requires that the District respectively file with the FERC and Washington Department of Ecology an annual Water Temperature report by April 30th of each year. In early 2017, the FERC approved the ASA parties' request to modify the annual water temperature reporting deadline from April 30th to May 31st to remain consistent with other annual reporting deadlines (FERC Order issued February 24, 2017). In the same FERC Order, the Aquatic Nuisance Species Management Plan annual reporting deadline was moved from April 1st of each year to May 31st. Consistent with the FERC's 2017 Order, Douglas PUD's 2024 Annual Water Temperature Report and 2024 Aquatic Nuisance Species Management Plan Report have also been included within Exhibit A.

Article 406 of the license also requires Douglas PUD to provide documentation of consultation with resource agencies and tribes including the parties to the ASA. Towards meeting these requirements, these agencies and tribes were provided an opportunity to review, provide comment, and approve the Annual Report, all six of the Annual Management Plan Reports, and the Water Temperature Report. Draft reports were distributed to the ASA parties on March 5, 2025. During the required review period the Confederated Tribes of the Colville Reservation (CTCR), Yakama Nation (YN), and the United States Fish and Wildlife Service (FWS) provided suggested edits or revisions. Douglas PUD either accepted the edits received or worked with the parties to resolve the remaining comments and edits in advance of the May 14, 2025 conference call. Revisions were discussed and accepted during the May 14, 2025 Aquatic Settlement Workgroup Microsoft Teams meeting. The pre-filing consultation record documenting the review and May 14, 2025 approval of the revised ASA Annual Report, including all six Annual Management Plan Reports and the Water Temperature Report, can be found in Exhibit B to this letter.

In addition to meeting the requirements of Article 406 of the FERC license, the enclosed ASA Reports were developed to meet the requirements of section 6.4, 6.6 and 7(b) of the 401 Certification, section 11.7 of the ASA and section 4.0 within each of the aquatic resource management plans contained within the ASA.

If you have any questions or require further information related to the attached documents, please feel free to contact me at (509) 881-2323 or andrew.gingerich@dcpud.org.

Sincerely,

Andrew Gingerich
Natural Resources Supervisor

Exhibit A. Annual Report Calendar Year 2024 Activities under the Aquatic Settlement Agreement for the Wells Hydroelectric Project

Exhibit B. Pre-filing Consultation Record supporting the approval of the 2024 Aquatic Settlement Agreement Annual Report, 2024 Aquatic Settlement Agreement Management Plan Reports, and 2024 Water Temperature Report

Cc: Aquatic Settlement Work Group
Shane Bickford, Chas Kyger, & Mariah Mayfield – Douglas PUD
Wells Compliance – Douglas PUD

EXHIBIT A

ANNUAL REPORT CALENDAR YEAR 2024 ACTIVITIES UNDER THE AQUATIC SETTLEMENT AGREEMENT FOR THE WELLS HYDROELECTRIC PROJECT

FINAL

May 2025
Wells Hydroelectric Project FERC License No. 2149

ANCHOR QEA

Annual Report Calendar Year 2024 Activities Under the Aquatic Settlement Agreement

Prepared for Public Utility District No. 1 of Douglas County

FINAL

May 2025
Wells Hydroelectric Project FERC License No. 2149

Annual Report Calendar Year 2024 Activities Under the Aquatic Settlement Agreement

Prepared for
Public Utility District No. 1
of Douglas County, Washington
1151 Valley Mall Parkway
East Wenatchee, Washington 98802-4497

Prepared by
Anchor QEA
1201 3rd Avenue, Suite 2600
Seattle, Washington 98101

Project Number: 240280-01.01
\\fuji\anchor\Projects\Douglas PUD\Aquatic SWG\Annual Report\2024\2024 ASA Annual Report.docx

FINAL

Executive Summary

This *Annual Report Calendar Year 2024 Activities Under the Aquatic Settlement Agreement* (2024 ASA Annual Report) summarizes activities completed from January 1 to December 31, 2024, by Public Utility District No. 1 of Douglas County (Douglas PUD), the Confederated Tribes of the Colville Reservation (CTCR), Washington State Department of Ecology (Ecology), Washington Department of Fish and Wildlife (WDFW), the Yakama Nation (YN), U.S. Fish and Wildlife Service (USFWS), and U.S. Bureau of Land Management (Parties to the Aquatic Settlement Work Group [Aquatic SWG]). The report was produced in accordance with Douglas PUD's Federal Energy Regulatory Commission (FERC) License No. 2149, Clean Water Act (CWA) Section 401 Water Quality Certification, and the Aquatic Settlement Agreement (Agreement) and its six aquatic resource management plans (*White Sturgeon Management Plan* [WSMP], *Bull Trout Management Plan* [BTMP], *Water Quality Management Plan* [WQMP], *Pacific Lamprey Management Plan* [PLMP], *Aquatic Nuisance Species Management Plan* [ANSMP], and *Resident Fish Management Plan* [RFMP]).

The goal of the Aquatic SWG is to work collaboratively to implement actions and achieve the goals and objectives set forth under the FERC license, the CWA Section 401 Water Quality Certification, and the Agreement to adequately identify and address Wells Hydroelectric Project (Wells Project) impacts to aquatic resources that are not addressed by the *Anadromous Fish Agreement and Habitat Conservation Plan* (HCP) for the Wells Project (Douglas PUD 2002) or other related agreements. In 2023, Douglas PUD and the Aquatic SWG continued the successful implementation of the Agreement and its six aquatic resource management plans.

In 2024, Douglas PUD and the Aquatic SWG continued efforts to supplement the White Sturgeon (*Acipenser transmontanus*) population in the Wells Reservoir. The release of Brood Year (BY) 2023 larval-origin yearling White Sturgeon into the Wells Reservoir completed the second year of the Phase II Wells Project White Sturgeon Supplementation Program. The release of 330 yearling White Sturgeon was consistent with the *Statement of Agreement Regarding Wells Reservoir White Sturgeon Supplementation 2023–2026* (as appended to the 2022 ASA Annual Report). All BY 2023 White Sturgeon were screened and shown to be negative for spontaneous autopolyploidy (SAP) prior to release. SAP screening was consistent with the aforementioned statement of agreement (SOA). All BY 2023 White Sturgeon were also given pretransfer health checks and were approved for release. In July, 8,629 BY 2024 White Sturgeon larvae were delivered to Wells Hatchery. Larvae transfers were completed to meet Douglas PUD's annual goal of releasing 325 fish for their program in 2025, as well as rearing 2,250 fish for Chelan PUD per an interlocal agreement between the two Districts. Survival of BY 2024 fish in the hatchery was optimal, resulting in surplusing approximately 400 wild-caught larvae to the CTCR Resident Fish Hatchery. It is expected that the stocking target for the Douglas PUD program goal will be achieved in 2025. Douglas PUD completed the first indexing effort under the Phase II Wells Project White Sturgeon Monitoring and Evaluation Program.

Douglas PUD and the Aquatic SWG continued discussing evaluation of adult passage, per Section 4.4 of the WSMP (Objective 5), per the final *Statement of Agreement Regarding Evaluation and Implementation of White Sturgeon Adult Passage Measures (WSMP Objective 5; Section 4.4)* (as appended to the 2023 ASA Annual Report). Douglas PUD continued hosting annual public outreach events by inviting students from Bridgeport High School to assist Douglas PUD with releasing BY 2023 yearling White Sturgeon into the Wells Reservoir.

In 2024, Douglas PUD continued to identify, monitor, and address impacts, if any, on Bull Trout (*Salvelinus confluentus*) in the Wells Reservoir. At the request of the Aquatic SWG, Douglas PUD extended implementation of the *Bull Trout Movement and Life History Investigation 2022* (2022 Bull Trout PIT Study Plan) from completion in spring 2023, to completion in fall 2023. This extension added 31 study fish to the evaluation. Results from this evaluation are summarized in the *Bull Trout Movement and Life History Investigation 2022–2023* (2022–2023 Bull Trout Study Report; Appendix J) which was approved as revised by the Aquatic SWG on February 14, 2024, and the final report was filed with FERC on March 7, 2024, completing the Year 10 study license requirement. In September 2024, modified fishway operations were implemented at Wells Dam to maintain safe fish passage through the fishways per the *Wells Hydroelectric Project Adult Fish Passage Plan*. This was due to higher-than-normal volumes of aquatic vegetation, which impinged on the trash racks of turbine units and fishways. No impacts to Bull Trout were observed during these modified operations. Douglas PUD continued to be available to participate in regional and technical meetings specific to Bull Trout recovery. Douglas PUD also implemented additional protection, mitigation, and enhancement measures (PMEs) toward meeting the goals and objectives of the BTMP.

In 2024, Douglas PUD continued efforts to protect the quality of the surface waters throughout the Wells Reservoir. Douglas PUD continued to operate the Wells Dam bypass in compliance with the Aquatic SWG-approved *2024 Total Dissolved Gas Abatement Plan* (and appended *Wells Bypass Operating Plan*; Appendix L) toward meeting Washington State water quality standards for total dissolved gas (TDG) at the Wells Project. Biological monitoring of juvenile salmonids and native resident fish was performed, as required. Douglas PUD continued providing the Aquatic SWG with updates on Wells Project water quality and TDG levels. Pursuant to a 10-year compliance schedule established in 2013, Douglas PUD submitted the draft *Total Dissolved Gas Water Quality Attainment Plan Year 10 Report* (Water Quality Attainment Plan 10-Year Report) to Ecology and the Aquatic SWG for review in November 2023. Douglas PUD and Ecology continue to work jointly to further develop the draft report, and a final report is expected in 2025.

In 2024, Douglas PUD continued efforts to monitor and address impacts, if any, to Pacific Lamprey (*Entosphenus tridentatus*) in the Wells Project. Douglas PUD and the Aquatic SWG executed the second and final year of the 2-year SOA *To Translocate Adult Pacific Lamprey from Priest Rapids Dam to Areas Within or Upstream of the Wells Project 2023–2024* (as appended to the 2023 ASA Annual

Report). This 2-year translocation program allowed time to review and discuss the results of the *Wells Dam 2022–2023 Adult Lamprey Approach and Passage Study* (2022–2023 Adult Pacific Lamprey Approach and Passage Study). Results of the 2022–2023 Adult Pacific Lamprey Approach and Passage Study are summarized in the final report, *Wells Dam Adult Lamprey Approach and Passage Study, 2022–23* (Appendix M), which was approved by the Aquatic SWG as revised on June 12, 2024. Douglas PUD, in coordination with the Wells HCP Coordinating Committee, deployed and operated lamprey traps in the east and west fishways at Wells Dam. Based on the results of the 2022–2023 Adult Pacific Lamprey Study and lamprey trap operations, the draft *Wells Dam 2025 Adult Lamprey Approach and Passage Study Plan* (2025 Adult Pacific Lamprey Study Plan) proposes collection of study fish at Wells and Priest Rapids dams for an upstream passage evaluation, including testing head differential treatments. Components of the draft plan also require review and approval by the Wells HCP Coordinating Committee. A final study plan is expected in early 2025. Douglas PUD and the Aquatic SWG continued discussing juvenile Pacific Lamprey studies in the Upper Columbia River, including participating in another joint meeting of the Priest Rapids Fish Forum (PRFF) and Rocky Reach Fish Forum (RRFF) Pacific Lamprey Subgroups. Douglas PUD and the Aquatic SWG continued participating in regional conservation efforts, including regional coordination for adult Pacific Lamprey translocation efforts, supporting regional environmental DNA (eDNA) and genetic sampling, and tracking of regional information exchanges. In September 2024, modified fishway operations were implemented at Wells Dam to maintain safe fish passage through the fishways per the *Wells Hydroelectric Project Adult Fish Passage Plan*. No impacts to Pacific Lamprey were observed during these modified operations. Douglas PUD continued maintenance activities to improve Pacific Lamprey passage through the Wells Project, including repairing plating in the Wells Dam fishways to reduce gaps in both ladders and installing perforated plating on a Wells Hatchery outfall. Douglas PUD and the Aquatic SWG began investigating the Wells Hatchery volunteer channel for possible impacts to lamprey behavior and passage through the area. Douglas PUD hosted a tour of the west fishway and collection gallery and Wells Hatchery volunteer channel area that included viewing Pacific Lamprey passage improvements through the area. The Aquatic SWG once again reviewed and updated the juvenile and adult Pacific Lamprey literature reviews and document libraries.

In 2024, Douglas PUD continued aquatic nuisance species (ANS) monitoring in the Wells Reservoir. Douglas PUD continued annual surveillance for non-native Eurasian Watermilfoil (*Myriophyllum spicatum*); non-native Zebra Mussel (*Dreissena polymorpha*) and Quagga Mussel (*D. bugensis*), collectively called Dreissenid Mussels; and non-native Northern Crayfish (*Orconectes virilis*) throughout the Wells Project. Douglas PUD implemented the seventh year of an eDNA monitoring program for Northern Pike (*Esox lucius*) in the Wells Project and executed the fifth full year of implementation of the *Northern Pike Monitoring and Response Plan*. Douglas PUD also continued coordinating with regional entities (Chelan PUD, Grant PUD, CTCR, WDFW, and USFWS) conducting

Northern Pike monitoring and suppression efforts in the Columbia River Basin. Douglas PUD implemented additional PMEs towards meeting the goals and objectives of the ANSMP, including maintaining the *Aquatic Nuisance Species Management Plan Contact List* of parties to notify in case Douglas PUD detects new ANS in the Wells Project.

In 2024, Douglas PUD continued efforts to protect and enhance native resident fish populations and habitat in the Wells Reservoir. Douglas PUD continued implementing the Northern Pikeminnow Removal Program due to concern about predation on out-migrating juvenile salmonids. The Program through 2023 has captured and removed approximately 372,000 Northern Pikeminnow from the Wells Reservoir and tailrace through removal efforts sponsored by Douglas PUD. The Aquatic SWG approved the *2024 Resident Fish Assemblage Study Plan*. Douglas PUD implemented the study from spring to fall 2024. A draft study report will be distributed for Aquatic review in early 2025.

In 2024, Douglas PUD and the Aquatic SWG continued administration of the Agreement, including convening monthly meetings, review and reappointment of the Chairperson and support staff, maintaining two document repositories, hosting and attending tours of Wells Dam facilities, and review and approval of Agreement-related publications. Douglas PUD and the Aquatic SWG also continued coordination with the Wells HCP Coordinating Committee, as needed, and as required by the FERC license and CWA Section 401 Water Quality Certification for the Wells Project. This included collaborative development and approval of the *2024 Total Dissolved Gas Abatement Plan* (and appended *Wells Bypass Operating Plan*), as revised (Appendix L), communication of Northern Pikeminnow research and removal efforts at the Wells Project, coordination on modified fishway operations per the *Wells Hydroelectric Project Adult Fish Passage Plan*, review of lamprey trap operations in 2024, and consideration of lamprey trap operations proposed in the memorandum "Wells Dam Lamprey Trapping and Fishway Modifications 2025" (Appendix P).

TABLE OF CONTENTS

Executive Summary i

1 Introduction 1

1.1 Aquatic Settlement Agreement 1

1.2 Wells Project Federal Energy Regulatory Commission License 1

1.3 Aquatic Resource Management Plans 2

2 Progress Toward Implementing the Agreement and Wells Project License Order 3

2.1 2024 Aquatic Settlement Agreement Decisions, Agreements, and Milestones 3

2.1.1 White Sturgeon 4

2.1.2 Bull Trout 11

2.1.3 Water Quality 14

2.1.4 Pacific Lamprey 17

2.1.5 Aquatic Nuisance Species 33

2.1.6 Resident Fish 36

3 Agreement Administration 38

3.1 Aquatic Settlement Work Group Members 38

3.2 Agreement Chairperson 3-Year Review 38

3.3 Aquatic Settlement Work Group Document Repositories 38

3.4 Habitat Conservation Plan Coordination 38

3.4.1 2024 Total Dissolved Gas Abatement Plan and Wells Bypass Operating Plan 39

3.4.2 Northern Pikeminnow Removal Program Annual Reports 39

3.4.3 Modified Fishway Operations 39

3.4.4 Lamprey Trap Operations and Modifications 40

3.5 Wells Dam and Wells Hatchery Site Visits 41

3.6 Agreement-Related Publications in Calendar Year 2024 42

4 References 44

TABLES

Table 1 2024 Summary of Aquatic Settlement Work Group Decisions, Agreements, and Milestones 3

Table 2 Adult Pacific Lamprey Studies 18

Table 3 Douglas PUD Pacific Lamprey Translocation Effort, To Date 21

Table 4 Pacific Lamprey Trapping Efforts at Priest Rapids Dam – Catch Rates, 2018 to 2024 21
Table 5 Pacific Lamprey Translocation "Last Seen" Table from 2023 to 2024 23
Table 6 Regional Pacific Lamprey Conservation Activities 28

APPENDICES

Appendix A Aquatic Settlement Work Group 2024 Conference Call Minutes
Appendix B Aquatic Settlement Work Group Members
Appendix C 2024 Annual Report White Sturgeon Management Plan
Appendix D 2024 Bull Trout Management Plan and Incidental Take Annual Report
Appendix E 2024 Annual Report Water Quality Management Plan
Appendix F Pacific Lamprey Management Plan 2024 Annual Report
Appendix G Aquatic Nuisance Species Management Plan 2024 Annual Report
Appendix H Resident Fish Management Plan 2024 Annual Report
Appendix I 2024 Aquatic Settlement Agreement and Workgroup Action Plan
Appendix J Bull Trout Movement and Life History Investigation 2022–2023, including Appendices A, B, and C
Appendix K 2023 Annual Report Total Dissolved Gas Abatement Plan
Appendix L Wells Hydroelectric Project 2024 Total Dissolved Gas Abatement Plan and appended Wells Bypass Operating Plan
Appendix M Wells Dam Adult Lamprey Approach and Passage Study, 2022–23
Appendix N 2023 Northern Pikeminnow Removal Annual Report
Appendix O 2024 Resident Fish Assemblage Study Plan
Appendix P Wells Dam Lamprey Trapping and Fishway Modifications 2025

ABBREVIATIONS

[Year] ASA Annual Report	*Annual Report Calendar Year [Year] Activities Under the Aquatic Settlement Agreement*
[Year] Adult Pacific Lamprey Approach and Passage Study	*Wells Dam 2022–2023 Adult Lamprey Approach and Passage Study*
2022–2023 Bull Trout Study Report	*Bull Trout Movement and Life History Investigation 2022–2023*
2024 GAP/BOP	*2024 Total Dissolved Gas Abatement Plan* and appended *Wells Bypass Operating Plan*
2025 Adult Pacific Lamprey Study Plan	*Wells Dam 2025 Adult Lamprey Approach and Passage Study Plan*
Agreement	Aquatic Settlement Agreement
ANS	aquatic nuisance species
ANSMP	Aquatic Nuisance Species Management Plan
Aquatic SWG	Aquatic Settlement Work Group
AWS	auxiliary water supply
BTMP	Bull Trout Management Plan
BY	Brood Year
CTCR	Confederated Tribes of the Colville Reservation
COVID-19	coronavirus disease 2019
CWA	Clean Water Act
DIDSON	Dual-frequency Identification Sonar
Douglas PUD	Public Utility District No. 1 of Douglas County
Ecology	Washington State Department of Ecology
eDNA	environmental DNA
ELAT	Eel/Lamprey Acoustic Tag
FERC	Federal Energy Regulatory Commission
g	gram
GBT	gas bubble trauma
HCP	Habitat Conservation Plan
JBS	Juvenile Bypass System
M&E	monitoring and evaluation
NCLDV	nucleocytoplasmic large DNA viruses
NMFS	National Marine Fisheries Service
Parties	Aquatic Settlement Agreement signatory entities: CTCR, Ecology, WDFW, YN, USFWS, and Bureau of Land Management
PIT	passive integrated transponder

PLMP	Pacific Lamprey Management Plan
PNNL	Pacific Northwest National Laboratory
PRFF	Priest Rapids Fish Forum
PUD	Public Utility District
qPCR	quantitative polymerase chain reaction
RFMP	Resident Fish Management Plan
RRFF	Rocky Reach Fish Forum
SAP	spontaneous autopolyploid
SOA	statement of agreement
TDG	total dissolved gas
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
ViRDCt	Virtual Release/Dead-Fish Correction
Water Quality Attainment Plan 10-Year Report	*Total Dissolved Gas Water Quality Attainment Plan Year 10 Report*
WDFW	Washington Department of Fish and Wildlife
Wells Project	Wells Hydroelectric Project
White Sturgeon M&E Plan	*Phase I: White Sturgeon Management Plan Monitoring and Evaluation Study Plan*
White Sturgeon Rearing Plan	White Sturgeon Rearing Plan, BY 2019, Wells Hatchery
WQMP	Water Quality Management Plan
WSIV	White Sturgeon Iridovirus
WSMP	White Sturgeon Management Plan
YN	Yakama Nation

1 Introduction

1.1 Aquatic Settlement Agreement

The Wells Hydroelectric Project (Wells Project) is owned and operated by Public Utility District No. 1 of Douglas County (Douglas PUD). The Aquatic Settlement Agreement (Agreement) for the relicensing of the Wells Project (Federal Energy Regulatory Commission [FERC] License No. 2149) was signed by Douglas PUD's commissioners on January 19, 2009, following the receipt of signatures from the Confederated Tribes of the Colville Reservation (CTCR; November 10, 2008), Washington State Department of Ecology (Ecology; November 18, 2008), and Washington Department of Fish and Wildlife (WDFW; November 20, 2008). The Yakama Nation (YN) signed the Agreement on February 24, 2009, the U.S. Fish and Wildlife Service (USFWS) signed the Agreement on July 23, 2009, and the U.S. Bureau of Land Management signed the Agreement on November 13, 2009. These signatory entities are collectively referred to as the Parties. The Agreement is the culmination of 3 years of collaborative discussions with stakeholders that began in March 2006. The Agreement is intended to resolve all aquatic resource issues related to compliance with federal and state laws applicable to the Wells Project FERC license that are not addressed by the *Anadromous Fish Agreement and Habitat Conservation Plan* (HCP) for the Wells Project (Douglas PUD 2002), or other related agreements.

Designated representatives of the Parties comprise the Aquatic Settlement Work Group (Aquatic SWG), which meets collectively each month to oversee and guide implementation of the Agreement. Minutes from the 2024 meetings are compiled in Appendix A. Aquatic SWG members are listed in Appendix B.

Preparation of this report was funded by Douglas PUD as a requirement of the Agreement and Wells Project License Article 406. It is the 16th annual report to be developed for activities accomplished under the Agreement, covering the period from January 1 to December 31, 2024. This report is due annually to FERC by May 31 of each year (License Article 406). Accordingly, on May 8, 2024, the Aquatic SWG approved the *Annual Report Calendar Year 2023 Activities Under the Aquatic Settlement Agreement* (2023 ASA Annual Report; Anchor QEA 2024), and Douglas PUD filed the report with FERC on May 15, 2024. This 2024 ASA Annual Report will be reviewed and approved by the Aquatic SWG and subsequently filed with FERC on or prior to the May 31, 2025, deadline.

1.2 Wells Project Federal Energy Regulatory Commission License

On November 9, 2012, FERC issued Douglas PUD their current License Order for the Wells Project (FERC 2012). The term of the license is 40 years, retroactive to November 1, 2012. FERC adopted the Wells Project Clean Water Act (CWA) Section 401 Water Quality Certification along with the required measures in the aquatic resource management plans (Section 1.3). Since license issuance, Douglas

PUD has worked collaboratively with the Parties to the Agreement to implement the CWA Section 401 Water Quality Certification and aquatic resource management plan actions.

1.3 Aquatic Resource Management Plans

As of the effective date of the Agreement and pursuant to Section 5 of the Agreement, the Parties agreed that the measures set forth in six aquatic resource management plans are adequate to identify and address Wells Project impacts to aquatic resources not addressed by the HCP. Furthermore, by implementing the management plans, Douglas PUD is expected to achieve the goals and objectives set forth in each of the aquatic resource management plans. The six management plans include the *White Sturgeon Management Plan* (WSMP), *Bull Trout Management Plan* (BTMP), *Water Quality Management Plan* (WQMP), *Pacific Lamprey Management Plan* (PLMP), *Aquatic Nuisance Species Management Plan* (ANSMP), and *Resident Fish Management Plan* (RFMP), which are contained in Attachments B through G, respectively, of the Agreement.

Article 406 of the Wells Project License requires that annual reports be developed for each aquatic resource management plan to document progress made toward the implementation of each respective plan, with a focus on the previous year's progress under each specific management plan objective.

In 2024, all six 2023 aquatic resource management plan annual reports were due to FERC by May 31. Accordingly, on May 8, 2024, the *2023 Annual Report White Sturgeon Management Plan, 2023 Bull Trout Management Plan and Incidental Take Annual Report, 2023 Annual Report Water Quality Management Plan, Pacific Lamprey Management Plan 2023 Annual Report, Aquatic Nuisance Species Management Plan 2023 Annual Report,* and *Resident Fish Management Plan 2023 Annual Report* were approved by the Aquatic SWG, and Douglas PUD filed the reports with FERC as appended to the 2023 ASA Annual Report on May 15, 2024 (Anchor QEA 2024).

The 2024 aquatic resource management plan annual reports (Appendices C, D, E, F, G, and H) were updated in early 2025 in consultation with the Aquatic SWG and will be filed with FERC as appended to this 2024 ASA Annual Report on or prior to the May 31 deadline, per FERC license requirements.

2 Progress Toward Implementing the Agreement and Wells Project License Order

Section 11.7 of the Agreement requires preparation of an annual report that includes all relevant materials associated with Agreement activities during the year. The following subsections describe activities that were implemented during 2024 in accordance with the Agreement and aquatic resource management plans, which are also required in the 2012 Wells Project License Order.

2.1 2024 Aquatic Settlement Agreement Decisions, Agreements, and Milestones

In 2024, Douglas PUD completed actions to meet Protection, Mitigation, and Enhancement measures contained within the WSMP, BTMP, WQMP, PLMP, ANSMP, and RFMP. These actions were outlined in the *2024 Aquatic Settlement Agreement and Workgroup Action Plan*, as revised (Appendix I), which was approved by the Aquatic SWG on March 13, 2024.

Decisions, agreements, and milestones reached by the Aquatic SWG during 2024 that are related to the Agreement are shown in Table 1 and are documented in the Aquatic SWG conference call minutes (Appendix A).

Table 1
2024 Summary of Aquatic Settlement Work Group Decisions, Agreements, and Milestones

Aquatic SWG Decisions, Agreements, and Milestones	Date
Approved the *2024 Total Dissolved Gas Abatement Plan* and appended *Wells Bypass Operating Plan*.	February 14, 2024
Approved the *2023 Annual Report Total Dissolved Gas Abatement Plan*.	February 14, 2024
Approved the *Bull Trout Movement and Life History Investigation 2022–2023*, as revised, including *Appendix A. FERC Order Granting Variance from Radio Telemetry Study Pursuant to Bull Trout Stranding, Entrapment, and Take Study Plan and Article 402 Issued October 12, 2021*; *Appendix B. 2022–2023 Bull Trout Detection History Plots of Individual Study Fish*; and *Appendix C. Genetic Analysis for Bull Trout Prepared by Washington Department of Fish and Wildlife Dated June 2023*.	February 14, 2024
Agreed to Douglas PUD's proposal to use new sampling methods, fyke nets and hoop nets, for the 2024 Resident Fish Assemblage Study, so Douglas PUD can move forward with purchasing gear for implementation this spring 2024.	February 14, 2024
Approved the *2024 Aquatic Settlement Agreement and Workgroup Action Plan*, as revised.	March 13, 2024
Approved the *2024 Resident Fish Assemblage Study Plan*, as revised.	March 13, 2024

Aquatic SWG Decisions, Agreements, and Milestones	Date
Approved the *Annual Report Calendar Year 2023 Activities Under the Aquatic Settlement Agreement*, as revised, and appended *2023 Annual Report White Sturgeon Management Plan*, as revised; *2023 Bull Trout Management Plan and Incidental Take Annual Report*, as revised; *2023 Annual Report Water Quality Management Plan*, as revised, and appended *2023 Water Temperature Annual Report*; *Pacific Lamprey Management Plan 2023 Annual Report,* as revised; *Aquatic Nuisance Species Management Plan 2023 Annual Report*, as revised; and *Resident Fish Management Plan 2023 Annual Report*.	May 8, 2024
Approved the *Wells Dam Adult Lamprey Approach and Passage Study, 2022–23*, as revised.	June 12, 2024

2.1.1 White Sturgeon

In 2024, Douglas PUD continued efforts to supplement the White Sturgeon (*Acipenser transmontanus*) population in the Wells Reservoir, as outlined in the WSMP and as required by the FERC license and CWA Section 401 Water Quality Certification for the Wells Project.

2.1.1.1 Phase I Supplementation Program

The FERC license and CWA Section 401 Water Quality Certification for the Wells Project, issued in 2012, required Douglas PUD to release up to 5,000 White Sturgeon yearlings into the Wells Reservoir annually for 4 consecutive years (up to 20,000 total), starting the first year following issuance of the operating license. This required collection of White Sturgeon broodstock or larvae beginning in 2013 and stocking of juvenile White Sturgeon in the years 2014 through 2017. In the 4 years ending in 2017, a total of 20,473 yearling White Sturgeon were released into the Wells Reservoir, which met the 4-year target.[1,2,3,4]

The FERC license required that additional years and numbers of yearling White Sturgeon be stocked during Phase I (Years 1 to 10), as determined by the Aquatic SWG, but not to exceed an additional 15,000 fish, for a total release of 35,000 yearling White Sturgeon. This included collection of White Sturgeon larvae beginning in 2017 and stocking of 325 (±5%) White Sturgeon greater than or equal to 200 grams (g) in size in the years 2018 to 2022. From 2018 to 2022, a total of 1,578 yearling White

[1] Per the *White Sturgeon Broodstock Collection and Breeding Plan* (filed with FERC in 2013).
[2] Per the *Wells White Sturgeon Offspring Collection Plan Statement of Agreement* (as appended to the 2012 ASA Annual Report).
[3] Per the *White Sturgeon Collection Plan SOA* (as appended to the 2013 ASA Annual Report).
[4] Per the *White Sturgeon Collection and Stocking SOA: Brood Years 2014 to 2016* (as appended to the 2015 ASA Annual Report).

Sturgeon were released into the Wells Reservoir, consistent with the Wells Reservoir adult population goals determined by the Aquatic SWG.[5,6]

From 2014 to 2022, a total of 22,051 yearling White Sturgeon were released into the Wells Reservoir, which met the goals of Phase I of the Wells Project White Sturgeon Supplementation Program.

2.1.1.2 Phase II Supplementation Program

Section 4.3.1 of the WSMP stipulates that during Phase II of the Wells Project White Sturgeon Supplementation Program (after Year 10 of the FERC license), stocking will range from 0 to 5,000 fish. Stocking rates will be based on results of White Sturgeon monitoring and evaluation (M&E), conducted to determine carrying capacity of the Wells Reservoir, and consistent with WSMP goals and objectives. In March 2022, the statement of agreement (SOA) *Wells Reservoir White Sturgeon Supplementation 2023–2026* (as appended to the 2022 ASA Annual Report) was approved by the Aquatic SWG. This SOA stipulates that the collection of White Sturgeon larvae be sourced from Lake Roosevelt beginning in 2022, and the stocking of 325 (±10%) White Sturgeon greater than or equal to 350 g in size each year from 2023 to 2026. Throughout 2022, Douglas PUD and the Aquatic SWG discussed spontaneous autopolyploidy (SAP) screening of all White Sturgeon being reared at Wells Hatchery for stocking in Wells Reservoir (Section 2.1.1.5.1). In August 2022, the *Statement of Agreement Regarding Wells Reservoir White Sturgeon Supplementation 2023–2026* (as appended to the 2022 ASA Annual Report) was approved by the Aquatic SWG. This SOA stipulates that in addition to the SOA approved in March 2022, fish will also be blood sampled and tested for SAP, and fish identified having anything other than 8N[7] chromosome types will be euthanized.

In 2024, Douglas PUD, in coordination with the Aquatic SWG, stocked 330 Brood Year (BY) 2023 larval-origin White Sturgeon in the Wells Reservoir, which was the second year of the 2023 to 2026, Phase II releases (Section 2.1.1.2 to Section 2.1.1.5). Additionally, Douglas PUD, in coordination with the Aquatic SWG, collected BY 2024 fish for the third Phase II release in 2025 (Section 2.1.1.4). It is expected that the stocking target for the Douglas PUD program goal will be achieved in 2025.

2.1.1.2.1 Brood Years 2022 to 2025

In May 2023, a total of 328 BY 2022 larval-origin (Lake Roosevelt) White Sturgeon were stocked in the Wells Reservoir. This met the 325-fish target plus an additional 3 fish allowed by the current SOA (Section 2.1.1.2). The 328-fish release included fish averaging 541 g each, with only two fish below the 350-g target size. On May 30, 2024, a total of 330 BY 2023 larval-origin (Lake Roosevelt) White Sturgeon were stocked in the Wells Reservoir, per the current SOA (Section 2.1.1.2). The 330-fish release

[5] Per the *White Sturgeon Broodstock Collection and Breeding Plan* (revised as the *2018 White Sturgeon Supplementation Plan*, as appended to the 2018 ASA Annual Report).
[6] Per the SOA, *Wells Reservoir White Sturgeon Supplementation 2018–2022* (as appended to the 2017 ASA Annual Report).
[7] White Sturgeon are normally evolutionary octoploids and have eight copies of each chromosome (8N).

included most fish averaging 375 g each, although some fish were below the 350-g target size but could be stocked consistent with past agreements (Section 2.1.1.3.2).

2.1.1.3 Collection and Stocking Considerations

2.1.1.3.1 Release Target

In January 2019, the Aquatic SWG approved stocking additional BY 2019 White Sturgeon in the Wells Reservoir in 2020, beyond the stocking target stipulated in the current SOA, to cover the shortfall in the BY 2018 program in 2019. Similarly, any additional or future shortfalls to stocking targets will be addressed in subsequent years, as necessary.

In 2024, there were no shortfalls in the BY 2023 program.

2.1.1.3.2 Size Target

In February 2020, the Aquatic SWG discussed and agreed to stock BY 2019 White Sturgeon that weigh less than the 200 g threshold, so long as: 1) the majority of BY 2019 White Sturgeon released weigh more than 200 g; and 2) any BY 2019 White Sturgeon weighing less than 200 g are large enough to receive a passive integrated transponder (PIT) tag. This approach was consistent with how smaller fish were stocked in 2018 and 2019 (under the current SOA), even though it had not been memorialized as a formal agreement.

In 2024, the 330 BY 2023 White Sturgeon released included approximately 100 fish below the 350-g target size (Section 2.1.1.2.1). Most fish for release exceeded the target size, and fish below the target size were large enough to receive PIT tags; therefore, all fish were released, which met the stocking obligations in the current SOA (Section 2.1.1.2).

2.1.1.3.3 Multiple Release Groups

In September 2020, exceptional survival and fish growth of BY 2020 White Sturgeon on station at Wells Hatchery prompted a discussion within the Aquatic SWG about whether there was any value in holding back some number of fish, in addition to the BY 2020 stocking target of 325 fish in 2021, to meet the 325-fish stocking target in 2022. Although there seemed to be not much risk of collecting numbers short of program targets in future years, the Aquatic SWG discussed the pros and cons associated with this concept. The topics discussed included genetics research that would support this approach, the potential for consequential competition, goals of the supplementation program, effects of slowing down fish growth, and benefits to survivability and recruitment to adult life stages. Ultimately, no agreements or decisions were made, and sending any surplus fish above program needs to the CTCR Resident Fish Hatchery continued.

In 2024, optimal survival of BY 2024 White Sturgeon while on station at Wells Hatchery resulted in surplusing approximately 400 wild-caught larvae to the CTCR Resident Fish Hatchery, with additional BY 2024 surplus events expected in 2025.

2.1.1.4 Interlocal Agreement

In 2021, Douglas PUD and Chelan PUD signed a 5-year interlocal agreement for Douglas PUD to use excess capacity at Wells Hatchery to rear yearling White Sturgeon for the Chelan PUD White Sturgeon Supplementation Program. The number of larvae delivered to Wells Hatchery is based on target stocking numbers for both programs, in-hatchery survival rates, not overcrowding the fish while rearing in the hatchery, and a goal to not have surplus fish. The interlocal agreement with Chelan PUD prioritizes Douglas PUD's program goal over Chelan PUD's program for fish reared at Wells Hatchery.

In 2024, the target stocking number for Douglas PUD's BY 2023 White Sturgeon Supplementation Program was 325 fish, based on the current SOA (Section 2.1.1.2). The target stocking number for Chelan PUD's BY 2023 White Sturgeon Supplementation Program was approximately 2,250 fish, based on an SOA approved by the Rocky Reach Fish Forum (RRFF). Survival of BY 2023 White Sturgeon in hatchery early on was suboptimal (Section 2.1.1.5.4). In February 2024, the CTCR transferred 157 BY 2023 wild larvae-original juvenile White Sturgeon originally caught in Lake Roosevelt to Wells Hatchery to make up for possible shortfalls in the Chelan PUD program. In April 2024, after scute-marking and PIT-tagging of BY 2023 White Sturgeon to meet Douglas PUD program goals, the balance, or 2,016 fish, were used to support Chelan PUD stocking goals.

In July 2024, Chelan PUD and Douglas PUD staff picked up and delivered 8,629 BY 2024 White Sturgeon larvae to Wells Hatchery to meet both Douglas PUD and Chelan PUD program goals in 2025. Survival in hatchery was optimal (Section 2.1.1.5.5). These White Sturgeon larvae were captured by the CTCR under contracts with Chelan and Douglas PUDs. By December 2024, numbers were on track to meet the goals for both Douglas PUD and Chelan PUD programs in 2025.

2.1.1.5 Fish Health

2.1.1.5.1 Autopolyploidy

Since 2019, the Aquatic SWG has discussed the potential presence of spontaneous autopolyploid White Sturgeon (i.e., White Sturgeon with 12 chromosome copies, or 12N fish) and spontaneous autopolyploid White Sturgeon progeny (i.e., White Sturgeon with 10 chromosome copies, or 10N fish) in the Wells Project (as described in respective ASA annual reports). In August 2022, the *Statement of Agreement Regarding Wells Reservoir White Sturgeon Supplementation 2023–2026* (as appended to the 2022 ASA Annual Report) was approved by the Aquatic SWG, which includes

guidelines for SAP screening of all BY 2022 to 2025 White Sturgeon being reared at Wells Hatchery for stocking in Wells Reservoir (Section 2.1.1.2).

Consistent with this SOA, in 2023, SAP sampling of BY 2022 White Sturgeon being reared at Wells Hatchery for stocking in Wells Reservoir was completed in house by Dr. Betsy Bamberger (Douglas PUD Fish Veterinarian). Following the blood sampling, there were no mortalities or injuries. All ploidy test results were negative, and all fish were stocked as planned. In 2024, SAP sampling of BY 2023 White Sturgeon being reared at Wells Hatchery for stocking in Wells Reservoir was completed in house by Dr. Betsy Bamberger (Douglas PUD Fish Health and Evaluation Specialist). There were no mortalities or injuries, and all ploidy test results were negative, as described in the memorandum "Results of 2024 White Sturgeon Autopolyploidy Testing" (Appendix A; April 10, 2024, meeting minutes).

2.1.1.5.2 White Sturgeon Iridovirus

Prior to 2019, White Sturgeon at Wells Hatchery were sampled for White Sturgeon Iridovirus (WSIV) via tissue sampling in advance of stocking. In 2019, WDFW suspended sampling for what was formerly called WSIV (now, tentatively referred to as nucleocytoplasmic large DNA viruses [NCLDV]) histopathology. Researchers discovered that histopathology is not effective in determining presence or absence of this virus. In March 2021, Dr. Jed Varney (retired), WDFW Senior Veterinarian, updated the Aquatic SWG on sampling for NCLDV. Canadian researchers have developed and are using a quantitative polymerase chain reaction (qPCR) test to screen for NCLDV and would like the qPCR test to be used in Washington State; however, the use of this qPCR test has not been approved or validated among wild populations in the state. The Aquatic SWG will continue reviewing NCLDV information in future years, as needed.

In 2024, all BY 2023 White Sturgeon being reared at Wells Hatchery for stocking in Wells Reservoir were given pretransfer checks by Dr. Bamberger in coordination with WDFW and were approved for release, as described in the memorandum "Notification of Fish Pre-Release/Transfer Health Inspection" (Appendix A; June 12, 2024, meeting minutes).

2.1.1.5.3 White Sturgeon Rearing Plan

In late 2018, to address the issues experienced with BY 2018 White Sturgeon and to obtain higher survival in subsequent BYs of White Sturgeon, Douglas PUD drafted the *White Sturgeon Rearing Plan, BY 2019, Wells Hatchery* (White Sturgeon Rearing Plan) for review and discussion, which focused on modifications to White Sturgeon rearing at Wells Hatchery. In early 2019, Douglas PUD hosted an in-person meeting inviting the Aquatic SWG, Douglas PUD, Wells Hatchery staff, and CTCR staff to discuss Wells Hatchery BY 2019 White Sturgeon rearing practices, review the draft rearing plan, and discuss White Sturgeon rearing, culture, and experiences in general. Based on these discussions, a

revised rearing plan was distributed, and on March 13, 2019, the Aquatic SWG-approved the final White Sturgeon Rearing Plan (as appended to the 2019 ASA Annual Report).

In 2024, White Sturgeon rearing practices at Wells Hatchery were performed consistent with recommendations outlined in this plan.

2.1.1.5.4 Brood Year 2023

In 2023, suboptimal survival in the early rearing stages of BY 2023 White Sturgeon was observed while these fish were on station at Wells Hatchery. Dr. Bamberger sampled the fish and found nothing pathologically wrong, which was also confirmed by the Washington Animal Disease Diagnostic Laboratory. In 2024, the overall condition of BY 2023 White Sturgeon while on station at Wells Hatchery was optimal, and mortalities were as expected and negligible.

2.1.1.5.5 Brood Year 2024

In 2024, survival and overall condition of BY 2024 White Sturgeon in hatchery was optimal, and mortalities were as expected and negligible. As of December 2024, approximately 3,982 BY 2024 White Sturgeon remained on station at Wells Hatchery after surplusing approximately 400 fish to the CTCR Resident Fish Hatchery (Section 2.1.1.3.3). All fish were in good condition, and fish growth was on track to tag and mark fish in early 2025.

2.1.1.6 Phase I Monitoring and Evaluation Program

Section 4.2 of the WSMP stipulates that during Phase I of the Wells Project White Sturgeon M&E Program (Years 1 to 10), Douglas PUD will conduct an M&E program within the Wells Reservoir for the purpose of assessing the effectiveness of the supplementation activities described in Section 4.1 of the WSMP (Section 2.1.1.1). In January 2014, the Aquatic SWG approved the *Phase I: White Sturgeon Management Plan Monitoring and Evaluation Study Plan* (White Sturgeon M&E Plan; as appended to the 2013 ASA Annual Report), which outlined implementation of the three M&E programs required by Section 4.2 of the WSMP.

Consistent with the White Sturgeon M&E Plan and Section 4.2.1 of the WSMP, Douglas PUD implemented an index monitoring program for juvenile and adult White Sturgeon in the Wells Reservoir from 2015 to 2019 and in 2021 and 2022 (as described in these respective ASA annual reports). Consistent with the White Sturgeon M&E Plan and Section 4.2.2 of the WSMP, Douglas PUD implemented a marked fish tracking program in the Wells Reservoir from 2015 to 2022 (as described in these respective ASA annual reports). Consistent with the White Sturgeon M&E Plan and Section 4.2.3 of the WSMP, Douglas PUD implemented an adult reproductive assessment in the Wells Reservoir in 2022 (as described in the 2022 ASA Annual Report).

2.1.1.7 Phase II Monitoring and Evaluation Program

Section 4.3.3 of the WSMP stipulates that during Phase II of the Wells Project White Sturgeon M&E Program (after Year 10 of the FERC license), Douglas PUD will continue implementation of long-term index monitoring activities every 3 to 5 years. To avoid long gaps in these data, Douglas PUD elected to switch to sampling every other year.

In 2024, Douglas PUD completed the first indexing effort under the Phase II M&E Program. From September 16 to October 18, 2024, the White Sturgeon monitoring and indexing session included one 5-week session, 4 days per week, and included a mix of large and small gear sizes. The preliminary data indicate there were 191 setline sites sampled, which resulted in sampling of 329 unique individuals, four unmarked wild fish (all around 170 centimeters), and two Chelan PUD hatchery-reared fish. During this effort more than 300 tissue samples were collected, which will also inform the evaluation of adult passage at Wells Dam (Section 2.1.1.8). A summary report on the 2024 White Sturgeon M&E sampling effort is expected in 2025.

2.1.1.8 Evaluation of Adult Passage

Per Section 4.4 of the WSMP (Objective 5), in Year 11 of the FERC license and every 10 years thereafter for the duration of the license unless otherwise determined by the Aquatic SWG, the Aquatic SWG shall evaluate the biological merit to providing upstream passage for adult White Sturgeon. The assessment of biological merit shall be determined by the following means: (i) evaluating information gathered from M&E activities and determining whether there is significant biological benefit and need for upstream passage; (ii) the availability of reasonable and appropriate means to provide upstream passage; and (iii) consensus from all other operators of the Mid-Columbia Projects to implement adult upstream passage measures.[8]

In November 2023, after months of discussing how to research these questions in a reasonable way, the final *Statement of Agreement Regarding Evaluation and Implementation of White Sturgeon Adult Passage Measures (WSMP Objective 5; Section 4.4)* (as appended to the 2023 ASA Annual Report) was approved by the Aquatic SWG, which identifies five tasks needed to meet the requirements for Year 11: 1) identify the biological benefits of providing upstream passage for White Sturgeon at Wells Dam; 2) document the status of sturgeon passage measures and plans at Columbia and Snake River dams; 3) complete a literature review on sturgeon passage at hydroelectric and dam facilities prior to the end of 2024; 4) acquire and summarize White Sturgeon PIT-tag and interrogation data at Mid-Columbia PUD projects; and 5) collect and archive tissue samples from White Sturgeon encountered in the Wells Project during M&E activities for genetic analysis, with an emphasis on sampling fish released from Wells Hatchery from 2014 to 2023.

[8] The intent is to provide connectivity to the Hanford Reach White Sturgeon population.

In November 2024, the draft *Adult White Sturgeon Upstream Passage Evaluation* report was distributed for Aquatic SWG review. This document was compiled by Douglas PUD, LGL Limited, and Blue Leaf Environmental and addresses Tasks 2 to 4 in the SOA discussed in the preceding paragraph that was approved in November 2023. Edits and comments received on the draft report were incorporated into a revised report, which was distributed in December 2024. Approval is expected in early 2025. To address Task 5, Douglas PUD collected tissue samples in the Wells Reservoir as part of this year's White Sturgeon M&E effort (Section 2.1.1.7). Next steps include discussing what the Aquatic SWG wants to do with these samples in terms of genetics and when. Once this information is in hand, Task 1 (addressing biological benefits) will need to be revisited. These discussions will continue in 2025.

2.1.1.9 Outreach

Since 2014, Douglas PUD has hosted public outreach events as a part of the WSMP and *Douglas PUD White Sturgeon Outreach Plan* (as appended to the 2014 ASA Annual Report). This entails inviting students from Bridgeport High School to participate in the release of yearling White Sturgeon into the Wells Reservoir. Students interrogate the fish for presence of PIT tags and record lengths and weights and have an opportunity to learn about White Sturgeon life history.

On May 30, 2024, students from Bridgeport High School assisted Douglas PUD with releasing 330 BY 2023 yearling White Sturgeon into the Wells Reservoir.

2.1.1.10 Planned Monitoring, Studies, and Activities in 2025

In 2025, implementation of the WSMP and White Sturgeon measures outlined in the FERC license and CWA Section 401 Water Quality Certification for the Wells Project will continue. This includes continuing implementation of the Phase II Supplementation Program in the Wells Reservoir, the Phase II M&E Program, the evaluation of adult passage (Objective 5), and continuing public outreach events. The *2024 Annual Report White Sturgeon Management Plan* (Appendix C), which summarizes White Sturgeon activities and results from 2024, will be reviewed by the Aquatic SWG in early 2025 and submitted to FERC as appended to this 2024 ASA Annual Report by the May 31, 2025, deadline.

2.1.2 Bull Trout

In 2024, Douglas PUD continued to identify, monitor, and address impacts, if any, on Bull Trout (*Salvelinus confluentus*) in the Wells Reservoir, as outlined in the BTMP and as required by the FERC license and CWA Section 401 Water Quality Certification for the Wells Project. Measures outlined in the BTMP and FERC License Order are consistent with the USFWS's Section 18 Fishway Prescription, Douglas PUD's Biological Opinion for Bull Trout, and Ecology's CWA Section 401 Water Quality Certification for the Wells Project.

2.1.2.1 Twisp Weir Removal

Each year around August 1, Douglas PUD begins removing the Twisp Weir trap boxes from the weir footings. Removing the trap boxes improves weir openness, particularly during low flow periods, and therefore provides a less confined downstream passage route for adult Bull Trout migrating downstream after spawning.

In 2024, removal of the Twisp Weir was completed as scheduled with no observed impacts on Bull Trout. All terms and conditions were consistent with the requirements in Douglas PUD's Biological Opinion for Bull Trout, and incidental take remained below set limits. Bull Trout interactions with the weir are summarized in the *2024 Bull Trout Management Plan and Incidental Take Annual Report* (Appendix D).

2.1.2.2 2022–2023 Bull Trout PIT Study

The Wells Project FERC License No. 2149 requires Douglas PUD to determine the survival and passage success rates for Bull Trout at Wells Dam and the Twisp Weir in Year 5 and Year 10 of the 2012-issued license and every 10 years thereafter. Douglas PUD conducted a 1-year radio telemetry Bull Trout survival and passage success study in 2016 to 2017 (Year 5 study). Development and implementation of the 2022–2023 Bull Trout PIT-Tag Study is described at length in the 2023 ASA Annual Report.

In December 2023, the draft *Bull Trout Movement and Life History Investigation 2022–2023* (2022–2023 Bull Trout Study Report) and appendices were distributed for an Aquatic SWG 45-day review. Considering the limitations of PIT technology, this report is a qualitative investigation about seasonal movement patterns of Bull Trout at the Wells Project and Twisp Weir. On February 14, 2024, the 2022–2023 Bull Trout Study Report, as revised (Appendix J) was approved by the Aquatic SWG. The final report was filed with FERC on March 7, 2024, which completed the Year 10 study license requirement.

While discussing the 2022 Bull Trout PIT Study in 2023, Douglas PUD, USFWS, and the Aquatic SWG agreed that it is important to continue monitoring the local Bull Trout population in the context of identifying an opportunity to conduct the next radio telemetry study. While the next required study is not for another 10 years, history shows Bull Trout numbers at Wells Dam, and likely the population, go through interannual cycles. The purpose of the monitoring is to identify any population rebounds, because these might present an opportunity for a study that may not align with the 10-year timeline.

2.1.2.3 Modified Fishway Operations

Section 4.1.1 of the BTMP stipulates that operation of the downstream passage facilities for Bull Trout will be consistent with bypass operations for Plan Species identified in the Wells HCP (as described in the *Wells Hydroelectric Project Adult Fish Passage Plan*).

In September 2024, higher-than-normal volumes of aquatic vegetation impinged on the trash racks of turbine units and fishways at Wells Dam, resulting in modified fishway operations to maintain safe fish passage through the fishways per the *Wells Hydroelectric Project Adult Fish Passage Plan*. The Wells HCP Coordinating Committee was briefed on this matter, and these communications were shared with the Aquatic SWG regarding how this issue was being addressed (Section 3.4.3).

2.1.2.4 Recovery Planning and Regional Coordination

In 2024, Douglas PUD was available to participate in regional and technical meetings specific to Bull Trout recovery, including the development of the Recovery Unit Implementation Plan for Bull Trout and re-evaluating threats-based analysis to Bull Trout local populations in the Wenatchee, Entiat, Methow, and Okanogan river basins. From September 17 to 19, 2024, Douglas PUD staff participated in the *Salvelinus Confluentus* Curiosity Society meeting in Mazama, Washington, where a host of presentations were given and field exercises completed related to Bull Trout conservation and restoration in the region.

2.1.2.5 Other Protection, Mitigation, and Enhancement Measures

Sections 4.1 to 4.6 of the BTMP outline protection, mitigation, and enhancement measures (PMEs) designed to meet the goals and objectives of the BTMP. Throughout 2024, Douglas PUD and the Aquatic SWG implemented these PMEs, as described in the previous sections.

In 2024, Douglas PUD implemented additional PMEs toward meeting the goals and objectives of the BTMP, including the following: 1) enumerating Bull Trout in the Wells Dam fish ladder count windows; 2) monitoring for sub-adults in the Wells Dam count windows (more than 10 sub-adults per year triggers additional measures); 3) being prepared to rescue Bull Trout encountered during fish salvage activities during winter maintenance (none were encountered); and 4) being prepared to PIT-tag incidental encounters of Bull Trout at Project Facilities. In total, 25 Bull Trout were incidentally encountered during 2024 broodstock collection activities completed under the Wells HCP. These encounters occurred at Wells Dam fishway traps, the Wells Hatchery adult fish handling facility, and Twisp River weir. Each fish was PIT tagged (if not already tagged), and a tissue sample (fin clip) was collected.

2.1.2.6 Planned Monitoring, Studies, and Activities in 2025

In 2025, implementation of the BTMP and Bull Trout measures outlined in the FERC license and CWA Section 401 Water Quality Certification for the Wells Project will continue. This includes continuing to monitor the local Bull Trout population for an opportunity to conduct the next radio telemetry study and continuing participating in regional coordination. The *2024 Bull Trout Management Plan and Incidental Take Annual Report* (Appendix D), which summarizes Bull Trout activities and results from 2024, will be reviewed by the Aquatic SWG in early 2025 and submitted to FERC as appended to this 2024 ASA Annual Report by the May 31, 2025, deadline.

2.1.3 Water Quality

In 2024, Douglas PUD continued efforts to protect the quality of the surface waters throughout the Wells Reservoir, as outlined in the WQMP and as required by Douglas PUD's CWA Section 401 Water Quality Certification for the Wells Project and FERC license.

2.1.3.1 2023 Annual Report Total Dissolved Gas Abatement Plan

On February 14, 2024, the report, *2023 Annual Report Total Dissolved Gas Abatement Plan* (Appendix K) was approved by Ecology and the Aquatic SWG. This report summarized total dissolved gas (TDG) performance during the 2023 fish and non-fish bypass season at Wells Dam, including gas bubble trauma (GBT) monitoring throughout 2023 (as described in the 2023 ASA Annual Report). The report was filed with FERC on February 22, 2024.

2.1.3.2 2024 Total Dissolved Gas Abatement Plan and Wells Bypass Operating Plan

On February 14, 2024, the *2024 Total Dissolved Gas Abatement Plan* and appended *Wells Bypass Operating Plan* (2024 GAP/BOP; Appendix L) was approved by Ecology and the Aquatic SWG. A 30-day review period was also provided to the Wells HCP Coordinating Committee (Section 3.4.1). This plan summarized operational and structural measures to be implemented by Douglas PUD to comply with Washington State water quality standards for TDG at the Wells Project. Spill operations for the 2024 spill season were outlined in the *Wells Hydroelectric Project Spill Playbook* (Appendix 1 to the 2024 GAP). This plan was filed with FERC on February 28, 2024.

In 2024, the *Wells Hydroelectric Project Spill Playbook* was modified to move concentrated spill under high river flow from Spillway 7 to Spillway 9 due to ongoing maintenance on Turbine Unit 6. This will maintain concentrated spill in the center of the spillway and toward the left bank. Studies during relicensing showed that this concentrated spill pattern produces the least amount of TDG in the Wells Dam tailrace. This modification did not appear to affect TDG performance throughout the season.

Complete results of the 2024 compliance period will be summarized in the *2024 Annual Report Total Dissolved Gas Abatement Plan*, expected in early 2025.

2.1.3.3 2024 Biological Monitoring

The 2024 GAP (Appendix L) includes a biological monitoring plan[9] that requires Douglas PUD to conduct biological monitoring of migrating salmonids and resident fish to measure impacts from exposure to increased TDG conditions throughout the spill season. The plan requires weekly sampling of juvenile salmonids and native and resident fish, including lampreys, for GBT while the Wells Dam juvenile bypass is in use. The 2024 GAP also includes the National Marine Fisheries

[9] Required by a TDG rule change adopted by Ecology on December 30, 2019, and approved by the U.S. Environmental Protection Agency (USEPA) on March 5, 2020, as codified in Washington Administrative Code 173-201A-200(1)(f). Effective January 1, 2021.

Service (NMFS) recommendation for additional sampling of juvenile salmonids for GBT, from July to August, when hourly TDG levels exceed 125% in the Wells Dam tailrace (NMFS 2000).

Per the biological monitoring plan, weekly GBT monitoring was performed from April 4 to August 7,[10] 2024, in juvenile salmonids sampled at the Rocky Reach Juvenile Bypass System (JBS) and in native and resident fish, including lampreys, collected via boat electroshocking in the first 2 miles downstream of Wells Dam. No GBT was observed in any juvenile salmonids or resident fish collected at the JBS or below Wells Dam. Of note, during each sample event, Douglas PUD endeavors to examine no fewer than 50 anadromous fish and 50 resident fish for GBT. However, due to low passage rates at the Rocky Reach JBS, there were several weeks when the 50-fish minimum was not met.

Per the NMFS recommendation, Douglas PUD was prepared to implement additional sampling of juvenile salmonids for GBT from the end of juvenile bypass (August 5) to August 31; however, there were no exceedances of the 125% tailrace TDG standard, so additional monitoring beyond what was stipulated per the biological monitoring plan was not required or implemented.

Complete results of biological monitoring for GBT in 2024 will be summarized in the *2024 Annual Report Total Dissolved Gas Abatement Plan*, expected in early 2025.

2.1.3.4 2024 Wells Project Water Quality Update

In 2024, Douglas PUD continued providing the Aquatic SWG with updates on water quality and TDG compliance for the Wells Project.

In 2024, inflow into the Wells Project was lower than average, remained low, and never reached the 7-day, 10-year frequency flood (or 7Q10) flows for the Wells Project (246,000 cubic feet per second). This resulted in 100% compliance with TDG standards from April to August for both spring and summer fish passage seasons. Additionally, no signs of GBT were observed in fish examined during this period (Section 2.1.3.3). During the non-spill season (September 1 to March 31), there was one noncompliance event where TDG values exceeded the 110% standard in the Wells Dam tailrace. This was due to a spill event to accommodate Hanford Reach Fall Chinook Salmon Agreement flows and likely could have been avoided through better communication with project operators. Since then, a new protocol and training memorandum are used by Wells Dam operators to meet the Hanford Reach Agreement and minimize TDG production.

In June 2024, Douglas PUD sent a letter to Ecology requesting clarification of the "new"[11] water quality standard for TDG, which says the 125% and 126% TDG tailrace standards will apply during the

[10] In 2024, the Wells Dam juvenile bypass operated from April 9 to August 5.

[11] On December 30, 2019, Ecology adopted a TDG rule change, which was approved by the USEPA on March 5, 2020. This modification that adjusted historical TDG criteria, codified in Washington Administrative Code 173-201A-200(1)(f),

spring bypass season, which is "generally from April to June." The letter explained that the Wells Dam bypass also runs from July to August to provide non-turbine bypass for late-migrating fish, per an obligation to meet Section 10 criteria for Endangered Species Act-listed fish, which may produce TDG in the tailrace. Ecology responded in the letter, "Clarification of Total Dissolved Gas Standards During Spring/Summer Juvenile Bypass Operational Period" (Appendix A; December 11, 2024, meeting minutes), and agreed that providing downstream passage is consistent with the Biological Opinion; therefore, spring TDG criteria may be applied, where appropriate, into July and August, as necessary to meet each dam's juvenile salmonid biological objectives.

2.1.3.5 Total Dissolved Gas Water Quality Attainment Plan Year 10 Report

Douglas PUD's FERC license (issued in 2012) and CWA Section 401 Water Quality Certification for the Wells Project require Douglas PUD to develop a 10-year compliance schedule for TDG production at the Wells Project, to be filed with FERC and Ecology within 1 year after issuance of the license. At that time, the Aquatic SWG approved a 10-year schedule and plan for implementation starting in 2013. Douglas PUD has been implementing this schedule and plan over the last 10 years, which culminates in the issuance of a 10-year report.

On November 14, 2023, pursuant to the 10-year compliance schedule, Douglas PUD submitted the draft *Total Dissolved Gas Water Quality Attainment Plan Year 10 Report* (Water Quality Attainment Plan 10-Year Report) to Ecology and the Aquatic SWG for review. On January 8, 2024, Douglas PUD and Ecology met and discussed a path forward to review and update the document over the next few months. Douglas PUD met the 10-year compliance schedule by submitting the draft report to Ecology in 2023, and now Douglas PUD and Ecology plan to review the data and collaboratively produce a high-quality finished product. Ecology noted that this type of review process for water quality attainment plans is not uncommon. In March 2024, the Ecology Aquatic SWG Technical Representative who had been coordinating with Douglas PUD on this report accepted another position, and this role has been vacant since (Section 3.1). Douglas PUD has been coordinating with the Ecology Aquatic SWG Policy Representative, as needed, and plans to revisit this report once the technical representation role is filled.

2.1.3.6 Planned Monitoring, Studies, and Activities in 2025

In 2025, implementation of the WQMP and water quality measures outlined in Douglas PUD's CWA Section 401 Water Quality Certification for the Wells Project and FERC license will continue. This includes continuing to provide the Aquatic SWG with water quality updates and finalizing the Water Quality Attainment Plan 10-Year Report. The *2024 Annual Report Water Quality Management Plan* (Appendix E), which summarizes water quality activities and results from 2024, will be reviewed by the Aquatic SWG in early 2025 and submitted to FERC as appended to this 2024 ASA Annual Report by the May 31, 2025, deadline.

2.1.4 Pacific Lamprey

In 2024, Douglas PUD continued efforts to monitor and address impacts, if any, to Pacific Lamprey (*Entosphenus tridentatus*) in the Wells Project, as outlined in the PLMP and as required by the FERC license and CWA Section 401 Water Quality Certification for the Wells Project. Measures outlined in the PLMP and FERC License Order are consistent with the USFWS's Section 18 Fishway Prescription for the Wells Project.

2.1.4.1 Adult Pacific Lamprey Studies

2.1.4.1.1 Past Studies

Pursuant to Objective 1 of the PLMP, Douglas PUD and the Aquatic SWG have conducted multiple studies with the goal of identifying and addressing any adverse Wells Project-related impacts on upstream passage of adult Pacific Lamprey. Table 2 summarizes adult Pacific Lamprey studies to date.

Table 2
Adult Pacific Lamprey Studies

Study Name[1] Technology	**Study Plan** Objectives	**Study Report** Results
	Pre-FERC License No. 2149 (2012)[2,3]	
2004 Radio Telemetry Study Radio Telemetry	***Radio-Telemetry Monitoring of Bull Trout, Lamprey, and Coho at Wells Dam and Project Tributaries, 2004–2005*** **(LGL Limited 2004)** (July 29, 2004) • Evaluate migration and passage behavior entering the Wells Project.	***Assessment of Adult Pacific Lamprey Migratory Behavior at Wells Dam Using Radio-Telemetry Techniques, 2004*** **(Nass et al. 2005)** (October 13, 2005) • 18 of 150 (12%) were released at or below Rocky Reach were detected in the Wells Dam tailrace. • 10 of 18 (56%) were observed at a Wells fishway entrance. • Limited sample size (N=18).
2007–2008 Adult Lamprey Passage Study Radio Telemetry	***Adult Lamprey Passage and Behavior Study Plan*** **(Douglas PUD 2007)** (September 2007) • Evaluate entrance efficiency. • Evaluate fishway passage efficiency.	***Adult Pacific Lamprey Passage and Behavior Study*** **(Robichaud et al. 2009)** (February 2009) • Low sample size (N=6); additional fish (N=15) from Rocky Reach. • Entrance efficiency averaged 27%. • 73% of tagged lamprey passed the count windows uncounted.
2009 DIDSON Study DIDSON	***Assessment of Adult Pacific Lamprey Behavior in Response to Temporary Velocity Reductions at Fishway Entrances*** **(Murauskas and Johnson 2009)** (July 24, 2009) • Evaluate entrance efficiency. • Evaluate the effects of reduced fishway head differential.	***Assessment of Adult Pacific Lamprey Response to Velocity Reductions at Wells Dam Fishway Entrances (2009 DIDSON Study Report)*** **(Johnson and Le 2010)** (April 2010) • Fishway entrances were passively monitored. • There were varying nighttime head differential treatments. • A total of 7 Pacific Lamprey were observed over both years combined.
	Post-FERC License No. 2149 (2012)[4,5]	
2013 Adult Pacific Lamprey Passage and Enumeration Study Radio Telemetry	***Adult Lamprey Passage and Enumeration Study, Wells Dam — 2013*** **(Long View 2012)** (September 21, 2012) • Evaluate passage behavior and success through Wells fishways. • Evaluate entrance efficiency under reduced head differentials. • Evaluate the enumeration efficiency.	***Adult Lamprey Passage and Enumeration Study, Wells Dam, 2013: The Effects of Head Differential on Entrance Efficiency, and of Picketed Leads on Count Window Enumeration Efficiency*** **(Robichaud and Kyger 2014)** (September 9, 2014) • 45 of 110 (49%) were never detected at the dam. • 47 of 110 (51%) approached the dam. • Lower ladder passage efficiency appears to be problematic (14%). • Enumeration efficiency was still low (55% overall), especially in the west fishway (33%).
2016 Adult Pacific Lamprey Approach, Passage, and Enumeration Study Acoustic	***Adult Lamprey Approach, Passage, and Enumeration Study Plan, Wells Dam — 2016*** **(Douglas PUD 2016)** (February 10, 2016) • Evaluate approach to Wells Dam. • Determine use of newly installed low-level lamprey entrances.	***Adult Lamprey Approach and Passage Study, Wells Dam, 2016–17*** **(Robichaud and Kyger 2018)** (September 12, 2018) • 51 Pacific Lamprey were tagged and released 1 mile upstream of Rocky Reach Dam. • 33 Pacific Lamprey were tagged and released above Priest Rapids Dam by Grant PUD. • Approach rates were 25% at the tailrace and 20% at the fishway. • 80% overwintered in Rocky Reach.
2018–2021 Translocation PIT	***To Translocate Adult Pacific Lamprey from Priest Rapids Dam to Areas Within or Upstream of the Wells Project and Postpone Passage Evaluations*** **(Aquatic SWG 2018)** (June 14, 2018) • Based on results of the 2016 Study, the Aquatic SWG agreed to conduct adult Pacific Lamprey translocation and postpone adult Pacific Lamprey passage studies at Wells Dam until numbers/upstream attraction improved.	• See Section 2.1.4.1.2 and Section 2.1.4.1.3.

Study Name[1] Technology	**Study Plan** Objectives	**Study Report** Results
2022–2023 Adult Pacific Lamprey Approach and Passage Study Acoustic and PIT	***Wells Dam 2022 Adult Lamprey Approach and Passage Study Plan* (Douglas PUD 2022)** (March 9, 2022) • Evaluate approach and at-dam passage after 4 years of translocation.	***Wells Dam Adult Lamprey Approach and Passage Study, 2022–23* (Robichaud et al. 2024)** (June 2024) • 120 dual-tagged and 334 PIT-only Pacific Lamprey were released in the Rocky Reach Dam forebay. • 50 dual-tagged and 141 PIT-only Pacific Lamprey were released at Daroga State Park. • Overall approach rate was 82% and fishway passage efficiency was 96% to 100%.
2025 Adult Pacific Lamprey Approach and Passage Study Radio Telemetry and PIT	***Forthcoming*** • See Section 2.1.4.1.6.	***Forthcoming***

Notes:

1. Studies described at length in associated ASA annual reports.
2. Studies conducted by Douglas PUD separate from the Aquatic SWG.
3. Parenthetical dates are publication dates.
4. Studies conducted by Douglas PUD in consultation with the Aquatic SWG.
5. Parenthetical dates are dates the document was distributed to the Aquatic SWG.

2.1.4.1.2 Translocation

Since 2015, Douglas PUD and the Aquatic SWG have discussed and participated in regional adult Pacific Lamprey translocation opportunities in the Wells Reservoir (as described in respective ASA annual reports). Through years of discussions, studies (Section 2.1.4.1.1), and workshops (Section 2.1.4.4), the Aquatic SWG identified a lack of pheromones upstream of Wells Dam as a potential issue behind why Pacific Lamprey appear to not be motivated to approach and pass Wells Dam. If this is accurate, the absence of Pacific Lamprey upstream of Wells Dam will continue to be an issue for conducting passage studies at Wells Dam in accordance with the Douglas PUD FERC license and PLMP. Although translocation is not a Protection, Mitigation, or Enhancement measure described in the PLMP, translocating fish enables Douglas PUD to evaluate the number one hypothesis identified by the Aquatic SWG—a lack of pheromones coming from above the dam is preventing fish to be motivated to pass the dam.

In early 2023, Douglas PUD and the Aquatic SWG began discussing next steps while the *Wells Dam 2022–2023 Adult Lamprey Approach and Passage Study* (2022–2023 Adult Pacific Lamprey Approach and Passage Study) was underway (Section 2.1.4.1.4). There was general agreement to continue translocation while waiting for the current study to end and to allow time to review and discuss the 2022 study results before starting discussion of the next study design. On June 14, 2023, the SOA *To Translocate Adult Pacific Lamprey from Priest Rapids Dam to Areas Within or Upstream of the Wells Project 2023–2024* (as appended to the 2023 ASA Annual Report), was approved by the Aquatic SWG. This SOA outlines a 2-year translocation program from 2023 to 2024, with the goal of PIT-tagging and translocating 1,000 adult Pacific Lamprey—or the number that can be trapped during two 4-week periods, whichever occurs first—each year and no fewer than 500 fish per year as averaged over the 2-year period. The SOA also includes measures to continue efforts toward future passage evaluations, potential fishway modifications, and additional studies of Pacific Lamprey passage at Wells Dam.

In 2023, a total of 1,007 adult Pacific Lamprey were translocated upstream of Wells Dam (Table 3). This completed the first year of the 2-year SOA. In 2024, the last year of the SOA, a total of 860 adult Pacific Lamprey were translocated upstream of Wells Dam (Table 3). This included collecting 499 adult Pacific Lamprey from Priest Rapids Dam over a 4-week period for tagging at Wells Dam and release into the Wells Reservoir. It also included 4 weeks of collecting and PIT-tagging 361 adult Pacific Lamprey from Grant PUD at Kirby Billingsley Hydro Park for release farther upstream in the Wells Reservoir. A total of 731 fish were released in the mainstem Columbia River (below the Methow River confluence at Starr Boat Launch), and Douglas PUD provided the CTCR with 129 PIT-tagged fish, which were released farther upstream in the Okanogan River Basin. Genetics samples were collected for all translocated fish, and the samples were sent to Columbia Inter-Tribal Fish Commission for analysis. This completed the second and final year of the 2-year SOA. Table 4 summarizes Grant PUD catch rate data from Pacific Lamprey trapping efforts at Priest Rapids Dam.

Table 3
Douglas PUD Pacific Lamprey Translocation Effort, To Date

Location	Guidance[1]	2018 SOA[2,3]				2023 SOA[4]		Total
	2017	2018	2019	2020	2021	2023	2024	
Methow River (Pateros)	--	507	--	--	--	--	--	507
Starr Boat Launch	136	--	102	266	345	956	731	2,536
Brewster	131	70	--	--	--	--	--	201
Loup Creek	--	--	--	21	25	--	36	82
Salmon Creek	--	16	22	26	32	--	37	133
Omak Creek	--	15	26	22	31	--	29	123
Similkameen River	49	61	--	20	28	51	27	236
Total	**316**	**669**	**150**	**355**	**461**	**1,007**	**860**	**3,818**

Notes:

1. Per guidance of the Aquatic SWG, effort conducted by Douglas PUD, in coordination with the YN, the CTCR, and Grant PUD
2. Per the SOA *To Translocate Adult Pacific Lamprey from Priest Rapids Dam to Areas Within or Upstream of the Wells Project and Postpone Passage Evaluations* (as appended to the 2018 ASA Annual Report)
3. The goal of translocating no fewer than 500 adult Pacific Lamprey per year as averaged over the 4-year translocation period, per this SOA, was not achieved. This can be attributed to the reduced run size in 2019 (19,374 fish counted at Bonneville Dam) and 2020 (11,889 fish counted at Bonneville Dam) compared to 2018 (43,419 fish counted at Bonneville Dam).
4. Per the SOA, *To Translocate Adult Pacific Lamprey from Priest Rapids Dam to Areas Within or Upstream of the Wells Project 2023–2024* (as appended to the 2023 ASA Annual Report).

--: No fish were translocated to this release site, as discussed within the Aquatic SWG.

Table 4
Pacific Lamprey Trapping Efforts at Priest Rapids Dam – Catch Rates, 2018 to 2024

Year	Counts at Priest Rapids Dam	Translocating Entity		Total Translocated	Total Arriving to Priest Rapids Dam	Total Percent Translocated	Percent Translocated Above Wells Dam
		Grant PUD[a]	Douglas PUD[b]				
2018	11,758	177	669	846	12,604	7%	5%
2019	3,276	111	150	261	3,537	7%	4%
2020	1,750	--	355	355	2,105	17%	17%
2021	2,482	--	461	461	2,943	16%	16%
2022	11,152	1,529	645[c]	2,174	13,326	16%	0%
2023	13,147	577	1,007	1,584	14,731	11%	7%
2024	6,670	--	860	860	7,530	11%	11%

Notes:

a. Grant PUD translocated Pacific Lamprey are released at Kirby Billingsley Hydro Park, downstream of the Wenatchee River confluence and Entiat River confluence with the Columbia River.
b. Douglas PUD translocated Pacific Lamprey are released at various locations upstream of Wells Dam.
c. Pacific Lamprey translocated in 2022 were tagged and released between Rocky Reach Dam and Wells Dam as part of the 2022 Adult Pacific Lamprey Approach and Passage Study.

--: Douglas PUD collected Grant PUD translocated Pacific Lamprey at Kirby Billingsley Hydro Park for release at various locations upstream of Wells Dam.

The 2022–2023 Adult Pacific Lamprey Study found that the approach of acoustic tagged lamprey toward Wells Dam, the proportion interacting with the fishway entrances, and the fishway ascent success rate (Section 2.1.4.1.4). were higher than was observed in 2016. Since the 2022–2023 study was conducted following an extended period of lamprey translocation (Table 3), this suggests the translocation efforts may have improved the motivation of lamprey to approach and pass Wells Dam.

2.1.4.1.3 Translocation Detection Table

Since 2019, Douglas PUD has monitored PIT-tag detections of Pacific Lamprey translocated through the Douglas PUD translocation program to date and has routinely provided these results for Aquatic SWG review in a Pacific Lamprey Translocation PIT Tag Information System File and Detection Summary Table (or "Last Seen" table). This table includes individual Pacific Lamprey release dates and locations, subsequent detection locations, and last detected dates and locations. The table has been revised several times at the request of the Aquatic SWG to show the timing and patterns of Pacific Lamprey movement more clearly.

This "Last Seen" table, updated on January 15, 2025, is provided in Table 5 for lamprey translocated from 2023 to 2024 (as part of the most recent translocation SOA; see previous annual reports for data from 2018 to 2022). Fish move in both the fall and spring after translocation. The data from 2023 and previous years are not expected to change because translocated Pacific Lamprey would have completed their lives prior to the final update.

Table 5
Pacific Lamprey Translocation "Last Seen" Table from 2023 to 2024

Last detection locations for translocated Pacific Lamprey, by release location and year. Non-zero cells are shaded based on their location (green: Okanogan watershed; blue: Methow watershed; and orange: Columbia and Entiat rivers).

	2023 Release Location (n = 1007)		*2024 Release Location (n = 860)*				
Last Detection Location	***Starr Boat Launch***	***Similkameen River***	***Starr Boat Ramp***	***Loup Loup Creek***	***Omak Creek***	***Salmon Creek***	***Similkameen River***
Zosel Dam (858.132)	1						
Rls: Similkameen River (858.119.013)		51					25
Rls: Omak Creek (858.052.018)					6		
OMAKC - Omak Creek (858.052)							
OMH - Omak Creek Haley Creek Road (858.052.020)					22		
OMF - Omak Creek above Mission Falls (858.052.011)							
OBF - Omak Creek below Mission Falls (858.052.010)	1						
OMK - Omak Creek Instream Array (858.052.000)	1						
Rls: Salmon Creek (858.041.021)						28	
SAD - Salmon Creek Above OID Div. (858.041.009)						5	
SA0 - Salmon Creek below OID Div. (858.041.006)							
SA1 - Salmon Creek Instream Array (858.041.002)						4	
Rls: Loup Loup Creek (858.028)				34			
LLC - Loup Loup Creek Instream Array (858.028.001)	1			1			
OKL - Lower Okanogan Instream Array (858.025)	143		62	1			1
CRU - Upper Chewuch Instream Array (843.080.028)	54		43				
CMU - Chewuch River Middle Upper (843.080.008)	26						
CML - Chewuch River Middle Lower (843.080.007)	41		32				
CRW - Chewuch River above Winthrop (843.080.001)	41		11				
MEM - Eightmile Acclimation Pond	1						
TWR - Lwr Twisp Rvr near MSRF Ponds (843.066.002)	2		1				
MRW - Methow River at Winthrop (843.085)	2		7				
LBC- Libby Creek	1						
MRC - Methow River at Carlton (843.045)	95		57				
METTRP - Methow Smolt Trap at McFarland Creek Road Bridge (843.030)							
LMR - Lower Methow River at Pateros (843.008)	123		157				
Rls: Methow River (843.000)							
Rls: Brewster Boat Launch (852)							
Rls: Starr Boat Launch (834)	420		355				
WEA - Wells Dam, DCPUD Adult Ladders (830)			2				
WEH - Wells Dam Hatchery (830)			4				
ENA - Upper Entiat River at rkm 17.1 (778.017)							
ENL - Lower Entiat River (778.002)	3		1				
Rls: Between RR Forebay and Daroga							
RRF- Rocky Reach Fishway			1				
RRJ - Rocky Reach Dam Juvenile (763)							
LWE- Lower Wenatchee Rover (754.003)							
RIA - Rock Island Adult (730)							
JDJ - John Day Dam Juvenile (347)							
TOTAL	**956**	**51**	**733**	**36**	**28**	**37**	**26**
Number Not Yet Detected	420	51	355	34	6	28	25
Detected Post Release (%)	56%	0%	52%	6%	79%	24%	4%
Overall detected by year as of January 2024(%)	**53%**				**48%**		

2.1.4.1.4 2022–2023 Adult Pacific Lamprey Approach and Passage Study

In early 2022, Douglas PUD and the Aquatic SWG developed a study plan to determine whether Wells Dam approach rates were different in 2022 compared to 2016, following 4 years of translocation and recent in-ladder diffuser grating modifications improved adult Pacific Lamprey passage behavior through the Wells Dam fishways. In March 2022, the *Wells Dam 2022 Adult Lamprey Approach and Passage Study Plan* (as appended to the 2022 ASA Annual Report) was approved as revised by the Aquatic SWG. This study plan incorporated the use of dual (acoustic and PIT) tagged and PIT-tagged only Pacific Lamprey collected at Priest Rapids Dam and released over a 4-week period in the Rocky Reach Dam forebay and at Daroga State Park. The SOA, *Statement of Agreement Regarding the Implementation of the Wells Dam 2022 Adult Lamprey Approach and Passage Study Plan*, as revised (as appended to the 2022 ASA Annual Report) was also approved by the Aquatic SWG. This SOA stipulates that Douglas PUD will implement the 2022 study, and the Aquatic SWG will determine a path forward based on study results. This SOA also allowed, at the unanimous direction of the Aquatic SWG, additional Pacific Lamprey trapped by Grant PUD at Priest Rapids Dam to be included as study fish. In summary, a total of 645 fish were released as part of the 2022–2023 Adult Pacific Lamprey Study, including the target of 170 dual-tagged fish and 340 PIT-tagged only fish, plus an additional 135 PIT-tagged only fish released between the two release locations.

The 2022–2023 study found that Wells Dam approach rates and fishway passage efficiency were significantly higher compared to 2016. For comparison, the 2016 acoustic telemetry study tracked 83 study fish. Of these fish, 21 fish (or 25%) were detected in the Wells Dam tailrace, 3 study fish were detected upstream of the entrances of the Wells Dam fishways (within the ladder), and only 1 fish was known to have passed Wells Dam. The 2022–2023 study detected a total of 139 fish (or 81.8%) in the Wells Dam tailrace, and 95.5% to 100% of these fish passed Wells Dam. Complete study results are summarized in the final report, *Wells Dam Adult Lamprey Approach and Passage Study, 2022–23* (Appendix M), which was approved by the Aquatic SWG as revised on June 12, 2024.

Per the 2022 SOA, throughout 2024, the Aquatic SWG discussed a path forward for studying adult Pacific Lamprey passage at Wells Dam based on these study results (Section 2.1.4.1.6).

2.1.4.1.5 Lamprey Trap Operations and Modifications

Douglas PUD and the Aquatic SWG constructed Pacific Lamprey traps for deployment in the east and west fishways at Wells Dam. When installed and operating, the traps sit atop each of the two overflow weirs at Pool 41 of each ladder, are flush to the fishway wall, and occupy approximately half the width of each overflow section of each weir. These traps have been deployed in previous years, but during those years, few Pacific Lamprey were counted ascending the Wells Dam fishways and few Pacific Lamprey were collected in the traps. Because of the possibility for HCP Plan Species to interact

with the lamprey traps, Douglas PUD has sought and received approval from the Wells HCP Coordinating Committee before operating the lamprey traps (Section 3.4.4).

In summer 2023, Douglas PUD wanted to capitalize on an unexpectedly high Pacific Lamprey run (as forecasted at Bonneville Dam) and deploy lamprey traps in a fishway to see how the traps performed during a year with greater abundance of Pacific Lamprey than previous study years and understand whether the traps can be used to collect study fish for future Aquatic SWG studies of adult Pacific Lamprey passage. After receiving approval from the Wells HCP Coordinating Committee (Section 3.4.4), Douglas PUD and the Aquatic SWG deployed two traps in the east ladder of Wells Dam from August 28 to September 15, 2023, each night from 2100 hours to 0700 hours. During this time, there was only 1 day where trapping was successful. On August 29, 2023, a total of four fish were collected. While August was the month with the most Pacific Lamprey counted at Wells Dam in 2023, the trapping effort started at the tail end of the month, and counts decreased into September. Additionally, in past years of trap operation, perforated plates were installed on the floor of the fishway to prevent Pacific Lamprey from attaching and passing through the orifices. In 2023, these plates were not in place because this was a last-minute, opportunistic effort conducted to take advantage of the large run.

On November 8, 2023, the Aquatic SWG agreed to reinstall perforated plates below the orifices of the weirs where lamprey traps are installed in both the east and west fish ladders at Wells Dam. The plating would not block or close off an orifice; rather, it is installed on the floor of the ladder just downstream of the weir orifices to encourage lamprey to pass over the top of the weir and into the traps. On November 28, 2023, the Wells HCP Coordinating Committee also approved installing the plating as well as expanded trap hours of operation for testing in 2024 (Section 3.4.4). The plating was reinstalled over the 2023/2024 winter maintenance period.

In 2024, Douglas PUD and the Aquatic SWG deployed two traps in the east ladder and two traps in the west ladder of Wells Dam from August 8 to August 28, 4 nights per week, from 2130 hours to 0800 hours. During the first 2 nights, the two traps on the west ladder were not seated all the way down (not fully deployed), which was resolved, and all four traps operated successfully for the remainder of the trapping operations. In total, the traps collected 63 individuals and five recaptures. Trap collection efficiency on the west ladder was 34%. There were not enough data for the east ladder alone, so trap collection efficiency for both ladders was calculated at 35%. Of note, there was 1 day where all fish counted through the east fishway were also collected in the traps. Additionally, toward the end of trapping, there were higher fish counts through the fishways, but fish collected in the traps did not increase proportionally. Based on these results, Douglas PUD and the Aquatic SWG proposed to the Wells HCP Coordinating Committee lamprey trap operations to collect study fish for the 2025 Adult Pacific Lamprey Approach and Passage Study (Section 2.1.4.1.6 and Section 3.4.4). A decision is forthcoming in early 2025.

2.1.4.1.6 2025 Adult Pacific Lamprey Approach and Passage Study

The Aquatic SWG-approved SOA, *Statement of Agreement Regarding the Implementation of the Wells Dam 2022 Adult Lamprey Approach and Passage Study Plan* (as appended to the 2022 ASA Annual Report) stipulated that Douglas PUD will implement the 2022–2023 Adult Pacific Lamprey Study, and the Aquatic SWG will determine a path forward based on the study results (Section 2.1.4.1.4). As such, throughout 2024, Douglas PUD and the Aquatic SWG discussed the 2022–2023 study results and identified objectives for study in 2025. Considerations included prioritizing the objectives and contemplating the best way to study the proposed objectives, pros and cons of different methodologies and how each objective will be measured, how the results compare and do not compare to past studies, contemplating strategies for prioritizing tags between study fish collected at two dams with different peak migration timing, and pros and cons of different fishway head differential treatments. On November 13, 2024, the draft *Wells Dam 2025 Adult Lamprey Approach and Passage Study Plan* (2025 Adult Pacific Lamprey Study Plan) was distributed for Aquatic SWG review. This study plan proposes the use of dual-tagged (radio telemetry and PIT) and PIT-tagged only Pacific Lamprey collected at Priest Rapids Dam and Wells Dam and released from approximately July to early September in the Rocky Reach Dam forebay. The primary objective (Objective 1a) is to determine the proportion of radio-tagged fish that approach Wells Dam, successfully enter the collection gallery, and ascend the fish ladder. Secondary objectives include evaluating nightly modification of the typical 1.5-foot head differential to a lower 0.5-foot head differential (Objective 2a), evaluating ladder count window efficiency (Objective 3a), evaluating tag burden by comparing dual-tagged fish to PIT-only fish (Objective 4a), and evaluating differences in approach behavior and passage rates between fish collected at Priest Rapids Dam and Wells Dam (Objective 4b). Components of this proposed study plan are also under review and require approval by the Wells HCP Coordinating Committee (Section 3.4.4). A final study plan is expected in early 2025.

2.1.4.2 Juvenile Pacific Lamprey Studies

In June 2023, the Aquatic SWG began discussing a path forward for juvenile Pacific Lamprey studies in the Upper Columbia River. The impetus was interest from the YN in possibly coordinating with an upcoming U.S. Army Corps of Engineers (USACE) acoustic telemetry study in the Snake and Lower Columbia rivers toward conducting a large-scale passage and survival study through the entire Columbia River system. On August 21, 2023, the Aquatic SWG participated in a virtual joint meeting of the Priest Rapids Fish Forum (PRFF) and RRFF Pacific Lamprey Subgroups to discuss the available models used to estimate juvenile survival and behavior (Section 2.1.4.4). The joint meeting also included a discussion about possibly coordinating with the USACE study. In September 2023, the YN presented to the Aquatic SWG a *Framework and Implementation Plan for the Upper Columbia Juvenile Pacific Lamprey Passage Acoustic Telemetry Study*, which suggested a collaborative approach, involving Douglas PUD, Chelan PUD, and Grant PUD. The components of this framework were discussed at length (as described in the 2023 ASA Annual Report). Ultimately, Section 4.2.4 of

Douglas PUD's PLMP stipulates a 1-year study using study fish from upstream of the Wells Project, and juvenile Pacific Lamprey data in the Methow and Okanogan basins suggest obtaining a required sample size will be problematic.

On January 10, 2024, the Aquatic SWG continued discussing juvenile Pacific Lamprey studies, including other ongoing studies and the state of tag technology. On June 5, 2024, the Aquatic SWG participated in another virtual joint meeting of the PRFF and RRFF Pacific Lamprey Subgroups to hear Pacific Northwest National Laboratory (PNNL) present results from their 2023 juvenile Pacific Lamprey passage behavior and survival study, which applied the Virtual Release/Dead-Fish Correction (ViRDCt) model and used Eel/Lamprey Acoustic Tags (ELATs) to study juvenile lamprey at Lower Granite and Lower Monumental dams (Section 2.1.4.4). On June 12, 2024, the YN shared with the Aquatic SWG juvenile and adult Pacific Lamprey count data and translocation numbers in the Columbia and Snake River systems, which suggest the number of juveniles collected in a system is not necessarily a reflection of the number of adults counted in the system. That is, there may be more juveniles in both river systems, but the key is to ensure there is a good system in place to collect the juveniles. The YN shared a funding proposal that was submitted to the Bureau of Indian Affairs for the purchase and design of juvenile lamprey traps for testing in raceway and bypass environments, and possibly river environments (Appendix A).

2.1.4.3 Monitoring and Evaluation

2.1.4.3.1 Fish Salvage Memorandums

Since 2019, at the request of the Aquatic SWG, Douglas PUD has distributed fish salvage numbers from winter maintenance activities at Wells Dam. The reason for the request is to monitor the number and frequency in which Pacific Lamprey are encountered in the dewatered fishways.

During the 2023/2024 winter maintenance outage, 4 larvae and 40 juveniles were collected from the east fishway, and 1 larva and 6 juveniles were collected from the west fishway. All 51 Pacific Lamprey were sampled for DNA analysis at the request of the YN before being released in the Columbia River at the Carpenter Island boat launch, approximately 1 mile downstream of Wells Dam.

2.1.4.4 Regional Pacific Lamprey Conservation Activities

Section 4.3.1 of the PLMP stipulates that Douglas PUD shall support regional conservation efforts. This may include but is not limited to participating in Pacific Lamprey Work Groups and information exchanges and coordinating with other entities conducting Pacific Lamprey research in the Mid-Columbia River. Table 6 summarizes regional Pacific Lamprey conservation activities to date. Current or ongoing activities are further described in the sections that follow.

Table 6
Regional Pacific Lamprey Conservation Activities

Activity[1]	Details
Adult Pacific Lamprey Translocation	Ongoing since 2015 (Section 2.1.4.1.2).
2016 Pacific Lamprey Regional Workshop	In June 2016, a Pacific Lamprey Regional Workshop was held to address scientific uncertainties regarding the causes of poor adult Pacific Lamprey passage over Wells Dam and facilitate regional collaboration in addressing Pacific Lamprey in the Mid-Columbia River Basin. The workshop convened members of the Aquatic SWG, RRFF, and PRFF, who received presentations by regional experts on the latest passage research. The workshop focused primarily on identifying and discussing critical uncertainties including approach behavior, study design limitations, propagation or translocation, presence and premature mortality, fish size (energetics), spawn timing, fish collection, survival models, tag types, and 3D detection of tagged fish.
2017 Aquatic SWG Pacific Lamprey Passage Workshop	In January 2017, another Pacific Lamprey Passage Workshop was held to continue discussions about Pacific Lamprey, including review of results of research conducted to date, notably the Douglas PUD 2016 Pacific Lamprey Study, review of governing documents, and potential next steps, including plans for Pacific Lamprey studies in 2017 and beyond. The Aquatic SWG agreed to limit attendance at this workshop to Aquatic SWG members and technical support staff and focus on identifying working hypotheses to address within the Aquatic SWG. The following three were identified as priorities for study in 2017: 1) lack of juvenile and adult pheromones; 2) poor hydraulic conditions at fishway entrances; and 3) reservoir mortality, fate in reservoirs, and mainstem spawning. Lastly, the Aquatic SWG discussed how to improve coordination among regional fish forums.
2017 Aquatic SWG Pacific Lamprey Subgroup Meeting	In April 2017, the Aquatic SWG convened a Pacific Lamprey Subgroup to further discuss a number of Pacific Lamprey topics prior to the 2017 Pacific Lamprey Passage Regional Workshop, including key data gaps and questions to raise during the workshop. The subgroup further discussed prioritizing hypotheses, bioenergetics, Douglas PUD 2016 Pacific Lamprey Study acoustic tag data, and mobile tracking in the Rocky Reach Reservoir. The subgroup unanimously agreed that translocation above Wells Dam should begin in 2017.
2017 Pacific Lamprey Passage Regional Workshop	Following the 2017 Aquatic SWG Pacific Lamprey Subgroup Meeting, also in April 2017, a Pacific Lamprey Passage Regional Workshop was held to reconvene the Aquatic SWG, RRFF, and PRFF, with the goal of discussing hypotheses to study a path forward and tasks needed to make forward progress on the topic of Pacific Lamprey passage in the Mid-Columbia River Basin. Regional experts and fish managers also attended the workshop. Grant PUD, Chelan PUD, and Douglas PUD discussed respective Pacific Lamprey studies and results. Translocation was a key topic. Based on discussions during the workshop, there was general support for translocating fish upstream of Wells Dam from Grant, Chelan, and Douglas PUDs.
2017 Pacific Lamprey Subgroup Regional Workshop	In October 2017, a Pacific Lamprey Subgroup Workshop was held convening common members among the Aquatic SWG, RRFF, and PRFF. Questions developed at the workshop were conveyed to the Aquatic SWG regarding adult White Sturgeon presence in the Wells Dam tailrace and fishways (a possible deterrent for Pacific Lamprey from approaching the area), passage and entrance efficiencies, and velocity profile data. In November 2017, the Aquatic SWG responded to these questions, which were provided to the subgroup in the form of Aquatic SWG-approved meeting minutes.
2018 Pacific Lamprey Passage Alternatives Presentation	In August 2018, the PRFF invited the RRFF and Aquatic SWG to attend a presentation by Damon Goodman (USFWS) on "Lamprey Passage Alternatives." The presentation described a lamprey passage technique using 2- and 4-inch flexible plastic tubing to move adult lamprey over structures. Preliminary conclusions indicate the 2-inch tubing works but delays lamprey travel time through the tubing compared to the 4-inch tubing. In the 4-inch tubing, there is approximately 0.5 to 1 inch of water depth, or 13 liters of water per minute flowing through the tubing. Goodman is also testing 8-inch tubing. He indicated this technique has had high success at a low cost.
Environmental DNA Monitoring	From 2018 to 2023, at the request of the YN, Douglas PUD agreed to collect and provide water samples taken from select locations upstream of Wells Dam to monitor Pacific Lamprey eDNA. This effort is in support of eDNA sampling proposed and conducted by the YN, and also in coordination with Chelan PUD, to monitor the variability in sample results of a large watershed and better understand movement of Pacific Lamprey upstream of Wells Dam. Sample locations for the broader effort include sites both upstream of Wells Dam near the Methow and Okanogan rivers and downstream of Wells Dam at sites along the right and left banks at Wells, Rocky Reach, McNary, and Bonneville dams (see past ASA annual reports for additional details).
Genetic Sampling	Ongoing since 2019 (Section 2.1.4.4.1).
Information Exchanges	Ongoing since 2020 (Section 2.1.4.4.2).
Public Signage	In 2023, at the request of the YN, Douglas PUD posted lamprey bait flyers throughout the Wells Project. The flyers state that it is illegal to use lamprey as bait.
Juvenile Pacific Lamprey Studies	On August 21, 2023, the Aquatic SWG participated in a virtual joint meeting of the PRFF and RRFF Pacific Lamprey Subgroups to discuss models and assumptions of models used to estimate juvenile survival and behavior. This also included a discussion about juvenile studies to be conducted in the Lower Columbia River and the potential opportunity to coordinate a large-scale passage and survival study throughout the entire Columbia River (Section 2.1.4.2). On June 5, 2024, the Aquatic SWG participated in a virtual joint meeting of the PRFF and RRFF Pacific Lamprey Subgroups to hear PNNL present preliminary results from its 2023 juvenile Pacific Lamprey passage behavior and survival study in the Lower Snake River. This study applied the ViRDCt model and used ELATs to study juvenile lamprey at Lower Granite and Lower Monumental dams (Section 2.1.4.2).

Notes:

1. Activities are described at length in the associated ASA annual reports.

2.1.4.4.1 Genetic Sampling

During the 2019/2020 winter maintenance outage, at the request of the Aquatic SWG, Douglas PUD began collecting genetic samples from Pacific Lamprey encountered during fish salvage events associated with winter maintenance activities. The reason for the request is to determine the parentage of Pacific Lamprey encountered in the Wells Dam fishways in support of a study being conducted by the YN and Columbia River Inter-Tribal Fish Commission. Consistent with the past 5 years, in 2024, Douglas PUD collected genetic samples from all captured juvenile and larval Pacific Lamprey, as requested. No adults have been encountered in the ladder during these winter maintenance outages.

2.1.4.4.2 Information Exchanges

Since 2020, the Aquatic SWG has routinely participated in and/or received debriefs on and discussed various Pacific Lamprey workshops and information exchanges held around the region. These events have included presenters and attendees representing local, state, national, and tribal interests. Web links to access workshop information and materials have also been provided to the Aquatic SWG.

On January 10, 2024, the Aquatic SWG received a debrief from the YN on Pacific Lamprey Conservation Initiative's Policy Meeting and 7th Annual Lamprey Information Exchange, which was held from December 12 to December 14, 2023. The Policy Committee focused on three topics: key threats, communication/advocacy, and funding. The Information Exchange covered a variety of topics, including genetics, phylogenetics, and taxonomy; restoration; juvenile entrainment, dewatering, and dredging investigations; and migration, tagging, and passage.

The Pacific Lamprey Conservation Initiative's Policy Meeting and 8th Annual Lamprey Information Exchange took place from December 10 to December 12, 2024, and was attended by Douglas PUD staff and Aquatic SWG members.

The Aquatic SWG will continue tracking Pacific Lamprey workshops and information exchanges to keep up to date on Pacific Lamprey efforts around the region.

2.1.4.5 Fishway Modifications

Based on recommendations and discussions within the Aquatic SWG, and in consultation with the Wells HCP Coordinating Committee, modifications have been discussed (with some implemented) over the years at Wells Dam to further improve Pacific Lamprey passage through the Wells Project. These modifications are described in the following sections.

2.1.4.5.1 Low-Level Side Entrances

Reopening the low-level side entrances of the Wells Dam collection galleries is discussed in greater detail in previous ASA annual reports. Currently, the entrances are closed. To date, no PIT-tagged Pacific Lamprey have been detected using the low-level side entrances.

2.1.4.5.2 Count Windows

Installation of aluminum ramps at the fish ladder count windows to test improved enumeration at Wells Dam is discussed in greater detail in previous ASA annual reports. Currently, enumeration structures are not installed in either fish ladder. The draft 2025 Adult Pacific Lamprey Study Plan includes a secondary objective to evaluate count window efficiency by pairing window ladder counts and upstream and downstream detections of dual-tagged (radio telemetry and PIT) and PIT-tagged only Pacific Lamprey (Section 2.1.4.1.6). A final study plan is expected in early 2025.

2.1.4.5.3 Collection Gallery and Fishways

Throughout 2018, the Aquatic SWG reviewed and discussed modifications implemented at other hydropower projects in efforts to improve Pacific Lamprey passage. Modifications discussed included installing ramps on the downstream side of perched weir orifices and solid plating along the edges of diffuser gratings in weirs to provide a surface for Pacific Lamprey to attach to and eliminate access to areas behind the diffuser gratings and reduce migration delay. Other modifications reviewed included modifying the bulkhead slots to be flush with the adjacent areas or implementing a Pacific Lamprey passage technique involving flexible plastic tubing (Section 2.1.4.4). The Aquatic SWG discussed the feasibility of implementing similar modifications in the Wells Dam collection gallery and fishways, as well as potentially modifying the spacing of the auxiliary water system diffuser grating panels at Wells Dam. Ultimately, in June 2018, an SOA was developed and approved by the Aquatic SWG that deferred fishway modifications while a translocation plan was implemented (Section 2.1.4.1.2).

In 2022 and 2023, following 4 years of translocation, Douglas PUD and the Aquatic SWG implemented the 2022–2023 Adult Pacific Lamprey Study (Section 2.1.4.1.4), which found the proportion of acoustic tagged lamprey interacting with the Wells Dam fishway entrances was higher than it was in 2016 (before lamprey translocation). Based on these results, the draft 2025 Adult Pacific Lamprey Study Plan outlines a comprehensive upstream passage evaluation (Section 2.1.4.1.6), which may inform future fishway modifications to improve Pacific Lamprey passage at Wells Dam. A final study plan is expected in early 2025.

2.1.4.6 Fishway Maintenance

In 2018, while discussing potential maintenance opportunities to assist Pacific Lamprey passage through the Wells Dam fishways, the Aquatic SWG discussed the spacing requirements for the diffuser grating openings (i.e., closing any gaps greater than 1 inch), including reviewing Wells Dam fishway design specifications, consulting WDFW guidelines and requirements by NMFS, and consulting with Wells Dam mechanical staff and the Douglas PUD HCP Coordinating Committee representative regarding requirements for all anadromous fish. At the request of the Aquatic SWG, Douglas PUD scheduled a thorough inspection of all diffuser grating openings throughout the collection gallery and fish ladder and other needed repairs to be completed during upcoming winter

maintenance outages. Over the next three winter maintenance periods, Douglas PUD worked to reduce gaps in horizontal and vertical auxiliary water supply diffuser gratings throughout the fishway, including hosting a tour of the dewatered fishway where the Aquatic SWG was able to see the progress to date. In the years where coronavirus disease 2019 (COVID-19) safety protocols did not allow an in-person tour to take place, Douglas PUD shared and discussed photographs of progress to date. As of the end of 2021, all plating and closing of gaps was completed in both ladders and the collection galleries.

In 2022 and 2023, following 4 years of translocation, Douglas PUD and the Aquatic SWG implemented the 2022–2023 Adult Pacific Lamprey Study (Section 2.1.4.1.4), which in part, was intended to evaluate these in-ladder improvements. Results showed that every acoustic-tagged lamprey detected in the fishways exited via a known route. No fish disappeared mid-route, and there was no evidence of fish exiting via a diffuser grating or the auxiliary water supply system. This suggests these fishway maintenance activities may have improved Pacific Lamprey passage at Wells Dam.

During the 2023/2024 winter maintenance outage, maintenance included refixing plating that had come loose and installation of perforated plates at the lamprey trap locations (in Weir 40) in preparation for lamprey trap operations in summer 2024 (Section 2.1.4.1.5).

On December 10, 2024, Douglas PUD hosted a tour of the Wells Dam west fishway and collection gallery, where USFWS had the opportunity to view the dam and fish ladders, including passage improvements designed for Pacific Lamprey (Section 3.5).

2.1.4.7 Fishway Operations

Section 4.2.1 of the PLMP stipulates that Douglas PUD is required to operate the downstream bypass system at Wells Dam in accordance with criteria outlined in the Wells HCP (as described in the *Wells Hydroelectric Project Adult Fish Passage Plan*).

In September 2024, higher-than-normal volumes of aquatic vegetation impinged on the trash racks of turbine units and fishways at Wells Dam, resulting in modified fishway operations to maintain safe fish passage through the fishways per the *Wells Hydroelectric Project Adult Fish Passage Plan*. Wells HCP Coordinating Committee communications were shared with the Aquatic SWG regarding how this issue was being addressed (Section 3.4.3). No impacts to Pacific Lamprey were observed during these modified operations (no dead or injured lamprey were found, and the count of adult lamprey at Wells Dam remained consistent with expected seasonal run distribution).

2.1.4.8 Wells Hatchery

Based on recommendations and discussions within the Aquatic SWG, modifications have been discussed (with some implemented) at Wells Hatchery to further improve Pacific Lamprey passage through the Wells Project. These modifications are described in the following sections.

2.1.4.8.1 Plant Drain and Return-to-River Pipe

During the 2023/2024 winter maintenance outage, Douglas PUD hosted a tour at Wells Dam (Section 3.5). During the tour, the YN recalled a past acoustic telemetry study that detected Pacific Lamprey in the vicinity of two outfalls at Wells Hatchery. These outfalls are the plant drain and the return-to-river pipe where fish are returned to the Columbia River from the adult handling facility at Wells Hatchery. Douglas PUD and the Aquatic SWG discussed these outfalls, including whether lamprey may have the ability to access and ascend the outfalls, how to detect this if it happens, and how to prevent it from possibly happening in the future. Ultimately, Douglas PUD installed perforated plating on the plant drain to prevent Pacific Lamprey from entering the outfall. No perforated plating was installed on the return-to-river pipe because fish (salmon and steelhead) are returned to the river from the adult handling facility via this outfall. Additionally, if a lamprey were to ascend the return-to-river pipe, it would be found in the adult handling facility and returned to the river.

2.1.4.8.2 Volunteer Channel

In 2024, during lamprey trap operations (Section 2.1.4.1.5), Douglas PUD continued tracking fish that were collected in the traps, PIT tagged, and released downstream of Wells Dam in the tailrace. A total of eight fish were last detected at the Wells Hatchery volunteer channel. During the 2022–2023 Adult Pacific Lamprey Study (Section 2.1.2.1.4), a total of 17 fish were last detected at the Wells Hatchery volunteer channel. This prompted discussion about the area. Operation and the configuration of the channel were discussed at length, including reviewing aerial photographs section by section (Appendix A; September 11 and November 13, 2024, meeting minutes). The concern was whether lamprey are entering and ascending the channel, and if so, when lamprey are leaving the channel. To further investigate this, the 2025 Adult Pacific Lamprey Study (Section 2.1.4.1.6) includes additional radio antennas being installed at the downstream and upstream weirs within the channel to evaluate whether study fish are entering this area and when and how far into the channel they are moving. This will show what proportion of the population is entering the channel, which will also show the magnitude of the issue. On December 10, 2024, Douglas PUD hosted a tour at Wells Dam, attended by members from USFWS, which included visiting and discussing the Wells Hatchery volunteer channel area. Douglas PUD plans to host another tour of the Wells Hatchery volunteer channel area, coupled with an in-person meeting, in early 2025 (Section 3.5).

2.1.4.9 Pacific Lamprey Literature Review

The PLMP stipulates that Douglas PUD will conduct a literature review in year 5 of the FERC license, addressing current tag technologies and juvenile Pacific Lamprey passage issues. Accordingly, in late 2017, Douglas PUD, in coordination with HDR Engineering, Inc., began compiling this information, as well as information for adult Pacific Lamprey. In 2019, Douglas PUD finished compiling and updating the juvenile and adult Pacific Lamprey passage and survival literature reviews, including an online document clearinghouse containing available literature to date, and the Aquatic SWG approved the

juvenile and adult Pacific Lamprey literature reviews and document libraries with the intention to revisit the literature reviews and libraries in terms of format, structure, and content annually each fall.

On November 13, 2024, Douglas PUD and the Aquatic SWG reviewed eight publications recently added to the Juvenile and Adult Pacific Lamprey Document Libraries (Appendix A).

2.1.4.10 Planned Monitoring, Studies, and Activities in 2025

In 2025, implementation of the PLMP and Pacific Lamprey measures outlined in the FERC license and CWA Section 401 Water Quality Certification for the Wells Project will continue. This includes finalizing the 2025 Adult Pacific Lamprey Study Plan for implementation in 2025, continued evaluation of methods and assumptions needed to conduct a juvenile passage study, continued participation in regional Pacific Lamprey conservation activities, ongoing maintenance to plating installed to reduce diffuser grating gaps in the Wells Dam fishway collection galleries and ladders, and continuing to maintain and update the juvenile and adult Pacific Lamprey passage and survival literature reviews. The *Pacific Lamprey Management Plan 2024 Annual Report* (Appendix F), which summarizes Pacific Lamprey activities and results from 2024, will be reviewed by the Aquatic SWG in early 2025 and submitted to FERC as appended to this 2024 ASA Annual Report by the May 31, 2025, deadline.

2.1.5 Aquatic Nuisance Species

In 2024, Douglas PUD continued aquatic nuisance species (ANS) monitoring in the Wells Reservoir, as outlined in the ANSMP, and as required by the FERC license and CWA Section 401 Water Quality Certification for the Wells Project.

2.1.5.1 Eurasian Milfoil

Douglas PUD implements annual surveillance for non-native Eurasian Watermilfoil (*Myriophyllum spicatum*) throughout the Wells Project. On July 17, 2024, aquatic herbicide was applied to control aquatic macrophytes at swimming areas at Pateros Park, Columbia Cove Park (Brewster, Washington), and Marina Park (Bridgeport, Washington). The aquatic herbicide used was Tribune (active ingredient: diquat bromide). The control efforts were successful, and no reapplication of herbicide was required for the remainder of 2024. This was the eighth year that this herbicide has been used in these areas successfully, and based upon spot surveys, the species composition of the macrophyte communities in these areas have not changed nor has the concentration of Eurasian Watermilfoil.

2.1.5.2 Zebra and Quagga Mussels

Douglas PUD implements annual surveillance for non-native Zebra Mussel (*Dreissena polymorpha*) and Quagga Mussel (*D. bugensis*), collectively called Dreissenid Mussels, throughout the Wells Project. Consistent with past years, from June to October 2024, Douglas PUD coordinated

Zebra and Quagga Mussel monitoring with WDFW. Monitoring consisted of plankton net tows for mussel veligers, inspection of artificial substrate, and shoreline surveys at three locations in the Wells Reservoir on three occasions. Plankton tow samples collected were sent out for analysis, and results were provided to WDFW. Results from sample analysis determined no presence of either species at any of the sites monitored in the Wells Project. In 2024, environmental DNA (eDNA) sample analysis also continued to be employed as an additional monitoring method for Zebra and Quagga Mussels.

2.1.5.3 Northern Crayfish

Douglas PUD implements annual surveillance for non-native Northern Crayfish (*Orconectes virilis*) throughout the Wells Project. In 2024, non-native crayfish monitoring took place as part of the 2024 Resident Fish Assemblage Study. The 2024 Resident Fish Assemblage Study encompassed the entire Wells Reservoir and utilized sampling methods including beach seines, minnow traps, fyke nets, boat electrofishing, hoop nets, cod traps, and gill nets. During the study, 412 non-native Northern Crayfish were captured from 58 different locations throughout the Wells Reservoir.

2.1.5.4 Northern Pike

Northern Pike (*Esox lucius*) have become established upstream of the Wells Project in Lake Roosevelt. In response, Douglas PUD initiated a monitoring program for Northern Pike in the Wells Project in 2017. To date, there have been no detections of Northern Pike within the Wells Project.

2.1.5.4.1 Monitoring and Evaluation

In 2024, Douglas PUD implemented the seventh year of an eDNA monitoring program for Northern Pike in the Wells Project. Consistent with the past 6 years of the program, two eDNA samples were collected monthly from March through October at five locations for a total of 10 samples throughout the Wells Project. For a sixth year in a row, results from the 2024 monitoring effort came back negative for Northern Pike.

2.1.5.4.2 Northern Pike Monitoring and Response Plan

In 2024, Douglas PUD executed the fifth full year of implementation of the *Northern Pike Monitoring and Response Plan* (approved by the Aquatic SWG on May 8, 2019, as appended to the 2019 ASA Annual Report). The plan outlines how Douglas PUD will monitor for the presence of Northern Pike in the Wells Project, including a description of baseline data, potential monitoring methods and associated risks and benefits, and consideration of Endangered Species Act species and minimizing impacts to these species. The plan also describes suppression activities should Northern Pike become established, including when it is appropriate to implement these activities and the methodology to be used.

2.1.5.4.3 Regional Coordination

In 2024, Douglas PUD participated in Regional Pike Forum conference calls with regional entities (Chelan PUD, Grant PUD, CTCR, WDFW, and USFWS) conducting Northern Pike monitoring and suppression efforts in the Columbia River Basin. These discussions focused on sharing information on Northern Pike monitoring and removal efforts and coordinating future eDNA sample collection efforts in the region.

2.1.5.5 Other Protection, Mitigation, and Enhancement Measures

Sections 4.1 to 4.3 of the ANSMP outline PMEs designed to meet the goals and objectives of the ANSMP. Throughout 2024, Douglas PUD and the Aquatic SWG implemented these PMEs, as described in the previous sections.

In 2024, Douglas PUD implemented additional PMEs toward meeting the goals and objectives of the ANSMP, including the following: 1) applied ANS best management practices for all in-water construction work; 2) verified the condition of ANS signs at boat launches and added Northern Pike signage; 3) supplied ANS pamphlets at Wells Project boat launches and at the visitor overlook; 4) performed cyanobacteria monitoring and provided public health advisories, as needed; and 5) maintained the *Aquatic Nuisance Species Management Plan Contact List* (Section 2.1.5.5.1).

2.1.5.5.1 Aquatic Nuisance Species Management Plan Contact List

In 2020, the Aquatic SWG approved a formal *Aquatic Nuisance Species Management Plan Contact List* of parties to notify in case Douglas PUD detects new ANS in the Wells Project. This list, which is a living document subject to updates, includes Aquatic SWG members and additional stakeholders who might find this information relevant. Douglas PUD will revisit this list each year as an appendix to the ANSMP annual report.

The *Aquatic Nuisance Species Management Plan Contact List* will be updated by Douglas PUD using the management plan annual report review (expected in March 2025).

2.1.5.6 Planned Monitoring, Studies, and Activities in 2025

In 2025, implementation of the ANSMP and ANS measures outlined in Douglas PUD's CWA Section 401 Water Quality Certification for the Wells Project and FERC License Order will continue. This includes continuing annual surveillance and monitoring for non-native Eurasian Watermilfoil, non-native Zebra and Quagga Mussels, and non-native Northern Crayfish. Additionally, Douglas PUD will continue the eDNA monitoring program for Northern Pike in the Wells Project and implementation of the Aquatic SWG-approved *Northern Pike Monitoring and Response Plan*. The *Aquatic Nuisance Species Management Plan 2024 Annual Report* (Appendix G), which summarizes ANS activities and results from 2024 and will be reviewed by the Aquatic SWG in early 2025 and submitted to FERC as appended to this 2024 ASA Annual Report by the May 31, 2025, deadline.

2.1.6 Resident Fish

In 2024, Douglas PUD continued efforts to protect and enhance native resident fish populations and habitat in the Wells Reservoir, as outlined in the RFMP, and as required by the FERC license and CWA Section 401 Water Quality Certification for the Wells Project.

2.1.6.1 Northern Pikeminnow Removal Program

Per the Wells HCP, since 1993, Douglas PUD has funded research on, and removal of, Northern Pikeminnow (*Ptychocheilus oregonensis*) at the Wells Project to understand and control predators of juvenile anadromous salmonids within the project. Northern Pikeminnow are also included in the resident fish assemblage under the Agreement; therefore, annual reports that summarize these efforts are provided to the Aquatic SWG for reference (Section 3.4.2).

The final report, *2023 Public Utility District No. 1 of Douglas County Northern Pikeminnow Removal and Research Program* (Appendix N), summarizes Northern Pikeminnow removal efforts in the Wells Reservoir and tailrace in 2023.

As of 2023, approximately 372,000 Northern Pikeminnow have been captured and removed from the Wells Reservoir and tailrace through Douglas PUD sponsored removal efforts. Future yearly catch data will continue to inform the state of the Northern Pikeminnow population in the Wells Project and how environmental conditions affect it. In 2024, Douglas PUD continued Northern Pikeminnow removal efforts, and a final report on these efforts is expected in the spring of 2025.

2.1.6.2 Resident Fish Assemblage Study

Objective 2 of the RFMP requires Douglas PUD to conduct a study to determine the relative abundance of resident fish species found in the Wells Reservoir in Year 2 of the 2012-issued FERC license and every 10 years thereafter. Douglas PUD conducted a Resident Fish Assemblage Study in 2014 (Year 2 study).

On January 29, 2024, a draft *2024 Resident Fish Assemblage Study Plan* was distributed for Aquatic SWG review. In this draft plan, Douglas PUD proposed new sampling methods—fyke nets and hoop nets—to target deepwater species. The Aquatic SWG discussed these and other options regarding potential impacts to White Sturgeon, Bull Trout, and out-migrating smolts, as well as gear that might broaden catch to smaller-size fish. On February 14, 2024, the Aquatic SWG agreed to Douglas PUD's proposed new sampling methods so that Douglas PUD could move forward with purchasing gear for implementation in spring 2024. The Aquatic SWG continued discussing the draft plan, including providing edits and comments on sampling methods, how to handle invasive species encountered during the study, and use of standardized net and biological data collection protocols.

On March 13, 2024, the *2024 Resident Fish Assemblage Study Plan* (Appendix O) was approved by the Aquatic SWG. Specific objectives of the study include the following: 1) collect resident fish

abundance data using previously established methods and make comparisons to results of past studies; 2) collect baseline resident fish abundance data using alternative sampling methods, with a focus on species ineffectively sampled by previously established methods; 3) compare the effectiveness of previously established and alternative sampling methods for individual resident fish species and develop relationships for comparing results among sampling methods; and 4) use established and alternative sampling methods to determine the abundance and distribution of non-native and native predator species.

Sampling efforts were initiated in spring 2024 and included seining, fyke netting, electrofishing, and minnow trapping. Sampling in fall 2024 included walleye gillnetting and additional burbot trapping. A draft report summarizing the entire effort and results will be available for review in early 2025.

2.1.6.3 Planned Monitoring, Studies, and Activities in 2025

In 2025, implementation of the RFMP and resident fish measures outlined in the FERC license and CWA Section 401 Water Quality Certification for the Wells Project will continue, including implementation of the Northern Pikeminnow Removal Program and finalization of a Resident Fish Assemblage Study Report. The *Resident Fish Management Plan 2024 Annual Report* (Appendix H), which summarizes resident fish activities and results from 2024, will be reviewed by the Aquatic SWG in early 2025 and submitted to FERC as appended to this 2024 ASA Annual Report by the May 31, 2025, deadline.

3 Agreement Administration

This section lists processes, activities, and events of note that occurred in 2024 related to the administration of the Agreement, including a list of reports published and approved in 2024 that relate to the Aquatic SWG.

3.1 Aquatic Settlement Work Group Members

A designated technical representative and a separate designated policy representative for each of the Parties make up the Aquatic SWG, as established under the Agreement, including designated alternates for each representative. The Aquatic SWG meets collectively to expedite the process for overseeing and guiding the implementation of the Agreement. Meeting minutes and conference call minutes from the monthly Aquatic SWG meetings are compiled in Appendix A of this report, and the current members of the Aquatic SWG are listed in Appendix B.

Since March 2024, the Ecology Aquatic SWG technical representation role has been vacant. Douglas PUD has been coordinating with Ecology regarding water quality topics as needed.

3.2 Agreement Chairperson 3-Year Review

The Agreement contains a requirement to review the performance of the Chairperson in 3-year intervals, or per the request of two Aquatic SWG technical representatives. In January 2024, Douglas PUD indicated that the Aquatic SWG conducted a review and positive feedback was received; therefore, Douglas PUD moved forward with renewing a contract to retain Anchor QEA as Aquatic SWG Chairperson and support staff for another 2-year term, which may include an additional transition period while a new Chairperson is selected and in place.

3.3 Aquatic Settlement Work Group Document Repositories

Throughout 2024, Douglas PUD and the Aquatic SWG continued maintaining two online document repositories that house the Agreement's administrative record. The internal extranet site is a private repository that houses draft and final documents for Aquatic SWG members. The external Douglas PUD website includes a public repository of final documents accessible to Aquatic SWG members and non-members.

3.4 Habitat Conservation Plan Coordination

In 2024, the Aquatic SWG continued coordination with the Wells HCP Coordinating Committee, as needed and as required by the FERC license and CWA Section 401 Water Quality Certification for the Wells Project.

3.4.1 2024 Total Dissolved Gas Abatement Plan and Wells Bypass Operating Plan

Each year, the annual GAP/BOP is developed collaboratively by the Aquatic SWG and Wells HCP Coordinating Committee (Section 2.1.3.2). In 2024, the Aquatic SWG approved the 2023 GAP/BOP, as revised (Appendix L) on February 14, 2024, and the Wells HCP Coordinating Committee approved the document via email on February 27, 2024, prior to Douglas PUD filing the plan with FERC on February 28, 2024.

3.4.2 Northern Pikeminnow Removal Program Annual Reports

Each year, the Wells HCP Coordinating Committee develops a report that summarizes Northern Pikeminnow research and removal efforts conducted over the past year and provides the final report to the Aquatic SWG for reference because Northern Pikeminnow are also included in the resident fish assemblage under the Agreement (Section 2.1.6.1). In 2024, the final report, *2023 Public Utility District No. 1 of Douglas County Northern Pikeminnow Removal and Research Program* (Appendix N), which summarizes Northern Pikeminnow removal efforts in the Wells Reservoir and tailrace in 2023, was approved by the Wells HCP Coordinating Committee on September 9, 2024, and the final report was provided to the Aquatic SWG.

3.4.3 Modified Fishway Operations

On September 5, 2024, Douglas PUD notified the Wells HCP Coordinating Committee of higher-than-normal volumes of aquatic vegetation impinging on the trash racks of turbine units and fishways at Wells Dam. On September 10, 2024, an update was provided explaining that aquatic vegetation was clogging the trash racks of intakes to five turbine units and the trash racks of the fish-pump and supplemental flow penstocks and the ladder exits for the east fishway, resulting in a several-hour outage of the east fishway to allow trash racks to be cleaned. During this time, sufficient water was maintained in the ladder, so there was no need to perform a ladder dewatering and fish salvage action, and the west fishway remained in operation during the cleaning effort. The buildup of aquatic vegetation continued resulting in pressure-differential alarms for the diffuser gratings between the supply chamber and collection gallery on both fishways. These alarms alert operators to unsafe head differentials on the diffuser gratings between the auxiliary water supply (AWS) system and the collection gallery. In 2001, this same issue occurred. At that time, NMFS recommended reducing AWS flow to reduce pressure on the diffuser gratings, which also reduced the head differential at the fishway entrance. Therefore, NMFS also recommended partially closing the collection gallery doors from 8 feet to 4 feet to maintain the head differential at the fishway entrances at 1.0 foot (normal differential is 1.5 feet). Consistent with this recommendation, Douglas PUD took this action to maintain safe fish passage through the fishways, per the *Wells Hydroelectric*

Project Adult Fish Passage Plan. These operations were maintained in both fishways until annual winter fishway maintenance was initiated.

The BTMP and PLMP require Douglas PUD to operate the fishways at Wells Dam consistent with the *Wells Hydroelectric Project Adult Fish Passage Plan* (Sections 2.1.3.2 and 2.1.4.7). Considering this, on September 10, 2024, Douglas PUD shared this Wells HCP Coordinating Committee correspondence with the Aquatic SWG. At the next Aquatic SWG meeting, Douglas PUD discussed this situation in detail (Appendix A; September 11, 2024, meeting minutes).

3.4.4 Lamprey Trap Operations and Modifications

In 2007, Douglas PUD and the Aquatic SWG constructed and deployed lamprey traps in the Wells Dam fishways, an action reviewed and approved by the Wells HCP Coordinating Committee at that time.

In 2023, Douglas PUD and the Aquatic SWG expressed a renewed interest in deploying these same Pacific Lamprey traps to see how the traps perform during a year with greater abundance of Pacific Lamprey than previous study years and to understand whether the traps can be used to provide study fish for future Aquatic SWG studies of adult Pacific Lamprey passage (Section 2.1.4.1.5). Douglas PUD and the Aquatic SWG proposed to deploy two traps in the east ladder of the Wells Dam fishway from August 28 to September 15, 2023, from 2100 hours to 0700 hours each night. Trapping dates and times coincide with historical peak passage timing of Pacific Lamprey at Wells Dam and when HCP Plan Species are less likely to be transiting through the fishway. The Wells HCP Coordinating Committee agreed to Douglas PUD's proposed Pacific Lamprey trap operations with regard to potential effects on passage of HCP Plan Species and contingent on Douglas PUD conducting a post hoc analysis of PIT detections of steelhead within the east and west adult fish ladders at Wells Dam. This post hoc analysis was performed and showed no significant difference in the mean ladder transit times of steelhead in the east or west ladder when the lamprey traps were deployed and were not deployed.

In November 2023, Douglas PUD and the Aquatic SWG proposed the following for implementation in 2024: 1) installing perforated plates on floor of orifices of the weirs where lamprey traps would be deployed in the east and west fish ladders, which might discourage passage through the orifices and improve the efficiency of the lamprey traps; and 2) expanding trapping operations in 2024, to occur in both fish ladders from August 1 to September 30, from 2100 hours to 0800 hours. Douglas PUD and the Wells HCP Coordinating Committee discussed possible impacts of the installed perforated plates and expanded trapping operations on the passage of Pacific Lamprey, Bull Trout, and HCP Plan Species. The Wells HCP Coordinating Committee approved these activities, as described in the final memorandum "Wells Dam Lamprey Trapping and Fishway Modifications 2024" (as appended to the 2023 ASA Annual Report), contingent on Douglas PUD providing weekly in-season updates on adult steelhead passage timing through the east and west fishways at Wells Dam. In 2024, weekly

in-season updates were provided to the Wells HCP Coordinating Committee on August 8, August 15, and August 22, and a season summary was provided on September 23. Based on weekly reviews of steelhead PIT-tag detection histories in both the east and west fishways, no effect on steelhead transit times was observed while the Pacific Lamprey traps were deployed, consistent with past observations.

On December 16, 2024, the memorandum "Wells Dam Lamprey Trapping and Fishway Modifications 2025" (Appendix P) was discussed with the Wells HCP Coordinating Committee. In this memorandum, Douglas PUD and the Aquatic SWG proposed the following for implementation in 2025: 1) deploying the lamprey traps and trapping adult Pacific Lamprey in both fish ladders from August 1 to September 30, 2025; and 2) reducing the collection gallery head differential from 1.5 feet to 0.5 foot from late-July to October 15, 2025, in accordance with the forthcoming study plan pending finalization by the Aquatic SWG. Douglas PUD and the Wells HCP Coordinating Committee discussed the objectives and regulatory compliance of the reduced head differentials. More discussion and an SOA for approval is expected in early 2025.

3.5 Wells Dam and Wells Hatchery Site Visits

Each year, Douglas PUD extends an invitation to the Aquatic SWG, and other interested parties, to tour the Wells Dam fishway while a ladder is dewatered for annual winter maintenance. This provides an opportunity to view components of the fishway frequently discussed throughout the year while implementing the Agreement and aquatic resources management plans, including any modifications that may be under discussion. This tour is also typically coupled with a tour of the Wells Hatchery and White Sturgeon rearing facility and an in-person Aquatic SWG monthly meeting. Douglas PUD consistently offers and accommodates site visits and tours of locations within the Wells Project, as the opportunities arise or are requested.

During the 2023/2024 winter maintenance outage, Douglas PUD hosted a tour of the Wells Dam east fishway and collection gallery. The tour was attended by members from the YN and USFWS. The tour of the collection gallery provided an opportunity to view Pacific Lamprey passage improvements, such as the plating installed to reduce gaps in the diffuser grating spacings (Section 2.1.4.6). The tour also included viewing the lamprey trap and orifice floor plating installed for Pacific Lamprey trapping activities in 2024 (Section 2.1.4.1.5). On January 10, 2024, the YN and Aquatic SWG discussed photographs collected during the tour (Appendix A). Photographs of the Wells Hatchery plant drain and return-to-river pipe were also reviewed and discussed to determine whether lamprey may have the ability to access and ascend the outfalls (Section 2.1.4.8.1).

On December 10, 2024, Douglas PUD hosted a tour of the Wells Dam west fishway and collection gallery. The tour was attended by members from USFWS. Throughout 2024, the Aquatic SWG discussed the Wells Hatchery volunteer channel area (Section 2.1.4.8.2), so this area and the

collection facilities were also toured. Douglas PUD plans to host another tour of the Wells Hatchery volunteer channel area, coupled with an in-person meeting, in early 2025.

3.6 Agreement-Related Publications in Calendar Year 2024

The following documents were finalized by the Aquatic SWG in 2024:

- Anchor QEA, 2024. *Annual Report Calendar Year 2023 Activities Under the Aquatic Settlement Agreement*. May 8, 2024.
- Douglas PUD (Public Utility District No. 1 of Douglas County), 2023. *Bull Trout Movement and Life History Investigation 2022–2023*. Wells Hydroelectric Project, FERC Project No. 2149. December 2023.
- Douglas PUD, 2024. *2023 Annual Report Total Dissolved Gas Abatement Plan*. Wells Hydroelectric Project FERC No. 2149. Prepared for Washington State Department of Ecology and the Aquatic Settlement Work Group. February 2024.
- Douglas PUD, 2024. *2023 Annual Report Water Quality Management Plan*. Wells Hydroelectric Project, FERC Project No. 2149. May 8, 2024.
- Douglas PUD, 2024. *2023 Annual Report White Sturgeon Management Plan*. Wells Hydroelectric Project FERC No. 2149. May 8, 2024.
- Douglas PUD, 2024. *2023 Bull Trout Management Plan and Incidental Take Annual Report*. Wells Hydroelectric Project, FERC Project No. 2149. May 8, 2024.
- Douglas PUD, 2024. *2024 Aquatic Settlement Agreement and Workgroup Action Plan*. Hydroelectric Project FERC No. 2149. March 14, 2024.
- Douglas PUD, 2024. *2024 Resident Fish Assemblage Study Plan*. Wells Hydroelectric Project FERC No. 2149. March 2024.
- Douglas PUD, 2024. *2024 Total Dissolved Gas Abatement Plan* and appended *Bypass Operating Plan*. Wells Hydroelectric Project FERC No. 2149. Prepared for Washington State Department of Ecology and Aquatic Settlement Work Group. February 2024.
- Douglas PUD, 2024. *Aquatic Nuisance Species Management Plan 2023 Annual Report*. Wells Hydroelectric Project, FERC Project No. 2149. May 8, 2023.
- Douglas PUD, 2024. *Pacific Lamprey Management Plan 2023 Annual Report*. Wells Hydroelectric Project, FERC Project No. 2149. May 8, 2023.
- Douglas PUD, 2024 *Resident Fish Management Plan 2023 Annual Report*. Wells Hydroelectric Project, FERC Project No. 2149. May 8, 2023.
- Douglas PUD, 2024. Memorandum to: Wells HCP Coordinating Committee Representatives. Regarding: Wells Dam Lamprey Trapping and Fishway Modifications 2025. December 12, 2024.
- Jerald, T. (Columbia Research Specialists, LLC), 2024. *2023 Public Utility District No. 1 of Douglas County Northern Pikeminnow Removal and Research Program*. Wells Hydroelectric Project FERC No. 2149. Prepared for Public Utility District No. 1 of Douglas County. December 2024.

- Robichaud, D., J. Rohrback, and M. Mayfield, 2024. *Wells Dam Adult Lamprey Approach and Passage Study, 2022–23*. Prepared for Public Utility District No. 1 of Douglas County. June 2024.

4 References

Anchor QEA, 2024. *Annual Report Calendar Year 2023 Activities Under the Aquatic Settlement Agreement*. Prepared for Public Utility District No. 1 of Douglas County. May 8, 2023.

Aquatic SWG (Wells Aquatic Settlement Work Group). 2018. *To Translocate Adult Pacific Lamprey from Priest Rapids Dam to Areas Within or Upstream of the Wells Project and Postpone Passage Evaluation*. June 13, 2018.

Douglas PUD (Public Utility District No. 1 of Douglas County, Washington), 2002. *Exhibit No. 1, Anadromous Fish Agreement and Habitat Conservation Plan – The Wells Hydroelectric Project.* FERC License No. 2149. Available from: http://dcpud.org/wells-project/aquatic-settlement-agreement.

Douglas PUD, 2007. *Adult Pacific Lamprey Passage and Behavior Study*. FERC License No. 2149. September 2007.

Douglas PUD, 2016. *Adult Lamprey Passage and Enumeration Study, Wells Dam — 2016*. FERC License No. 2149. February 10, 2016.

Douglas PUD, 2022. *Wells Dam 2022 Adult Lamprey Approach and Passage Study Plan*. FERC License No. 2149. February 2022.

FERC (Federal Energy Regulatory Commission), 2012. Order issuing new license to Douglas PUD to continue operation and maintenance of the existing Wells Hydroelectric Project No. 2149. November 9, 2012. Available at: http://dcpud.org/wells-project/wells-project-license.

Johnson, P.N., and B. Le, 2010. *Assessment of Adult Pacific Lamprey Response to Velocity Reductions at Wells Dam Fishway Entrances (2009 DIDSON Study Report)*. Prepared for Public Utility District No. 1 of Douglas County. April 2010.

LGL Limited, 2004. *Radio-Telemetry Monitoring of Bull Trout, Lamprey, and Coho at Wells Dam and Project Tributaries, 2004–2005*. July 29, 2004.

Long View (Long View Associates), 2012. *Adult Lamprey Passage and Enumeration Study, Wells Dam — 2013*. Prepared for Public Utility District No. 1 of Douglas County. September 21, 2012.

Murauskas, J.G., and P. N. Johnson, 2009. *Assessment of Adult Pacific Lamprey Behavior in Response to Temporary Velocity Reductions at Fishway Entrances.* Prepared for the Wells Aquatic Settlement Work Group. July 24, 2009.

Nass, B., C. Sliwinski, and D. Robichaud, 2005. *Assessment of Adult Pacific Lamprey Migratory Behavior at Wells Dam Using Radio-Telemetry Techniques, 2004*. Prepared for Public Utility District No. 1 of Douglas County. October 13, 2005.

NMFS (National Marine Fisheries Service), 2000. *Endangered Species Act – Section 7 Consultation: Biological Opinion*. Consultation on Remand for Operation of the Columbia River Power System and 19 Bureau of Reclamation Projects in the Columbia Basin. F/NWR/2004/00727. November 30, 2005. Pages 5–6, 5–7, 5–53, 10–9, and Appendix E: Risk Analysis.

Robichaud, D., and C. Kyger, 2014. *Adult Lamprey Passage and Enumeration Study, Wells Dam, 2013: The Effects of Head Differential on Entrance Efficiency, and of Picketed Leads on Count Window Enumeration Efficiency*. Prepared for Public Utility District No. 1 of Douglas County. September 9, 2014.

Robichaud, D., and C. Kyger, 2018. *Adult Lamprey Approach and Passage Study, Wells Dam, 2016–17*. Prepared for Public Utility District No. 1 of Douglas County. June 2018.

Robichaud, D., B. Nass, and Public Utility District No. 1 of Douglas County, Washington, 2009. *Adult Pacific Lamprey Passage and Behavior Study*. Prepared for Public Utility District No. 1 of Douglas County, Washington. February 2009.

Robichaud, D., J. Rohrback, and M. Mayfield, 2024. *Wells Dam Adult Lamprey Approach and Passage Study, 2022–23*. Prepared for Public Utility District No. 1 of Douglas County. June 2024.

Appendix A
Aquatic Settlement Work Group 2024 Conference Call Minutes

FINAL

Conference Call Minutes

Aquatic Settlement Work Group

To: Aquatic SWG Parties Date: February 14, 2024

From: John Ferguson, Chair, Anchor QEA

Re: Final Minutes of the January 10, 2024, Aquatic SWG Conference Call

The Aquatic Settlement Work Group (SWG) met by conference call on Wednesday, January 10, 2024, from 10:00 a.m. to 11:40 a.m. Attendees are listed in Attachment A of these conference call minutes.

Summary of Action Items

1. The Yakama Nation (YN) will ask Pacific Northwest National Laboratory (PNNL) about possibly presenting results from their 2023 juvenile Pacific Lamprey passage behavior and survival study during a joint meeting of the Aquatic SWG, Rocky Reach Fish Forum (RRFF), and Priest Rapids Fish Forum (PRFF) this spring, 2024 (Item II-E).
2. Douglas PUD will consider options for monitoring whether Pacific Lamprey enter the plant drain and return-to-river pipe at Wells Dam and report back to the Aquatic SWG (Item II-G).
3. Douglas PUD will review structural design specifications to verify the two ports at the bottom of the end wall within the collection gallery connect with Weir 1 at Wells Dam (Item II-G). *(Note: Andrew Gingerich confirmed these ports connect with Weir 1, in both the east and west fishways at Wells Dam, in an email provided after the conference call on January 10, 2024, which Kristi Geris distributed to the Aquatic SWG that same day.)*
4. The YN will provide the photographs of the Wells Dam east fishway tour that were discussed during today's Aquatic SWG conference call, and Anchor QEA will upload the photographs to the Aquatic SWG extranet site (Item II-G). *(Note: Ralph Lampman provided these photographs after the conference call on January 10, 2024, which Kristi Geris uploaded to the extranet site that same day.)*
5. The Aquatic SWG meeting on February 14, 2024, will be held by conference call (Item III-B).

Summary of Decisions

1. There were no Decision Items approved during today's conference call.

Agreements

1. There were no Agreements discussed during today's conference call.

Review Items

1. The draft *Total Dissolved Gas Water Quality Attainment Plan Year 10 Report* (Water Quality Attainment Plan 10-Year Report) was distributed to the Aquatic SWG by Kristi Geris on November 14, 2023, and is available for review with edits and comments due to Mariah Mayfield (Item II-A).
2. The draft *Bull Trout Movement and Life History Investigation 2022–2023* (2022–2023 Bull Trout Study Report), including *Appendix A. FERC Order Granting Variance from Radio Telemetry Study Pursuant to Bull Trout Stranding, Entrapment, and Take Study Plan and Article 402 Issued October 12, 2021*, *Appendix B. 2022–2023 Bull Trout Detection History Plots of Individual Study Fish*, and *Appendix C. Genetic Analysis for Bull Trout Prepared by Washington Department of Fish and Wildlife Dated June 2023*, were distributed to the Aquatic SWG by Kristi Geris on December 13, 2023, and are available for a 45-day review with edits and comments due to Chas Kyger by January 26, 2024. Douglas PUD will request approval of the draft report documents during the Aquatic SWG conference call on February 14, 2024 (Item II-C).
3. The draft *2023 Annual Report Total Dissolved Gas Abatement Plan* (2023 TDG Report) and draft *2024 Total Dissolved Gas Abatement Plan and appended Wells Bypass Operating Plan* (2024 GAP/BOP) were distributed to the Aquatic SWG by Kristi Geris on January 9, 2024, and are available for a 30-day review with edits and comments due to Mariah Mayfield by February 10, 2024. Douglas PUD will request approval of the draft documents during the Aquatic SWG conference call on February 14, 2024 (Item II-B).
4. The draft 2024 Resident Fish Assemblage Study Plan was distributed to the Aquatic SWG by Kristi Geris on January 29, 2024, and is available for a 30-day review with edits and comments due to Chas Kyger by February 28, 2024.
5. The draft *2024 Aquatic Settlement Agreement and Workgroup Action Plan* (2024 ASA Action Plan) was distributed to the Aquatic SWG by Kristi Geris on February 13, 2024, and is available for a 30-day review with edits and comments due to Andrew Gingerich by March 12, 2024. Douglas PUD will request approval of the draft plan during the Aquatic SWG conference call on March 13, 2024.

Documents Finalized

1. The final *2022 Public Utility District No. 1 Of Douglas County, Northern Pikeminnow Removal and Research Program*, which was approved by the Wells Habitat Conservation Plan (HCP) Coordinating Committee on July 31, 2023, after no disapprovals were received prior to the 60-day review period deadline, was distributed to the Aquatic SWG for reference by Kristi Geris on January 26, 2024.

I. Welcome

A. Review Agenda (John Ferguson)

John Ferguson welcomed the Aquatic SWG members (Attachment A) and reviewed the agenda. Ferguson asked for any additions or changes to the agenda. No additions or changes were requested.

B. Meeting Minutes Approval (John Ferguson)

The revised draft December 13, 2023, conference call minutes were reviewed. Kristi Geris said edits were received from Douglas PUD and Washington State Department of Ecology (Ecology). Edits were minor clarifications that were incorporated into the revised minutes. To note, the edit from Ecology was just received today and was a clarification about Chad Brown's title, Ecology Hydropower Unit Supervisor. Geris also added distribution of the draft 2023 TDG/GAP Report and draft 2024 GAP/BOP. Aquatic SWG representatives present approved the December 13, 2023, conference call minutes, as revised. The YN abstained because a representative did not participate in the December 13, 2023, conference call.

C. Review of Action Items (John Ferguson)

Action items from the Aquatic SWG conference call on December 13, 2023, are as follows *(Note: The following italicized item numbers correspond to agenda items from the December 13, 2023, meeting)*:

1. *The draft Water Quality Attainment Plan 10-Year Report will be placed on the agenda for the Aquatic SWG conference call on January 10, 2024, for further discussion and possible decision in January or February 2024 (Item II-A).*
   This was placed on the agenda.
2. *The draft 2023 TDG/GAP Report and draft 2024 GAP/BOP will be distributed for review in early January 2024, and Douglas PUD will request approval of these documents during the Aquatic SWG conference call on February 14, 2024 (Item II-B).*
   The draft 2023 TDG/GAP Report and draft 2024 GAP/BOP were distributed on January 9, 2024.
3. *The draft 2022–2023 Bull Trout Study Report and appendices will be placed on the agenda for the Aquatic SWG conference call on January 10, 2024, for discussion and questions, and Douglas PUD will request approval of the report documents during the Aquatic SWG conference call on February 14, 2024 (Item II-C).*
   This was placed on the agenda.
4. *The Wells Fish Passage System Overview will be redistributed to the Aquatic SWG (Item II-F).*
   Kristi Geris redistributed this document following the conference call on December 13, 2023.

II. Summary of Discussions

A. Water Quality Attainment Plan 10-Year Report (Mariah Mayfield)

Mariah Mayfield said the review process for this document is a little different than usual. The draft Water Quality Attainment Plan 10-Year Report was distributed to the Aquatic SWG for review by Kristi Geris on November 14, 2023. Mayfield said Douglas PUD and Ecology met last Monday, January 8, 2024, and discussed a path forward to review and update the document together over the next few months. In the meantime, she asked that Aquatic SWG members reach out with any edits, comments, or questions on the draft report.

John Ferguson asked about a timeline for finalizing the report. Mayfield said that Douglas PUD met the 10-year compliance schedule by submitting the draft report to Ecology in 2023, and now Douglas PUD and Ecology plan to coordinate as needed to produce a quality finished product. Ferguson summarized that Douglas PUD and Ecology are working jointly on this document, and the Aquatic SWG will have an opportunity to review the revised draft before formal approval. Mayfield said this is correct. Breean Zimmerman also noted that this type of review process for water quality attainment plans is not uncommon. It takes a while to review all of the data to make sure to produce a good, finished product.

Ralph Lampman asked whether, in Section 4.2 Biological Monitoring Program, Table 3, it is possible to separate out Pacific Lamprey. There is a lot of interest in impacts of gas bubble trauma on lamprey, and it would be helpful to identify this separately. Mayfield said Pacific Lamprey are separated out in the annual TDG/GAP reports, but not in this 10-year, which is a high-level, summary report.

B. 2024 GAP/BOP and 2023 TDG/GAP Report (Andrew Gingerich)

Andrew Gingerich said, as promised last month, the draft 2023 TDG/GAP Report and draft 2024 GAP/BOP were distributed for Aquatic SWG review on January 9, 2024, with edits and comments due to Mariah Mayfield by February 10, 2024. Gingerich recalled that the 2024 GAP/BOP must also be reviewed and approved by the Wells HCP Coordinating Committee, because Wells Dam bypass operations have a nexus with the Wells HCP and Section 10 coverage for juvenile salmonids.

Gingerich said this year, the most notable change is that Turbine Unit 6 is undergoing a total overhaul and will be unavailable for the duration of the 2024 bypass season. Due to the hydro combine design of Wells Dam, not having Turbine Unit 6 operating prevents being able to concentrate spill through Spillway 7; therefore, the draft 2024 GAP/BOP proposes to shift concentrated spill to Spillway 9. As river flow increases, bypass barriers will first be pulled from Spillway 8. This will maintain concentrated spill in the center of the spillway and towards the left bank. Studies during relicensing showed that this concentrated spill pattern produces the least

amount of total dissolved gas in the Wells Dam tailrace. Another nuance is the order in which bypass barriers are pulled. Aside from this, the documents are fairly consistent with past year's plans. Mariah Mayfield noted that changes in the draft 2024 GAP/BOP from past years will be shown in the Spill Playbook or the BOP, Appendices 1 and 2, respectively, to the GAP.

Gingerich said Douglas PUD can typically be lenient with review periods; however, with these documents, Douglas PUD's Federal Energy Regulatory Commission (FERC) license and 401 Certification[1] include a requirement to file the final approved documents with FERC by February 28 each year. Douglas PUD is requesting a 30-day review and hopes to receive comments in advance of the next meeting, in time to share comments with both the Aquatic SWG and Wells HCP Coordinating Committee before requesting approval of the draft documents during the Aquatic SWG conference call on February 14, 2024, and HCP Coordinating Committees meeting in late February (February 27, 2024). Douglas PUD requested the same 30-day review for the Wells HCP Coordinating Committee. John Ferguson noted that the Wells HCP Coordinating Committee also received the draft 2024 GAP/BOP for review yesterday, so the review periods are on the same schedule.

C. 2022-2023 Bull Trout Study Report (Chas Kyger)

The draft 2022–2023 Bull Trout Study Report, including Appendices A, B, and C, was distributed to the Aquatic SWG by Kristi Geris on December 13, 2023, and is available for a 45-day review with edits and comments due to Chas Kyger by January 26, 2024. Douglas PUD will request approval of the draft report documents during the Aquatic SWG conference call on February 14, 2024.

Chas Kyger said no comments have been received, and he asked whether there are any questions or comments today. RD Nelle said he has no questions but appreciates the 45-day review period around the holidays.

D. Brood Year 2023 Wells White Sturgeon Rearing Update (Chas Kyger)

A brood year (BY) 2023 White Sturgeon Rearing Update (Attachment B) was distributed to the Aquatic SWG by Kristi Geris prior to the Aquatic SWG conference call on January 10, 2024.

Chas Kyger said fish are starting to graduate up to the magnum tanks. Fish in a lot of tanks continue to grow, but a couple are still lagging behind. As discussed last month, the Chelan PUD program may be close to the stocking target, and he has not heard any updates about surplus fish being available.

Jason McLellan said that during the last RRFF meeting, Chelan PUD indicated that they planned to talk with Douglas PUD about fish numbers, and then Chelan PUD was going to contact the Confederated Tribes of the Colville Reservation (CTCR) with a request. Kyger said he appreciates that

[1] Ecology-issued Clean Water Act 401 Water Quality Certification.

these discussions took place. He plans to send Chelan PUD this rearing update (Attachment B) after today's conference call, as he does each month, so Chelan PUD will then have updated numbers.

McLellan said that currently at Sherman Creek Hatchery, there is one tank with 150 fish of medium size distribution marked for transfer, assuming the CTCR receives a request. John Ferguson asked what medium size distribution means. McLellan explained that the largest fish on station are 10 fish per pound or about 45 grams (g) each, and the smallest fish are closer to 10 g each. The 150 fish marked for transfer are somewhere in the middle, probably about 30 g each. He recalled that Sherman Creek Hatchery is on well water and has no heated water, so fish growth is quick in the beginning but then slows down. This time of year, temperatures are cooling. Currently, temperatures are around 12°C.

Kyger asked whether there are any updates on blood sampling. McLellan said no, he let Chelan PUD know the CTCR's preference to start in March 2024 and to conduct all the sampling at once to limit the handling small fish. Chelan PUD seemed agreeable but needed to confirm this internally, and he has not yet heard back. McLellan said the CTCR are tentatively planning to start blood sampling in March 2024. Kyger said he does not foresee issues with this plan.

Andrew Gingerich asked whether the fish marked for transfer at Sherman Creek Hatchery are also from BY 2023. McLellan said yes, these fish are the same BY 2023 collection that went to Wells Hatchery for the Chelan PUD and Douglas PUD programs.

Ferguson said Chelan PUD needs about 2,000 fish and Douglas PUD needs 325 fish. According to Attachment B, this means the programs are roughly 90 fish short as of now, which 150 fish can cover. What about Tank 2 that is averaging 12.7-g fish? Will these fish be usable? Might there be further shortfall that then requires more than 150 fish to meet program goals? Kyger said expects that if there are more mortalities, they will be from this tank. He believes some of these fish will survive but may not reach the target fish size. He noted that just because fish are not growing fast does not mean the fish will inevitably die.

McLellan also noted that the surplus fish from Sherman Creek Hatchery are still growing, but slowly due to the colder water. When moved to Wells Hatchery, with the ability to manipulate water temperatures, there is no reason these fish should not be able to reach the target fish size of 200 g by the end of May or early June 2024, which is the typical stocking time. Regarding the 116 fish at 12.7 g each, some will make it to 200 g and some will not. He does not believe anyone will be opposed to stocking a few undersized fish, notably because some fish will be oversized. If the CTCR transfer 150 fish and some of the 12.7-g fish reach size, the majority of the 2,000-fish program will reach the 200-g minimum fish size target. Overall, this meets program objectives.

E. Juvenile Pacific Lamprey Downstream Passage Study (Ralph Lampman)

Ralph Lampman said he is still collecting a few final datapoints and expects to have a more complete dataset next month. He believes there is a sufficient number of Pacific Lamprey, but not enough at the juvenile life stage in the Upper Columbia River to conduct the reach-wide study the YN has proposed unless there is a willingness to accept wild or propagated fish from other locations. For example, there are thousands of juveniles in the Yakima River each year. He is interested in seeing the latest results from the juvenile Pacific Lamprey passage behavior and survival study in the Snake River. He believes PNNL plans to present these results in a couple of weeks at the U.S. Army Corps of Engineers Anadromous Fish Evaluation Program (AFEP). PNNL used propagated fish from the Yakima River in this study. Study fish were released in the fall, when there were not many other fish migrating through the area. It will be good to understand how fish source impacts behavior. If using juvenile fish from other sources is not possible, it may take years to build up these numbers in the Upper Columbia River.

Mariah Mayfield recalled that last year, when Ryan Harnish (PNNL) presented the 2022 juvenile Pacific Lamprey passage behavior and survival study results during a joint session with the Aquatic SWG, RRFF, and PRFF (on August 21, 2023), it provided a good opportunity to ask questions that might not be possible in a setting like AFEP. Mayfield asked whether it might be possible to convene another joint session of the fish forums for a presentation of the 2023 study results, maybe this spring, to have that same opportunity to ask questions and have a discussion. Lampman agreed this is a good idea, and said Harnish, Daniel Deng (PNNL), Bob Mueller (PNNL), or Katie Deters (PNNL) are all possible options for presenters. He said he will ask PNNL about possibly presenting results from their 2023 juvenile Pacific Lamprey passage behavior and survival study during a joint meeting of the Aquatic SWG, RRFF, and PRFF this spring 2024. Lampman asked who hosted last year. Kristi Geris said the RRFF hosted, and Grant PUD and Douglas PUD joined.

Andrew Gingerich said it is his understanding that the Eel/Lamprey Acoustic Tag (ELAT) is undergoing a similar process as the Juvenile Salmon Acoustic Telemetry System (JSATS) tag. That is, during the JSATS design and development stage there was a 2- to 3-year period where PNNL holds a pseudo patent before making the tag commercially available to vendors who could then sell the tags to researchers. He asked Lampman if this is true, and whether the ELATs are commercially available? Lampman said this is correct, and ELATs are not yet commercially available. An agreement with vendors is already in place, and the YN is a partner on this cooperative agreement. There are certain components of the ELAT that are built by partners. This process has been ongoing for a couple of years now, and there are plans to pull the patent any time now, but he has not yet heard when.

John Ferguson asked whether the study in the Lower Columbia River will start this year. Lampman said yes, the study will involve passage at McNary and John Day dams, all the way down to the

forebay of The Dalles. At the earliest, the study will begin in late March and go into June/July 2024. Ferguson asked whether PNNL expects to be able to meet the tag production requirements for this study. Lampman said has not heard about any issues with tag production.

F. Pacific Lamprey Conservation Initiative Lamprey Information Exchange Update (Ralph Lampman)

Ralph Lampman shared on Microsoft Teams the Pacific Lamprey Conservation Initiative (PLCI) Policy Committee 2023 Agenda (Attachment C) and PLCI 7th Annual Lamprey Information Exchange 2023 Agenda (Attachment D), which he distributed to the Aquatic SWG prior to the conference call on January 10, 2024.

Lampman said the Policy Committee convened on December 12, 2023, and broke into four groups of 8 to 10 people each. Each group focused on three questions: Key Threats, Communication/Advocacy, and Funding (as further described on page 2 of Attachment C). Each group came up with unique answers, but the direction was similar among all groups. Everyone appreciated this new format, which included more discussion and dialogue opposed to the typical one-way information sharing. Meeting notes will be available soon, and there are plans to convene another Policy Committee meeting this summer 2024.

Lampman said the Information Exchange was held December 13 and December 14, 2023, and covered a variety of topics, including Genetics, Phylogenetics, and Taxonomy; Restoration; Juvenile Entrainment, Dewatering, and Dredging Investigations; and Migration, Tagging, and Passage (as further described in Attachment D). There was also an Open Session and a Lamprey Rockstar Award Ceremony. Lampman reviewed topics relevant to the fish forums, which he highlighted in red in Attachment D. There were technical issues with the remote access, so recordings are not available for all presentations, but he will share the PDFs of the presentations once these become available.

G. Wells Dam Winter Maintenance Update (John Rohrback)

Fishway Maintenance and Fish Salvage Memorandum

John Rohrback recalled sharing last month information about the east fishway winter maintenance outage. Crews dewatered the upper ladder of the Wells Dam west fishway and conducted a fish rescue on December 13. Crews dewatered the lower ladder and collection gallery of the west fishway and conducted a fish rescue on December 18, 2023. A fish salvage memorandum from the west fishway was distributed to the Aquatic SWG on December 21, 2023. Maintenance was performed, and the west fishway was rewatered on January 8, 2024. Work included routine maintenance, refixing

plating[2] that had come loose, and installation of perforated plates at the lamprey trap locations (in Weir 40) in preparation to initiate a lamprey trapping program in summer 2024.

Ralph Lampman said in discussing with the PRFF, one difference at Priest Rapids Dam is the ability to close the orifice so fish must pass over the overflow weir. Can this be tested at Wells Dam, after testing the perforated plates? Rohrback said currently, there is no infrastructure in place to accomplish this, nor does Douglas PUD and the Aquatic SWG have Wells HCP Coordinating Committee approval to do this. He suggested seeing how this year goes with the perforated plates and perhaps revisiting this idea in the future. John Ferguson said, in his opinion, closing orifices will be a hard sell to the Wells HCP Coordinating Committee in terms of its impact on salmonid passage.

Lampman said that, regarding the fish salvage, it sounds like Columbia River Inter-Tribal Fish Commission is missing genetic data from recent years. Rohrback said he believes all recent tissue samples have been sent. Mariah Mayfield noted that this is the case except for 2023; Douglas PUD is still waiting for these samples from Washington Department of Fish and Wildlife. Ferguson said he understood there is not a lot of genetic differentiation in the Pacific Lamprey population. Are researchers finding something different? Lampman clarified that this dataset is primarily looking at parentage genetics to inform whether translocated fish are producing juveniles.

East Fishway Tour

Lampman shared on Microsoft Teams photographs from the Wells Dam east fishway tour (Attachment E), which Geris uploaded to the Aquatic SWG extranet site after the conference call on January 10, 2024.

Lampman noted the gap larger than 1 inch on a wall-oriented diffuser grating in the collection gallery (photographs 1 and 2 in Attachment E), which Rohrback indicated was repaired already. Lampman said there were more gaps larger than 1 inch in the floor diffuser gratings (photograph 3). There was an opening in the floor panel that looked like it once had a cover but is now just a hole in the collection gallery floor (photograph 4). He recommended locating and closing these gaps each year. There was another hole at the upper end of the collection gallery that seems to be a place Pacific Lamprey could easily access, and he is curious where this leads to (photographs 5 and 6).

Lampman said that at the collection gallery gate, there are bolts in the base of the gate where it pivots (photograph 7). He suggested covering these to not obstruct Pacific Lamprey passage. Ferguson said that typically these gates will be open. He asked whether Lampman is saying when Pacific Lamprey swim up along this edge, these bolts might affect their ability to attach and burst

[2] Installed in previous years to improve Pacific Lamprey passage through the fishways

through. Lampman said yes and asked whether these gates open to the interior. Rohrback said the doors swing out.

Lampman suggested redoing the zip ties in the lamprey trap to make sure lamprey cannot get out (slides 8, 9, and 10). He noted that the trap itself is set up nicely.

Lampman thought he recalled, during an acoustic telemetry study, detections of Pacific Lamprey in the vicinity of two outfalls at Wells Dam (photograph 11). He wonders whether the outfalls may be an access location for Pacific Lamprey. Rohrback said the shorter outfall is the plant drain, and the longer outfall is the return-to-river pipe where fish are returned to the river from the adult handling facility at Wells Hatchery. Acoustic receivers deployed at Wells Dam were able to detect Pacific Lamprey in the tailrace, but these detections could not say whether Pacific Lamprey were in the immediate vicinity of these outfalls because there were no receivers in this location. He is unaware of any evidence that Pacific Lamprey use these outfalls as an access point. Lampman confirmed that the return-to-river pipe does not run continuously. Rohrback said this is correct, and this is also the case with the plant drain because sometimes this water is diverted elsewhere. He has not heard of Pacific Lamprey swimming into and being detected inside the adult handling facility. Lampman asked whether the outfalls have ever been screened. Rohrback said not that he is aware of, and he does not believe this could be done due to potential build-up of aquatic plant material on the screens that could clog the outfalls. Lampman suggested considering larger mesh sizes, such as 3/4-inch. If there are a lot of detections of adults in this area, he will worry about these outfalls being problematic. Rohrback acknowledged the concern and said that Douglas PUD will monitor the outfalls. If there is evidence Pacific Lamprey in any numbers are swimming up to the outfalls, Douglas PUD will take action. Lampman said if this occurs at night, it will be a hard thing to monitor. Ferguson suggested installing game cameras to snap photographs. Mayfield said she thought of the same thing, but wondered whether high water velocity may trigger the cameras or whether anything can be seen at night. As for the next adult passage study, the Aquatic SWG may want to consider radio telemetry to monitor more fine-scale movements. Rohrback said Douglas PUD will consider options for monitoring whether Pacific Lamprey enter the plant drain and return-to-river pipe at Wells Dam and report back to the Aquatic SWG.

Andrew Gingerich said that, regarding the hole at the upper end of the collection gallery (photographs 5 and 6), this leads into the first weir of the fishway. From the area shown in photograph 5, there are two ways to get into Weir 1. First, by going up and over the end wall. Second, by going through one of two ports at the bottom left and right of the end wall (the left port is hidden in the shadow in photograph 5). He guessed that these bottom ports serve the following two purposes: 1) due to head pressure in Weir 1, the ports serve as an attraction jet to get fish through the collection gallery; and 2) during maintenance, these ports help drain the lower section of

the ladder. If Pacific Lamprey move through these ports, he would argue that this is a good thing because this gets fish into Weir 1. Lampman asked whether fish need to go through floor diffuser grating to get back into Weir 1. Gingerich said no, behind the end wall is Weir 1. Lampman said he thought the top and bottom areas are not connected behind the end wall. Gingerich said this is not his understanding, but he will review structural design specifications to verify the two ports at the bottom of the end wall within the collection gallery connect with Weir 1 at Wells Dam. *(Note: Gingerich confirmed these ports connect with Weir 1, in both the east and west fishways at Wells Dam, in an email provided after the conference call on January 10, 2024, which Geris distributed to the Aquatic SWG that same day.)*

The YN will provide the photographs of the Wells Dam east fishway tour that were discussed during today's Aquatic SWG conference call, and Anchor QEA will upload the photographs to the Aquatic SWG extranet site. *(Note: Lampman provided these photographs after the conference call on January 10, 2024, which Geris uploaded to the extranet site that same day.)*

III. Administration

A. Aquatic SWG Leadership (Andrew Gingerich)

Andrew Gingerich said there is a requirement in the Aquatic Settlement Agreement that as often as every 3 years the Aquatic SWG must evaluate and review the Chairperson. In mid-November 2023, he reached out to the Aquatic SWG Technical Representatives asking for a review of the process and position that John Ferguson has been supporting now for over 6 years. Gingerich heard back from every technical representative, and in general, there were all positive reviews of the position. He thanked the Aquatic SWG for the thoughtful review and responses. He thanked Ferguson, Kristi Geris, and the Anchor QEA team for the leadership and organization. Gingerich said this review gives Douglas PUD the opportunity to negotiate a renewed contract. He is currently working on a new 2-year agreement, which may include a transition period, understanding that the Aquatic SWG will need time to consider, review, and select a new Chairperson after this 2-year period.

Ferguson said on behalf of Geris, himself, and the Anchor QEA team, the positive reviews are appreciated, and he looks forward to supporting another contract. Ferguson said his current Chairperson contract ends in May 2024, and his general plans are to work through 2025. As he indicated to Gingerich, he is open to helping with the transition, as needed.

Gingerich noted that 2 years goes by fast, and the Aquatic SWG has some work to do to identify another Chairperson. In previous transitions, Aquatic SWG representatives brought forward names and worked together through an interview process towards selecting someone unanimously. He encouraged representatives to start thinking about who has the skills and capacity to support the Aquatic SWG 2 years from now.

Ralph Lampman asked Geris whether she might be interested in the Chairperson role. Geris said she would definitely be interested in continuing the support role and would need to consider filling the Chairperson role and thanked Lampman for asking. Ferguson noted that he and Douglas PUD had discussed this option where there may be a new Chairperson but Geris remains the support role.

B. Upcoming Meetings (John Ferguson)

The Aquatic SWG meeting on February 14, 2024, will be held by Microsoft Teams conference call.

Other upcoming meetings include March 13 and April 10, 2024 (conference call).

List of Attachments

Attachment A List of Attendees
Attachment B BY 2023 White Sturgeon Rearing Update
Attachment C PLCI Policy Committee 2023 Agenda
Attachment D PLCI 7th Annual Lamprey Information Exchange 2023 Agenda
Attachment E Wells Dam East Ladder Tour Photographs

Attachment A – Attendees

Name	Role	Organization
John Ferguson	Aquatic SWG Chairman	Anchor QEA, LLC
Kristi Geris	Administration/Technical Support	Anchor QEA, LLC
Andrew Gingerich	Aquatic SWG Technical Representative	Douglas PUD
Chas Kyger	Aquatic SWG Technical Alternate	Douglas PUD
John Rohrback	Aquatic SWG Technical Support	Douglas PUD
Mariah Mayfield	Aquatic SWG Technical Support	Douglas PUD
RD Nelle	Aquatic SWG Technical Representative	U.S. Fish and Wildlife Service
Stuart Fety	Aquatic SWG Technical Alternate	U.S. Fish and Wildlife Service
Patrick Verhey	Aquatic SWG Technical Representative	Washington Department of Fish and Wildlife
Breean Zimmerman	Aquatic SWG Technical Representative	Washington State Department of Ecology
Jason McLellan	Aquatic SWG Technical Representative	Confederated Tribes of the Colville Reservation
Ralph Lampman	Aquatic SWG Technical Representative	Yakama Nation

	11-Dec		9-Jan	
Tank	Population	Grams	Population	Grams
1	160	78.7	177	159.3
2	223	13.6	116	12.7
3	168	115.2	143	67.6
4	81	126.1	149	210.2
5	251	60.1	134	36.2
6	163	127.2	149	205.4
7	143	183.1	139	117.9
8	179	28.8	140	80.1
9	165	132.4	149	205.4
10	241	77.2	140	55.4
11	109	168.1	158	68.3
12	258	82.1	169	141.0
Mag 1	--	--	187	194.0
Mag 2	83	200.9	282	227.0
Total	2,224	94.0	2,232	137.5

PLCI 2023 POLICY COMMITTEE MEETING

When:

Tuesday 12 Dec. 2023
12:30 pm to 4:30 pm

Where:

Water Resources Education Center
4600 SE Columbia Way
Vancouver WA, 98661

Wednesday Night PLCI Partner Social:

Wednesday, 13 Dec. 2023
6 pm to 10 pm

Loowit Brewing Company
507 Columbia St,
Vancouver, WA 98660

WHAT'S NEXT FOR PACIFIC LAMPREY?

TUESDAY 12 DECEMBER 2023

In response to PLCI partner and supporter feedback, this year's Policy Committee will focus on small group discussions. We hope this format can provide a space for all PLCI partners and supporters to bring our collective knowledge and experience together to answer the question: *What's next for Pacific Lamprey?*

WELCOME & TRIBAL INVOCATION

12:30 pm to 1:00 pm

Welcome by Kelly Coates (Cow Creek Umpqua Tribe)

Invocation by Ashton Picard (Nez Perce Tribe Executive Committee, Chaplin & Vice Chair of the Natural Resource Sub-committee)

PLCI UPDATE & MEETING FORMAT DISCUSSION

1:00 pm to 1:30 pm

Joint presentation by PLCI State Co-Chair Ben Clemens and Coordinator Max Calloway

BREAKOUT GROUP DISCUSSION

1:30 pm to 3:00 pm

THREE 25-MINUTE SESSIONS (TOPICS ON PAGE 2)

GROUP REPORT OUT AND COMMON THEME IDENTIFICATION

3:15 pm to 4:30 pm

Facilitated by Kelly Coates (Cow Creek Umpqua Tribe)

BREAKOUT GROUP DISCUSSION TOPICS

& GUIDING QUESTIONS / THOUGHTS

NOTE: *Guiding questions should not be interpreted as putting any partners "on-the-spot", or as a request for detailed accounting of partner organizations' past efforts. Instead, these questions are intended to help guide or jumpstart our discussion to help us collectively understand where we came from, are now, and where we would like to see Pacific Lamprey in the future with as much specificity as possible.*

1. KEY THREATS
- What progress has been made in addressing threats?
- What threats unify large areas and/or large numbers of partners?
- What threats require more focus and what barriers do we think stand in the way?
2. COMMUNICATION / ADVOCACY
- How are we getting the word out about Lamprey?
- How can we more effectively advocate for Lamprey in Salmon spaces?
- Are there untapped, easily accessible venues we are not using / aware of as an entity and as a whole?
3. FUNDING
- How are partners funding Lamprey work?
- What potential funding resources are on the horizon as an entity and as a whole?
- What would it take to create a large, dedicated funding source for Pacific Lamprey (in the style of the Pacific Coastal Salmon Recovery Fund)?

NATIONAL FISH HABITAT PARTNERSHIP

PLCI is one of 20 nationally recognized fish habitat partnerships in the United States. Through its work, PLCI seeks to advance its own goals, and those of the National Fish Habitat Partnership (NFHP) which are to protect, restore, and enhance the nation's fish and aquatic communities through partnerships that foster fish habitat conservation and improve quality of life for all Americans.

Learn more about the work of NFHP and the other Fish Habitat Partnerships at www.fishhabitat.org

7TH ANNUAL LAMPREY INFORMATION EXCHANGE

When:

Wednesday 13 Dec. 2023
9 am to 4 pm

Thursday 14 December 2023
9 am to 1 pm

Where:

Water Resources Education Center
4600 SE Columbia Way
Vancouver WA, 98661

Wednesday Night PLCI Partner Social:

Wednesday, 13 Dec. 2023
6 pm to 10 pm

Loowit Brewing Company
507 Columbia St,
Vancouver, WA 98660

AGENDA

DAY 1: WEDS. 13 DEC. 2023

WELCOME & TRIBAL INVOCATION

9:00 a.m. to 9:30 a.m.

Invocation by Kelly Coates (Cow Creek Umpqua Tribe)

TRIBAL KEYNOTE

9:30 to 10:15 a.m.

Introduction by Laurie Porter (CRITFC)

The Asuum ku Kisooyas (Pacific Lamprey), are resilient and are an important indicator species to their natural habitats and ecosystems. They continue to have an important role to the Plateau tribes of the N'chi Wana (Columbia River) ceremonies and provide subsistence food source. The Asuum have sustained our people for thousands of years and it is our responsibility to protect their habitat, migratory corridors, and distribution so our future generations will have the ability to fish for this important First Food.

Elaine Harvey (CRITFC)

BREAK: 10:15 A.M. TO 10:30 A.M.

GENETICS, PHYLOGENETICS & TAXONOMY

10:30 a.m. to 1200 p.m.

Facilitator: Christina Wang (USFWS)

GAINING AND LOSING LAMPETRA SPECIES DIVERSITY THROUGH PHYLOGENETIC ANALYSIS - IMPLICATIONS AND NEXT STEPS FOR RESEARCH AND MANAGEMENT

Kellie Carim (USFS)

Lampreys in California: Mitochondrial phylogenetic analysis reveals previously unrecognized diversity

Grace Auringer (UC Davis)

A 400k bright spot on the horizon for Pacific lamprey

Jon Hess (CRITFC)

Lunch: 12:00 p.m. to 12:50 p.m.

Lamprey Rockstar Award Ceremony

12:50 p.m. to 1:00 p.m.

Presented by Christina Wang (USFWS)

Restoration

1:00 p.m. to 2:30 p.m.

Facilitator: Julie Harris (USFWS)

Integrating Lampreys into habitat restoration

Amy Horstman (USFWS)

Lamprey use of salmonid focused habitat restoration projects

John Crandall (Methow Salmon Recovery Foundation)

Larval lamprey use of habitat restoration to a stage 0 condition

Logan Bodiford (USFS)

Lamprey in urban streams of Port Angeles, and recolonization of the Elwha River

Justin Stapleton (Lower Elwha Klallam Tribe)

Panel Discussion

Juvenile Entrainment, Dewatering, & Dredging Investigations (JEDDI)

2:30 p.m. to 4:00 p.m.

Facilitators: Marty Liedtke (USGS) & Joe Skalicky (USFWS)

Patterns in distribution and density of larval lampreys in the mainstem Columbia River

Monica Blanchard (WDFW / USFWS)

Pursuing creative methods to reduce entrainment for lamprey: Case study from testing Flow Velocity Enhancement System (FVES)

Tyler Beals (Yakama Nation Fisheries)

Pump screens: Do salmon screening criteria protect larval lampreys?

Danny Didricksen (WDFW)

Screening options to protect larval lamprey and an open call for large-scale salvage solutions

Joe Skalicky (USFWS)

Panel Discussion

Nearby Lodging:

Mention of these lodging options is not an endorsement. Other lodging options are available for review online.

Hilton Vancouver

301 W. 6th St, Vancouver, WA 98660

(855) 605-0316

Comfort Inn & Suites Vancouver Downtown

401 E 13th St, Vancouver, WA 98660

(360) 696-0411

Homewood Suites by Hilton Vancouver-Portland

701 SE Columbia Shores Blvd, Vancouver, WA 98661

(360) 750-1100

Hotel Indigo Vancouver Downtown

550 Waterfront Wy, Vancouver, WA 98660
(360) 816-0058

Holiday Inn Portland – Columbia Riverfront
909 N Hayden Island Dr, Portland, OR 97217
(503) 283-4466

Oxford Suites Portland – Jantzen Beach
12226 N Jantzen Dr, Portland, OR 97217
(503) 283-3030

Holiday Inn Express & Suites Portland – Jantzen Beach
2300 N Hayden Island Dr, Portland, OR 97217
(503) 283-8000

DAY 2: THURS. 14 DEC. 2023

MIGRATION, TAGGING & PASSAGE

9:00 a.m. to 10:30 a.m.

Facilitators: Ben Clemens (ODFW) & Ralph Lampman (Yakama Nation Fisheries)

INVESTIGATIONS OF SEAWARD MIGRATION AND SURVIVAL OF JUVENILE SEA LAMPREY USING ELAT, A MICRO ACOUSTIC TRANSMITTER

Michael Wagner (Michigan State University) [Recorded Presentation & Remote Q&A]

SWIMMING A FINE LINE: HOW MIGRATING ADULT SEA LAMPREY NAVIGATE THROUGH COMPLEX AND RISKY HABITATS

Kandace Griffin (Michigan State University) [Recorded Presentation & Remote Q&A]

AN OPEN-SOURCE PACIFIC LAMPREY LIFE-CYCLE MODELING TOOL: WHAT DOES IT LOOK LIKE AND WHAT CAN WE LEARN FROM IT?

Dylan Gomes (USGS)

PANEL DISCUSSION

OPEN SESSION

10:30 a.m. to 12:30 p.m.

Facilitators: Jen Poirier & Julie Harris (USFWS)

MY TRANSFORMATION INTO A LAMPREY ADVOCATE: WRITING THE 2022 PACIFIC LAMPREY ASSESSMENT AS A USFWS AND MANRRS INTERN

Mee-ya Monneedy (M.S. Student, Fisheries Science at OSU)

FINDING PACIFIC LAMPREY: USING eDNA TO MAP SEASONAL PRESENCE IN THE MAD RIVER.

Maddy Rifka Brunt (Mattole Salmon Group/Yurok Tribe)

WILL WARMING WINTER TEMPERATURE RESULTING FROM CLIMATE CHANGE INFLUENCE LARVAL METAMORPHOSIS IN PACIFIC LAMPREY?

Will Simpson (USFWS)

NATAL ORIGINS OF PACIFIC LAMPREY (*ENTOSPHENUS TRIDENTATUS*)

Jessica Miller (OSU)

ORGANOHALOGENATED CONTAMINANTS IN MULTIPLE LIFE STAGES OF THE PACIFIC LAMPREY (*ENTOSPHENUS TRIDENTATUS*)

Casie Smith (USGS, Oregon Water Science Center)

NATIONAL FISH HABITAT PARTNERSHIP

PLCI is one of 20 nationally recognized fish habitat partnerships in the United States. Through its work, PLCI seeks to advance its own goals, and those of the National Fish Habitat Partnership (NFHP) which are to protect, restore, and enhance the nation's fish and aquatic communities through partnerships that foster fish habitat conservation and improve quality of life for all Americans.

Learn more about the work of NFHP and the other Fish Habitat Partnerships at www.fishhabitat.org

LAMPREY ROCKSTAR AWARDS

TO RECOGNIZE & COMMEND EXCEPTIONAL EFFORTS IN SUPPORT OF LAMPREYS

The Lamprey Rockstar Awards are broken into three categories with three winners picked annually by the Info Exchange Planning Committee and announced at the Info Exchange.
Award recipients receive a commemorative rock, hand-painted by none other than PLCI's Monica Blanchard and a lifetime place in the Lamprey Hall of Fame.

LAMPREY HUB ROCKSTARS

Awarded to one individual and one team whose main work responsibilities (the "hub" of their work) are focused on lamprey conservation. Award recipients go above and beyond to make contributions to science, management and/or education.

LAMPREY SPOKE ROCKSTAR

Awarded to an individual who does NOT work on lamprey conservation as a primary activity but advocates for, educates others about, and focuses on lamprey conservation outside of their everyday work responsibilities or in their personal time.

Know a Rockstar?

NOMINATE ONE TODAY!

Candidates can be nominated by the public online any time before November 27, 2023. The Info Exchange Planning Committee will meet and select award recipients ahead of the Info Exchange.

Winning a Rockstar award is a "once-in-a-lifetime" event. Past award winners are never eligible for the same category again but can be nominated for other categories they have not won.

Please check the past winners (listed on this page) before submitting nominations.

CLICK HERE TO SUBMIT NOMINATIONS BEFORE NOVEMBER 27, 2023

LAMPREY HALL OF FAME

2022 WINNERS:

Individual Hub Rockstar: Mary Moser

Hub Team Rockstar: Yakama Nation (feat. Ralph Lampna, Tyler Beals, & Daavey Lumley)
Spoke Rockstar: Angie Haners WDFW

STANLEY
ft
in
25ft
1
2
3
4

25ft
ft
in
2
3
4
STANLEY

STANLEY
2
3
4
5
6

FINAL

Conference Call Minutes

Aquatic Settlement Work Group

To: Aquatic SWG Parties Date: March 13, 2024

From: John Ferguson, Chair, Anchor QEA

Re: Final Minutes of the February 14, 2024, Aquatic SWG Conference Call

The Aquatic Settlement Work Group (SWG) met by conference call on Wednesday, February 14, 2024, from 10:00 a.m. to 12:00 p.m. Attendees are listed in Attachment A of these conference call minutes.

Summary of Action Items

1. The Yakama Nation (YN) will ask Pacific Northwest National Laboratory (PNNL) about possibly presenting results from their 2023 juvenile Pacific Lamprey passage behavior and survival study during a joint meeting of the Aquatic SWG, Rocky Reach Fish Forum (RRFF), and Priest Rapids Fish Forum (PRFF) this spring, 2024 (Item I-C). *(Note: this presentation is tentatively scheduled for June 5, 2024.)*
2. Douglas PUD will provide additional information about the operation of the return-to-river pipe at Wells Dam, including photographs of inside the Adult Handling Facility where the pipe connects to the sorting table and approximate dates and hours of when flush water might be running through the pipe (Item I-C). *(Note: Mariah Mayfield provided this information on February 21, 2024, which Kristi Geris distributed to the Aquatic SWG that same day.)*
3. Douglas PUD will contact the Washington Department of Fish and Wildlife (WDFW) genetics laboratory regarding *Bull Trout Movement and Life History Investigation 2022–2023* (2022–2023 Bull Trout Study Report), *Appendix C. Genetic Analysis for Bull Trout Prepared by Washington Department of Fish and Wildlife Dated June 2023*, notably for clarification about methods used and populations considered in the genetic analysis (Item II-C).
4. Douglas PUD will ask Grant PUD for information about lamprey trap operations at Priest Rapids Dam, including photographs of how the orifices are configured when the traps are operated (Item II-E). *(Note: Mariah Mayfield provided this information on February 21, 2024, which Kristi Geris distributed to the Aquatic SWG that same day.)*
5. Douglas PUD will consult the YN about lamprey trap operations for implementation at Wells Dam in 2024, including possibly collecting genetic fin clips and release location for fish collected in the traps, for further discussion with the Aquatic SWG (Item II-E).
6. The Aquatic SWG meeting on March 13, 2024, will be held by conference call (Item III-A).

Summary of Decisions

1. Aquatic SWG representatives present approved the *2024 Total Dissolved Gas Abatement Plan and appended Wells Bypass Operating Plan* (2024 GAP/BOP). The Confederated Tribes of the Colville Reservation (CTCR) approved the plan via email prior to the Aquatic SWG conference call on February 14, 2024 (Item II-A).
2. Aquatic SWG representatives present approved the *2023 Annual Report Total Dissolved Gas Abatement Plan* (2023 TDG Report). The CTCR approved the report via email prior to the Aquatic SWG conference call on February 14, 2024 (Item II-B).
3. Aquatic SWG representatives present approved the 2022–2023 Bull Trout Study Report, as revised, including *Appendix A. FERC Order Granting Variance from Radio Telemetry Study Pursuant to Bull Trout Stranding, Entrapment, and Take Study Plan and Article 402 Issued October 12, 2021*; *Appendix B. 2022–2023 Bull Trout Detection History Plots of Individual Study Fish*; and *Appendix C. Genetic Analysis for Bull Trout Prepared by Washington Department of Fish and Wildlife Dated June 2023*. The CTCR approved the report via email prior to the Aquatic SWG conference call on February 14, 2024 (Item II-C).

Agreements

1. Aquatic SWG representatives present agreed to Douglas PUD's proposal to use new sampling methods, fyke nets and hoop nets, for the 2024 Resident Fish Assemblage Study, so Douglas PUD can move forward with purchasing gear for implementation this spring 2024 (Item II-F).

Review Items

1. The draft *Total Dissolved Gas Water Quality Attainment Plan Year 10 Report* (Water Quality Attainment Plan 10-Year Report) was distributed to the Aquatic SWG by Kristi Geris on November 14, 2023, and is available for review with edits and comments due to Mariah Mayfield.
2. The draft 2024 Resident Fish Assemblage Study Plan was distributed to the Aquatic SWG by Kristi Geris on January 29, and was available for a 30-day review with edits and comments due to Chas Kyger by February 28. Douglas PUD will request approval of the draft plan during the Aquatic SWG conference call on March 13, 2024 (Item II-F).
3. The draft *2024 Aquatic Settlement Agreement and Workgroup Action Plan* (2024 ASA Action Plan) was distributed to the Aquatic SWG by Kristi Geris on February 13, and is available for a 30-day review with edits and comments due to Andrew Gingerich by March 12. Douglas PUD will request approval of the draft plan during the Aquatic SWG conference call on March 13, 2024 (Item II-H).

4. The draft report, *Wells Dam Adult Lamprey Approach and Passage Study, 2022-23* (2022-2023 Adult Pacific Lamprey Approach and Passage Study Report), was distributed to the Aquatic SWG by Kristi Geris on March 4, and is available for a 30-day review with edits and comments due to Mariah Mayfield by April 5. Douglas PUD will request approval of the draft report during the Aquatic SWG conference call on April 10, 2024 (Item II-D).
5. The draft *Annual Report Calendar Year 2023 Activities Under the Aquatic Settlement Agreement* (2023 ASA Annual Report) and appended draft *2023 Annual Report White Sturgeon Management Plan* (2023 WSMP Annual Report), draft *2023 Bull Trout Management Plan and Incidental Take Annual Report* (2023 BTMP and ITS Annual Report), draft *2023 Annual Report Water Quality Management Plan* (2023 WQMP Annual Report) and appended draft 2023 Water Temperature Annual Report, draft *Pacific Lamprey Management Plan 2023 Annual Report* (2023 PLMP Annual Report), draft *Aquatic Nuisance Species Management Plan 2023 Annual Report* (2023 ANSMP Annual Report), and draft *Resident Fish Management Plan 2023 Annual Report* (2023 RFMP Annual Report) were distributed to the Aquatic SWG by Kristi Geris on March 8, and are available for a 45-day review with edits and comments due to Geris and Douglas PUD by April 22. Douglas PUD will request approval of the draft reports during the Aquatic SWG conference call on May 8, 2024.

Documents Finalized

1. The final 2022–2023 Bull Trout Study Report, as revised, including Appendices A, B, and C, were distributed to the Aquatic SWG by Kristi Geris following the Aquatic SWG conference call on February 14. The final report was filed with the Federal Energy Regulatory Commission (FERC) on March 7, 2024 (Item II-C).
2. The final 2023 TDG Report was distributed to the Aquatic SWG by Kristi Geris on February 22, 2024 (Item II-B).
3. The final 2024 GAP/BOP, as approved by the Aquatic SWG on February 14, and the Wells HCP Coordinating Committee on February 27, and filed with FERC on February 28, was distributed to the Aquatic SWG by Kristi Geris on February 29, 2024 (Item II-A).

I. Welcome

A. Review Agenda (John Ferguson)

John Ferguson welcomed the Aquatic SWG members (Attachment A) and reviewed the agenda. Ferguson asked for any additions or changes to the agenda. Douglas PUD added draft 2024 ASA Action Plan.

B. Meeting Minutes Approval (John Ferguson)

The revised draft January 10, 2024, conference call minutes were reviewed. Kristi Geris said the only edits received were from Douglas PUD and were minor clarifications that were incorporated into the revised minutes. Geris also added distribution of the draft 2024 ASA Action Plan. Aquatic SWG representatives present approved the January 10, 2024, conference call minutes, as revised. The CTCR approved the revised minutes via email prior to the Aquatic SWG conference call on February 14, 2024.

C. Review of Action Items (John Ferguson)

Action items from the Aquatic SWG conference call on January 10, 2024, are as follows *(Note: The following italicized item numbers correspond to agenda items from the January 10, 2024, meeting)*:

1. *The YN will ask PNNL about possibly presenting results from their 2023 juvenile Pacific Lamprey passage behavior and survival study during a joint meeting of the Aquatic SWG, RRFF, and PRFF this spring, 2024 (Item II-E).*
   Ralph Lampman said he sent this request to PNNL, which indicated that the final report may be ready by May. Lampman asked whether June might be better for a presentation of the data, and he is awaiting a response. This action item will be carried forward.
2. *Douglas PUD will consider options for monitoring whether Pacific Lamprey enter the plant drain and return-to-river pipe at Wells Dam and report back to the Aquatic SWG (Item II-G).*
   Mariah Mayfield shared on Microsoft Teams the following photograph, which was shared during last month's meeting.

Mayfield recalled that the outfall on the left is the return-to-river pipe, and the outfall on the right is the plant drain. Last month, the Aquatic SWG discussed ideas for monitoring whether Pacific Lamprey attempt to ascend these outfalls. After internal discussion, Douglas PUD does not believe any changes are needed to the return-to-river pipe, because water is only flowing through this pipe when staff are inside the Adult Handling Facility, where the pipe connects, so this pipe is already monitored. For the plant drain, it appears that Pacific Lamprey might be able to ascend this pipe when the tailrace is high enough. Therefore, Douglas PUD is proposing to install perforated plating, similar to what is installed for lamprey trap operations at Wells Dam, so Pacific Lamprey cannot attach and ascend the plant drain. This is preferable to installing a vertical screen that can get clogged with aquatic vegetation. John Ferguson asked whether the proposal is to line the bottom half of the open pipe, and Mayfield said yes. Ralph Lampman asked when the return-to-river pipe is being used. John Rohrback said this pipe is used when staff are working-up fish, so July and August. Lampman agreed that perforated plating for the plant drain might be a good idea, and he asked whether the tailwater reaches the top of the pipe during high flow. Mayfield said she does not believe so, based on the high-water mark on the rocks in the photograph. Chas Kyger added that the plant drain is designed so that it does not backwater into the plant. Mayfield said the plating can extend above the high-water mark just in case. Lampman suggested covering the entire length of the plant drain. He also suggested doing

something to the return-to-river pipe, considering that August is the peak Pacific Lamprey run. Rohrback also clarified that flush water might be left on in between handling events, so water might be flowing through this pipe when staff are not inside the Adult Handling Facility. That said, if Pacific Lamprey were to ascend this pipe, the fish would appear in the Adult Handling Facility, and to date, no lamprey have been observed in the facility. Lampman asked whether there are screens in this pipe or whether perforated plating can be installed like the plant drain. Rohrback said there are no screens, and no plating can be installed because salmonids would need to pass over the plating to return to the river, which is a nonstarter. Kyger further explained that this pipe connects to a stainless-steel sorting table inside the Adult Handling Facility, so if lamprey were to ascend the pipe, they would land on this table. A water supply is located at the end of this table and is turned on to flush fish down the table, down the pipe, and into the river. Lampman said Pacific Lamprey are nocturnal fish, so it is possible that staff would not see whether a fish ascended the pipe. Rohrback clarified that staff would find the fish on the sorting table. Mayfield said worst case scenario, a Pacific Lamprey ascends the pipe, realizes there is not enough water on the table, and descends the pipe back to the river, or it might suction to the table and staff find the fish in the morning. Lampman said his concern is Pacific Lamprey wasting a lot of time trying to ascend the pipe or holding inside the pipe. He said photographs of the area might be helpful. Mayfield said she can also look further into when flush water might be running through the pipe. Ferguson summarized that the plant drain will be lined with perforated plating and the return-to-river pipe will be left as is, but Douglas PUD will provide additional information about the operation of this pipe, including photographs of inside the Adult Handling Facility where the pipe connects to the sorting table and approximate dates and hours of when flush water might be running through the pipe. Lampman also suggested considering 1/8-inch perforated plating for the plant drain. *(Note: Mayfield provided this information on February 21, 2024, which Kristi Geris distributed to the Aquatic SWG that same day.)*

3. *Douglas PUD will review structural design specifications to verify the two ports at the bottom of the end wall within the collection gallery connect with Weir 1 at Wells Dam (Item II-G).*
   Andrew Gingerich confirmed these ports connect with Weir 1, in both the east and west fishways at Wells Dam, in an email provided after the conference call on January 10, 2024, which Kristi Geris distributed to the Aquatic SWG that same day.
4. *The YN will provide the photographs of the Wells Dam east fishway tour that were discussed during today's Aquatic SWG conference call, and Anchor QEA will upload the photographs to the Aquatic SWG extranet site (Item II-G).*
   Ralph Lampman provided these photographs after the conference call on January 10, 2024, which Kristi Geris uploaded to the extranet site that same day.

II. Summary of Discussions

A. DECISION: 2024 GAP/BOP (Mariah Mayfield)

The draft 2024 GAP/BOP was distributed to the Aquatic SWG by Kristi Geris on January 9, 2024, and was available for a 30-day review with edits and comments due to Mariah Mayfield by February 10, 2024. Mayfield said no comments were received from the Aquatic SWG nor the Wells HCP Coordinating Committee. The Wells HCP Coordinating Committee will convene on February 27, 2024, and will vote on the draft plan at that time.

Ralph Lampman asked why it was, on page 24, under "Resident Fish and Other Native Fishes," third paragraph starting with "Regardless of TDG values in the Wells tailrace," that lamprey not were not included. Mayfield said this was primarily due to the method of collection in the tailrace, which is via boat electroshocking, although last year, one lamprey was collected via this method. John Ferguson asked whether lamprey can be added to this paragraph. Mayfield said she prefers not to, but Table 3 in the annual TDG Report summarizes all species collected via electrofishing in the Wells Dam tailrace.

Aquatic SWG representatives present approved the 2024 GAP/BOP. The CTCR approved the plan via email prior to the Aquatic SWG conference call on February 14, 2024.

The final 2024 GAP/BOP, as approved by the Aquatic SWG on February 14, and the Wells HCP Coordinating Committee on February 27, and filed with FERC on February 28, 2024, was distributed to the Aquatic SWG by Geris on February 29, 2024.

B. DECISION: 2023 TDG Report (Mariah Mayfield)

The draft 2023 TDG Report was distributed to the Aquatic SWG by Kristi Geris on January 9, 2024, and was available for a 30-day review with edits and comments due to Mariah Mayfield by February 10, 2024. Mayfield said no comments were received from the Aquatic SWG.

Breean Zimmerman said Washington State Department of Ecology has no comments but appreciates the discussion about the TDG exceedance outliers potentially due to aquatic respiration, mention of the Water Quality Attainment Plan 10-Year Report is good to have in this report, and TDG compliance, in general, was very good.

Aquatic SWG representatives present approved the 2023 TDG Report. The CTCR approved the report via email prior to the Aquatic SWG conference call on February 14, 2024.

The final 2023 TDG Report was distributed to the Aquatic SWG by Geris on February 22, 2024.

C. DECISION: 2022-2023 Bull Trout Study Report (Chas Kyger)

The draft 2022–2023 Bull Trout Study Report, including *Appendix A. FERC Order Granting Variance from Radio Telemetry Study Pursuant to Bull Trout Stranding, Entrapment, and Take Study Plan and Article 402 Issued October 12, 2021*; *Appendix B. 2022–2023 Bull Trout Detection History Plots of Individual Study Fish*; and *Appendix C. Genetic Analysis for Bull Trout Prepared by Washington Department of Fish and Wildlife Dated June 2023*, were distributed to the Aquatic SWG by Kristi Geris on December 13, 2023, and were available for a 45-day review with edits and comments due to Chas Kyger by January 26, 2024. Kyger said the only comments received were from U.S. Fish and Wildlife Service (USFWS). A revised 2022–2023 Bull Trout Study Report was distributed on February 12, 2024, including a clean version and version with tracked changes. This revised report will also receive a tech edit before it is finalized.

Kyger said revisions to address USFWS comments largely entailed adding more information about the justification for using passive integrated transponder (PIT) tags and clarifying that this study is not a passage evaluation. Rather, it looked at patterns of seasonal movements and found similar results as what has been observed at the Wells Dam count windows and in previous studies.

RD Nelle said USFWS appreciates Douglas PUD's edits to the text. He would like to further discuss Section 4.5, last paragraph, where it says, "no significant changes in Bull Trout interactions." He appreciates the edits to Figure 6,[1] but he does not agree with the statement in Section 4.5 without a statistical test. Kyger said he did run a t-test, and it was highly significant. That is, the mean passage date in 2022 matched 2023, and these both matched the 2010 to 2021 results. However, he is unsure whether a t-test is the correct test to use, which is why he did not include these results. John Ferguson said the visual interpretation of Figure 6 alone shows the datasets are similar. Nelle suggested either editing the statement or finding the correct statistical test and inserting the results into the report. The Aquatic SWG made the following edits:

> While the results of the 2022-2023 study cannot be used to reassess passage and survival metrics directly, based on visual interpretation of the distribution of passage dates at Wells Dam (Figure 6), the patterns of movements and behaviors observed in ~~PIT tagged~~ Bull Trout at Wells Dam in 2022-2023 were similar to observations in previous studies.~~do not indicate significant changes in the way they interact~~timing of Bull Trout interactions ~~with Wells Dam and the Twisp River Weir compared to observations in previous studies~~. However, future studies should employ active tag technology (i.e., radio telemetry) to verify that Bull Trout passage and survival success continues to exceed the standards identified in the BTMP.

[1] In the final 2022–2023 Bull Trout Study Report, Figure 6 was edited to Figure 7 (distributed following the Aquatic SWG conference call on February 14, 2024).

Nelle said Section 1.1 indicates there have been "no significant structural modifications to the Wells Project fishways since 2016." He asked why the modifications for Pacific Lamprey passage are not listed here. Kyger said it was because these modifications were not "significant." He recalled that when Douglas PUD proposed these changes, it was communicated that these changes were improvements to the fishways, the fishways would still adhere to the design specifications, and these were not significant structural modifications that would require approval by FERC. He suggested adding a sentence about the plating, but noting these changes were not significant modifications. Nelle said he is unsure whether these modifications would have impacts to Bull Trout, but if the Wells HCP Coordinating Committee approved these modifications for salmonids, he supposes there would be no effect on Bull Trout. Kyger agreed. The Aquatic SWG made the following edits:

1.1 Wells Project Upstream and Downstream Fish Passage

In 2022 and 2023 the Wells Project fishways and downstream bypass system were operated in a manner consistent with the Wells Habitat Conservation Plan and the Section 18 Fishway Prescription to provide upstream and downstream fish passage. ~~No significant structural or operational modifications to the Wells Project fishways have occurred since the most recent Bull Trout passage and survival evaluation in 2016.~~Plating installed over diffuser gratings to address gaps and Pacific Lamprey passage considerations were reviewed and approved by the HCP-CC as having no substantial effects on the hydraulics of the fishways and salmon and steelhead passage.

Nelle said he appreciates Douglas PUD's willingness to make these additional revisions. Stuart Fety agreed, and said the edits and revisions made to the report largely addressed his comments.

Aquatic SWG representatives present approved the 2022–2023 Bull Trout Study Report, as revised, including Appendices A, B, and C. The CTCR approved the report via email prior to the Aquatic SWG conference call on February 14, 2024.

Nelle asked whether it might be possible to receive a presentation on the 2022–2023 Bull Trout Study Report's *Appendix C. Genetic Analysis for Bull Trout Prepared by Washington Department of Fish and Wildlife Dated June 2023*. Kyger said he could present the results, but if Nelle is interested in the methods, he would need to reach out to the WDFW genetics laboratory. Nelle said he is interested in whether the baseline samples were resampled or whether a model was used to recreate the baseline. Kyger said Appendix C cites Bohling et al. (2021),[2] which includes case studies on methods used for Bull Trout in the Lower Clark Fork River. He guessed that WDFW used a similar

[2] Bohling J., J. Von Bargen, M. Piteo, A. Louden, M. Small, T. Delamos, R. Kovach, 2021. "Developing a Standardized Single Nucleotide Polymorphism Panel for Rangewide Genetic Monitoring of Bull Trout." *NAJFM* 4:1920–1931.

process, but he is unsure about this. John Ferguson suggested reaching out to the WDFW genetics laboratory. Kyger said the USFWS Abernathy Fish Technology Center is the lead laboratory on this work. Nelle said he spoke with this laboratory, and as far as he knows, this laboratory has not rerun samples. Appendix C suggests that baseline samples were rerun, and he would like to know whether this is the case. He is also interested in which populations were included. Douglas PUD will contact the WDFW genetics laboratory regarding the 2022–2023 Bull Trout Study Report's *Appendix C. Genetic Analysis for Bull Trout Prepared by Washington Department of Fish and Wildlife Dated June 2023*, notably for clarification about methods used and populations considered in the genetic analysis.

The final 2022–2023 Bull Trout Study Report, as revised, including Appendices A, B, and C, was distributed to the Aquatic SWG by Geris following the Aquatic SWG conference call on February 14. The final report was filed with FERC on March 7, 2024.

D. Adult Pacific Lamprey Approach and Passage Study Report (Mariah Mayfield)

Mariah Mayfield said that last week, Dave Robichaud (LGL Limited) provided a draft report to Douglas PUD. Douglas PUD is now working through edits and plans to provide the draft report for an Aquatic SWG 30-day review by March 1, 2024. Douglas PUD will also provide a short presentation of results during the Aquatic SWG conference call on March 13, 2024.

Ralph Lampman asked whether the plan is to continue translocation this summer. John Ferguson said yes, per the current SOA,[3] which calls for translocation from 2023 to 2024, and the next study in 2025.

The draft 2022-2023 Adult Pacific Lamprey Approach and Passage Study Report was distributed to the Aquatic SWG by Kristi Geris on March 4, and is available for a 30-day review with edits and comments due to Mayfield by April 5. Douglas PUD will request approval of the draft report during the Aquatic SWG conference call on April 10, 2024.

E. Lamprey Trap Operations (Mariah Mayfield)

Mariah Mayfield recalled that discussions about lamprey trap operations at Wells Dam have been ongoing within the Aquatic SWG, as well as within the Wells HCP Coordinating Committee regarding impacts to salmon. Late last year, Douglas PUD presented to the Wells HCP Coordinating Committee potential trap operations for 2024. The Committee approved[4] nighttime trapping in both fish ladders from August 1 to September 30. Trapping will occur up to 4 nights per week. Mayfield recalled

[3] SOA titled *To Translocate Adult Pacific Lamprey from Priest Rapids Dam to Areas Within or Upstream of the Wells Project 2023–2024*, approved by the Aquatic SWG on June 14, 2023, and distributed on June 15, 2023.

[4] The Wells HCP Coordinating Committee approved the activities described in the memorandum "Wells Dam Lamprey Trapping and Fishway Modifications 2024" on November 28, 2023.

missing the peak Pacific Lamprey migration last year, so this year's proposal included expanded operations,[5] including increased hours. There is nothing for the Aquatic SWG to approve yet, but Douglas PUD is working on these details and will provide a more developed plan for Aquatic SWG approval later this year. Recall, these lamprey trap operations are testing whether study fish can be collected at Wells Dam or whether Douglas PUD needs to continue collecting study fish at Priest Rapids Dam.

Ralph Lampman asked whether 4 nights per week is due to staffing logistics. Mayfield said yes, staff will set the traps each Sunday night and check the traps over the next 4 mornings. Lampman asked about the increased hours. Mayfield said last year, trapping occurred from 2100 to 0700 hours. This year, the Wells HCP Coordinating Committee approved trapping from 2100 to 0800 hours. The increased hours provide time for qualified staff to transit from East Wenatchee to the dam, to work-up and PIT-tag the fish, if this is what the Aquatic SWG chooses to do.

RD Nelle asked how many traps will be deployed. Mayfield said each ladder has two traps on the same weir.

Lampman said Grant PUD closes the floor orifice, so all fish have to go up and over the weir. If Grant PUD can get this approved at Priest Rapids Dam, can Douglas PUD get this approved at Wells Dam? Mayfield said she plans to request information from Grant PUD explaining their trap operations. For Wells Dam, she believes closing the floor orifices will be a hard sell and would need solid rationale. Douglas PUD hopes the perforated plates, trapping in both ladders, and extended trapping days and hours will be enough. She guessed the weirs at Priest Rapids Dam are set up differently, and she is unsure how Grant PUD obtained permission to close the orifices. Lampman said he also requested diagrams from Grant PUD but has not yet received any. Mayfield said Douglas PUD will ask Grant PUD for information about lamprey trap operations at Priest Rapids Dam, including photographs of how the orifices are configured when the traps are operated. *(Note: Mayfield provided this information on February 21, 2024, which Kristi Geris distributed to the Aquatic SWG that same day.)*

John Ferguson recalled that the Wells HCP Coordinating Committee approved the proposed trapping in 2024, contingent on receiving weekly in-season updates and summary updates during the HCP Coordinating Committees meetings in August and September 2024. Regarding closing the orifices, that would result in a change to the hydraulic conditions through the weir.

Chas Kyger said he believes there are two floor orifices at Priest Rapids Dam, and Grant PUD only closes the one closest to the edge of the fishway wall, thinking that lamprey tend to prefer edges.

[5] In 2023, trapping occurred in the east ladder only, from August 28 to September 15.

Lampman suggested, if the floor orifice cannot be closed, installing a 1-inch-tall lip along the bottom to deter lamprey from passing through. Mayfield said this is what Douglas PUD is hoping the perforated plate will do. Ferguson asked whether Lampman is suggesting to install a lip on the downstream end of the weir, across the bottom of the orifice to encourage lamprey to swim vertically over the weir. Lampman said yes, and lamprey will likely go up along the edges, and the traps cover the edges, so the lamprey will likely end up in the trap. Ferguson said installing a lip will still require Wells HCP Coordinating Committee approval. Mayfield said this will also require dewatering the fishways, so even if approved, this is a no-go this year. She suggested revisiting this idea for next year.

Lampman asked what happens to the Pacific Lamprey after the individuals are trapped. Mayfield said last year, fish were enumerated and released back into the fishway, consistent with Grant PUD trapping protocols. This year, if anything additional is planned, it will be described in a study plan for Aquatic SWG approval. Lampman asked about Grant PUD releasing Pacific Lamprey back into the fishway. Mayfield explained that Douglas PUD has a requirement to collect x-number of fish, per the current SOA.[6] If excess fish are collected beyond this requirement, Grant PUD releases these fish back into the fishway. John Rohrback clarified that when Grant PUD is trapping for their program, all fish collected are retained for translocation.

Lampman asked, as Douglas PUD develops a plan, that it please consider releasing fish upstream of the dam to provide a better chance of migrating farther upstream and include collecting genetic fin clips. Mayfield said Douglas PUD will consult the YN about lamprey trap operations for implementation at Wells Dam in 2024, including possibly collecting genetic fin clips and release location for fish collected in the traps, for further discussion with the Aquatic SWG.

F. 2024 Resident Fish Assemblage Study Plan (Chas Kyger)

Chas Kyger said the draft 2024 Resident Fish Assemblage Study Plan was distributed to the Aquatic SWG by Kristi Geris on January 29, 2024, and is available for a 30-day review with edits and comments due by February 28, 2024. Douglas PUD will request approval of this draft plan during the Aquatic SWG conference call on March 13, 2024.

Kyger said that, while the comment period is still open, Douglas PUD hopes to obtain concurrence today on new sampling methods to move forward with purchasing gear. Douglas PUD is proposing to add fyke nets and hoop nets to target deepwater species, such as burbot and Northern Pikeminnow. For walleye, Jason McLellan suggested using walleye gillnets to decrease impacts to White Sturgeon. The CTCR use these gillnets in Lake Roosevelt and found that White Sturgeon can

[6] *To Translocate Adult Pacific Lamprey from Priest Rapids Dam to Areas Within or Upstream of the Wells Project 2023–2024.*

break through this monofilament to escape the nets. Douglas PUD is supportive of using these new methods or dropping the use all together if Aquatic SWG members have concerns.

John Ferguson asked when the gear is needed. Kyger said in past years, sampling was conducted in May and August. This year, Douglas PUD is proposing to start sampling in spring and continue through winter to be sure the effort is not missing any resident fish. The fyke nets and hoop nets (or baited traps) will start this spring and continue throughout the year, so concurrence on these new methods is what is needed now. The walleye gillnets do not start until late fall. The other methods, such as beach seining and electrofishing, are the same approved methods as in the past.

Ralph Lampman asked whether McLellan expressed any concern with the fyke nets or hoop nets. Kyger said no, these methods are low-impact and low-mortality because fish get trapped in the nets but can swim around. Lampman said that, regarding White Sturgeon, he defers to McLellan, and if McLellan had no concerns, neither does he. Lampman asked whether Table 2 in the draft study plan shows all sampling methods. Kyger said yes, except that trammel nets may be replaced with walleye gillnets.

Rd Nelle asked what the smallest size of fish the hoop nets can capture is. Kyger said hoop nets have an inner throat diameter of 25 centimeters, with 1/2-inch netting, and will be set in water deeper than 50 feet. Nelle asked whether smaller fish will be collected by beach seining and electrofishing. Kyger said yes, and the fyke nets could also collect smaller fish. He noted that fyke nets can also be effective in collecting out-migrating smolts, so this effort will avoid setting these nets in areas with a lot of smolts during the spring. Nelle said he knows Sand Rollers are not native to the area, but he is curious why these fish are not found in the area. Kyger said the species could have been extirpated from the area. Nelle said perhaps it has to do with the sampling methods. Kyger said this is one reason why Douglas PUD is considering new sampling methods.

Stuart Fety asked about incidental captures of Bull Trout during these efforts and whether would a Section 7 consultation be needed. Kyger said Douglas PUD has incidental take coverage for all Aquatic Settlement Agreement resource management plan (MP) activities. Fety asked whether the proposed methods for this study have been analyzed previously or whether the methods are covered under the take that is currently granted. Kyger said the Resident Fish MP does not identify specific methods. In the past, resident fish sampling and aquatic nuisance species monitoring have been conducted using various sampling techniques, and crews monitor for Bull Trout take and report it immediately. This language can be added to the study plan. Fety said he would also be interested in whether one monitoring method is catching more Bull Trout than others. Mariah Mayfield noted that past resident fish study results are available for download from the Aquatic SWG extranet site, but she does not recall any Bull Trout encounters during these efforts. Kyger said the only Bull Trout

encounter he recalls was during Northern Pike monitoring under the Aquatic Nuisance Species MP. When this happened, crews immediately stopped sampling, and USFWS was notified.

Patrick Verhey said WDFW is supportive of using fyke nets and hoop nets and is also supportive of replacing trammel nets with walleye gillnets. Lampman said the YN is also supportive of McLellan's recommendation for walleye gillnets. Ferguson said for now, he is hearing general support for fyke nets and hoops nets this spring. No objections were expressed.

Aquatic SWG representatives present agreed to Douglas PUD's proposal to use new sampling methods, fyke nets and hoop nets, for the 2024 Resident Fish Assemblage Study, so Douglas PUD can move forward with purchasing gear for implementation this spring 2024.

YN Lamprey Predation Study

Ralph Lampman said it is important to understand the walleye population. In the Lower Columbia River, walleye are detected at a high frequency. He can share a final report on predation of lamprey in the Lower Columbia and Yakima rivers. The YN plan to continue this study in 2024, in line with the acoustic telemetry study from McNary to John Day dams. The Columbia River Basin Restoration Initiative is adding more funding to restoration studies and activities, and the YN is looking into broadening its study to include samples from avian lethal take. Lampman asked whether it might also be possible to obtain samples from the Upper Columbia River, from efforts like the Northern Pikeminnow Removal Program. Chas Kyger said for this resident fish study, non-native predators will likely be euthanized, and he thinks Douglas PUD could send the YN the stomach contents of these fish. Lampman said the YN can also help with logistics and transfer of the samples. At this point, he is just inquiring about what might be available. He asked what species and numbers Douglas PUD expects to encounter. Kyger said this is hard to say. Sampling will occur throughout the entire year. Once this study plan is finalized, he can circle back to see which predator fish might be available to obtain diet samples from.

John Ferguson asked, if the focus of the study is on juvenile lamprey predation, can much be seen in these stomach samples or is everything largely digested? Lampman said this was a molecular study that looked for lamprey eDNA in predator fish. There was also a laboratory study to see what lamprey look like at various hours after consumption. Usually after 7 hours, it is hard to tell whether the stomach contents contain lamprey. With eDNA, lamprey can be detected up to 40 to 50 hours past consumption. For this to work, ethanol must be inserted into the mouth of the predator to help preserve the sample. In the Lower Columbia River, the YN is trying to coordinate with agencies conducting predation studies, so YN staff can pick up fish or be on the survey boat.

Mariah Mayfield asked whether the YN can provide Douglas PUD with a written request to incorporate into the draft 2024 Resident Fish Assemblage Study Plan. Lampman said at this stage, he

is just inquiring about possibilities. It would be helpful to know how many fish Douglas PUD will likely handle in terms of non-native invasive species. If the Columbia River Basin Restoration Initiative has a lot of funding, he would like to know how many samples he might be able to obtain. Kyger said, again, this is hard to say, but in past years most of these fish included Northern Pikeminnow and Smallmouth Bass, on the order of a couple hundred total, over the course of the study. Lampman asked whether these studies ever included avian lethal take. Mayfield said that as a part of relicensing, Douglas PUD did perform some culling of birds and found lamprey in stomach contents, but the sample size was low. She can provide this study report. Currently, there are no activities planned that involve culling birds. *(Note: Mayfield provided this predation study on juvenile lamprey,*[7] *which Geris distributed to the Aquatic SWG following the conference call on February 14, 2024.)*

G. Brood Year 2023 Wells White Sturgeon Rearing Update (Chas Kyger)

A brood year (BY) 2023 White Sturgeon Rearing Update (Attachment B) was distributed to the Aquatic SWG by Kristi Geris prior to the Aquatic SWG conference call on February 14, 2024. Chas Kyger said Jason McLellan reported via email that 157 BY 2023 wild larvae-original juvenile White Sturgeon originally caught in Lake Roosevelt are being transferred to Wells Hatchery today to make up for the shortfall in the Chelan PUD program. As for the Douglas PUD program, fish on station are already large, and there should be no issues reaching the size target at release. John Ferguson said, additionally, that McLellan noted via email that spontaneous autopolyploidy screening of the BY 2023 Chelan PUD program fish at Wells Hatchery is scheduled to start on March 4, 2024.

H. Draft 2024 ASA Action Plan (Chas Kyger)

The draft 2024 ASA Action Plan was distributed to the Aquatic SWG by Kristi Geris on February 13, 2024, and is available for a 30-day review with edits and comments due to Andrew Gingerich by March 12, 2024. Chas Kyger said this is a list of tasks planned for the calendar year, so everyone knows what is coming. This review is to make sure nothing is missing. Douglas PUD will request approval of the draft plan during the Aquatic SWG conference call on March 13, 2024.

John Ferguson asked whether there are any significant changes from last year. Kyger said most everything is business as usual, except the Resident Fish Assemblage Study and White Sturgeon Adult Passage Evaluation. Ferguson recalled that this plan is not a FERC requirement, and a similar plan is provided to the Wells HCP Coordinating Committee.

[7] Douglas PUD and LGL Limited, 2008. *Survival and Rates of Predation for Juvenile Pacific Lamprey Migrating Through The Wells Hydroelectric Project (Juvenile Lamprey Study).* September 2008.

III. Administration

A. Upcoming Meetings (John Ferguson)

The Aquatic SWG meeting on March 13, 2024, will be held by Microsoft Teams conference call.

Other upcoming meetings include April 10 and May 8, 2024 (conference call).

List of Attachments

Attachment A List of Attendees
Attachment B BY 2023 White Sturgeon Rearing Update

Attachment A – Attendees

Name	Role	Organization
John Ferguson	Aquatic SWG Chairman	Anchor QEA
Kristi Geris	Administration/Technical Support	Anchor QEA
Chas Kyger	Aquatic SWG Technical Alternate	Douglas PUD
John Rohrback	Aquatic SWG Technical Support	Douglas PUD
Mariah Mayfield	Aquatic SWG Technical Support	Douglas PUD
RD Nelle	Aquatic SWG Technical Representative	U.S. Fish and Wildlife Service
Stuart Fety	Aquatic SWG Technical Alternate	U.S. Fish and Wildlife Service
Patrick Verhey	Aquatic SWG Technical Representative	Washington Department of Fish and Wildlife
Laura Heironimus	Aquatic SWG Technical Alternate	Washington Department of Fish and Wildlife
Breean Zimmerman	Aquatic SWG Technical Representative	Washington State Department of Ecology
Ralph Lampman	Aquatic SWG Technical Representative	Yakama Nation

	9-Jan		14-Feb	
Tank	Population	Grams	Population	Grams
1	177	159.3	147	28.0
2	116	12.7	--	--
3	143	67.6	123	114.9
4	149	210.2	152	96.6
5	134	36.2	--	--
6	149	205.4	--	--
7	139	117.9	102	162.1
8	140	80.1	108	137.6
9	149	205.4	86	175.3
10	140	55.4	146	123.4
11	158	68.3	143	84.7
12	169	141.0	85	174.6
Mag 1	187	194.0	660	228.1
Mag 2	282	227.0	461	302.7
Total	2,232	137.5	2,213	187.3

FINAL

Conference Call Minutes

Aquatic Settlement Work Group

To: Aquatic SWG Parties Date: April 10, 2024

From: John Ferguson, Chair, Anchor QEA

Re: Final Minutes of the March 13, 2024, Aquatic SWG Conference Call

The Aquatic Settlement Work Group (SWG) met by conference call on Wednesday, March 13, 2024, from 10:00 a.m. to 11:30 a.m. Attendees are listed in Attachment A of these conference call minutes.

Summary of Action Items

1. Anchor QEA will contact Tracy Hillman (Rocky Reach Fish Forum [RRFF] and Priest Rapids Fish Forum [PRFF] Facilitator) to request the call-in information to attend Pacific Northwest National Laboratory (PNNL's) presentation of their 2023 juvenile Pacific Lamprey passage behavior and survival study during a joint meeting of the RRFF, PRFF, and Aquatic SWG on June 5, 2024, and the Yakama Nation (YN) will provide PNNL's presentation that was shared at the U.S. Army Corps of Engineers Anadromous Fish Evaluation Program (USACE AFEP) for distribution to the Aquatic SWG (Item I-C). *(Note: Kristi Geris contacted Hillman, who requested a follow-up reminder closer to June 5, when meeting logistics are confirmed. Ralph Lampman provided PNNL's presentations, which were distributed to the Aquatic SWG by Geris on April 8, 2024.)*
2. Douglas PUD will contact the Washington Department of Fish and Wildlife (WDFW) genetics laboratory regarding *Bull Trout Movement and Life History Investigation 2022–2023* (2022–2023 Bull Trout Study Report), *Appendix C. Genetic Analysis for Bull Trout Prepared by Washington Department of Fish and Wildlife Dated June 2023*, notably for clarification about methods used and populations considered in the genetic analysis (Item I-C). *(Note: Chas Kyger provided this information on March 19, 2024, which was distributed to the Aquatic SWG by Kristi Geris that same day.)*
3. Douglas PUD will consult the YN about lamprey trap operations for implementation at Wells Dam in 2024, including possibly collecting genetic fin clips and release location for fish collected in the traps, for further discussion with the Aquatic SWG (Item I-C).
4. The YN will provide Douglas PUD with a lamprey-specific condition factor to eliminate length-based bias, for consideration in the draft report *Wells Dam Adult Lamprey Approach and Passage Study, 2022–23* (2022–2023 Adult Pacific Lamprey Approach and Passage Study

Report) (Item II-C). *(Note: Ralph Lampman provided this information to Douglas PUD on April 5, and the information was distributed to the Aquatic SWG by Kristi Geris on April 8, 2024.)*

5. The Aquatic SWG meeting on April 10, 2024, will be held by conference call (Item III-B).

Summary of Decisions

1. Aquatic SWG representatives present approved the *2024 Aquatic Settlement Agreement and Workgroup Action Plan* (2024 ASA Action Plan), as revised (Item II-A).
2. Aquatic SWG representatives present approved the *2024 Resident Fish Assemblage Study Plan*, as revised (Item II-B).

Agreements

1. There were no agreements discussed during today's conference call.

Review Items

1. The draft *Total Dissolved Gas Water Quality Attainment Plan Year 10 Report* was distributed to the Aquatic SWG by Kristi Geris on November 14, 2023, and is available for review with edits and comments due to Mariah Mayfield.
2. The draft 2022–2023 Adult Pacific Lamprey Approach and Passage Study Report was distributed to the Aquatic SWG by Kristi Geris on March 4, and is available for a 30-day review with edits and comments due to Mariah Mayfield by April 5. Douglas PUD will request approval of the draft report during the Aquatic SWG conference call on April 10, 2024 (Item II-C).
3. The draft *Annual Report Calendar Year 2023 Activities Under the Aquatic Settlement Agreement* (2023 ASA Annual Report) and appended draft *2023 Annual Report White Sturgeon Management Plan*, draft *2023 Bull Trout Management Plan and Incidental Take Annual Report*, draft *2023 Annual Report Water Quality Management Plan* and appended draft 2023 Water Temperature Annual Report, draft *Pacific Lamprey Management Plan 2023 Annual Report*, draft *Aquatic Nuisance Species Management Plan 2023 Annual Report*, and draft *Resident Fish Management Plan 2023 Annual Report* were distributed to the Aquatic SWG by Kristi Geris on March 8, and are available for a 45-day review with edits and comments due to Geris and Douglas PUD by April 22. Douglas PUD will request approval of the draft reports during the Aquatic SWG conference call on May 8, 2024 (Item I-B).

Documents Finalized

1. The final *2024 Resident Fish Assemblage Study Plan* was distributed to the Aquatic SWG by Kristi Geris following the Aquatic SWG conference call on March 13, 2024 (Item II-B).

2. The final 2024 ASA Action Plan was distributed to the Aquatic SWG by Kristi Geris on March 14, 2024 (Item II-A).

I. Welcome

A. Review Agenda (John Ferguson)

John Ferguson welcomed the Aquatic SWG members (Attachment A) and reviewed the agenda. Ferguson asked for any additions or changes to the agenda. No additions or changes were requested.

B. Meeting Minutes Approval (John Ferguson)

The revised draft February 14, 2024, conference call minutes were reviewed. Kristi Geris said no edits were received from the Aquatic SWG. Geris added distribution of the draft 2023 ASA Annual Report and appended resource management plan annual reports under Review Items. She also noted the Federal Energy Regulatory Commission (FERC) filing date of the final 2022–2023 Bull Trout Study Report under Documents Finalized. Aquatic SWG representatives present approved the February 14, 2024, conference call minutes, as revised. The Confederated Tribes of the Colville Reservation (CTCR) abstained because a representative did not participate in the Aquatic SWG conference call on February 14, 2024.

C. Review of Action Items (John Ferguson)

Action items from the Aquatic SWG conference call on February 14, 2024, are as follows *(Note: The following italicized item numbers correspond to agenda items from the February 14, 2024, meeting)*:

1. *The YN will ask PNNL about possibly presenting results from their 2023 juvenile Pacific Lamprey passage behavior and survival study during a joint meeting of the Aquatic SWG, RRFF, and PRFF this spring, 2024 (Item I-C).*
   Ralph Lampman confirmed this presentation is scheduled for June 5, 2024; however, he is unsure about the start time or who will be the presenter. John Ferguson said Anchor QEA will request the call-in information from Tracy Hillman, so Douglas PUD and Anchor QEA can attend the presentation. Lampman said he will also provide PNNL's presentation that was shared at the USACE AFEP for distribution to the Aquatic SWG. *(Note: Kristi Geris contacted Hillman, who requested a follow-up reminder closer to June 5, when meeting logistics are confirmed. Ralph Lampman provided PNNL's presentations, which were distributed to the Aquatic SWG by Geris on April 8, 2024.)*
2. *Douglas PUD will provide additional information about the operation of the return-to-river pipe at Wells Dam, including photographs of inside the Adult Handling Facility where the pipe connects to the sorting table and approximate dates and hours of when flush water might be running through the pipe (Item I-C).*

Mariah Mayfield provided this information on February 21, 2024, which Kristi Geris distributed to the Aquatic SWG that same day.

3. *Douglas PUD will contact the WDFW genetics laboratory regarding 2022–2023 Bull Trout Study Report,* Appendix C. Genetic Analysis for Bull Trout Prepared by Washington Department of Fish and Wildlife Dated June 2023*, notably for clarification about methods used and populations considered in the genetic analysis (Item II-C).*
   Chas Kyger said he revisited the methods, and he believes the analysis reused the original samples from 2017. Kyger reached out to Amelia Louden at the WDFW genetics laboratory to confirm this. Once he hears back, he will report back to the Aquatic SWG. This action item will be carried forward. *(Note: Kyger provided this information on March 19, 2024, which was distributed to the Aquatic SWG by Kristi Geris that same day.)*
4. *Douglas PUD will ask Grant PUD for information about lamprey trap operations at Priest Rapids Dam (PRD), including photographs of how the orifices are configured when the traps are operated (Item II-E).*
   Mariah Mayfield provided this information on February 21, 2024, which Kristi Geris distributed to the Aquatic SWG that same day. Mayfield said there are clear differences between the PRD fishways and Wells Dam fishways, and Douglas PUD is not proposing any additional modifications at this time.
5. *Douglas PUD will consult the YN about lamprey trap operations for implementation at Wells Dam in 2024, including possibly collecting genetic fin clips and release location for fish collected in the traps, for further discussion with the Aquatic SWG (Item II-E).*
   Mariah Mayfield said this is still under internal discussion with more to come in the next months. This action item will be carried forward.

II. Summary of Discussions

A. DECISION: 2024 ASA Action Plan (Andrew Gingerich)

The draft 2024 ASA Action Plan was distributed to the Aquatic SWG by Kristi Geris on February 13 for a 30-day review. A revised plan was distributed on March 11, 2024. Andrew Gingerich shared the revised plan on Microsoft Teams. He recalled that this plan is not a FERC requirement; rather, it is a planning tool for the Aquatic SWG to help think about upcoming activities scheduled for the calendar year. The only comments received were from the YN, which are shown in tracked changes in the revised plan. Edits and comments were discussed as follows.

<u>Pacific Lamprey Management Plan</u>

2. Discussion of Future Adult Passage Study (or Continuation of Translocation) – April to December 2024

Gingerich said this line item was added by Ralph Lampman and is a good addition that should have been included in the first draft. Gingerich proposed to accept this edit.

4. Juvenile lamprey PIT tagging and migration monitoring Methow River at Carlton RST and discussion of future juvenile passage studies – Throughout 2024
Lampman suggested adding, "discussion of future juvenile passage studies." Gingerich incorporated this language, as requested.

6. Ladder salvage during winter maintenance – December 2024/January 2025
Gingerich said Lampman flagged that the annual winter maintenance outage sometimes lasts into January. The text, "/January 2025," was added to this line item. Gingerich proposed to accept this edit.

Bull Trout Management Plan
7. PIT tag incidental encounters of Bull Trout at Project Facilities and add data to annual reporting – Throughout 2024
RD Nelle recalled that Douglas PUD committed to continued passive integrated transponder (PIT)-tagging of Bull Trout, but this is not listed in the action plan. Chas Kyger clarified that Douglas PUD plans to continue PIT-tagging incidental encounters of Bull Trout, but this would not be a direct effort to capture and PIT tag Bull Trout. Nelle asked whether this would occur anywhere within the project area, and Kyger said yes. Nelle asked where this information would be reported, and Kyger said in the annual report. Nelle suggested adding this line item to the action plan. Gingerich added this line item, as requested.

Aquatic SWG representatives present approved the 2024 ASA Action Plan, as revised.

The final plan was distributed to the Aquatic SWG by Geris on March 14, 2024.

B. DECISION: 2024 Resident Fish Assemblage Study Plan (Chas Kyger)

The draft *2024 Resident Fish Assemblage Study Plan* was distributed to the Aquatic SWG by Kristi Geris on January 29, for a 30-day review. A revised plan was distributed on March 11, 2024. Chas Kyger said the only comments received were from the CTCR and U.S. Fish and Wildlife Service. Kyger said Jason McLellan added clarification regarding species encountered and suggested replacing trammel nets with Fall Walleye Index Netting (FWIN). Kyger said RD Nelle suggested adding minnow traps as an additional sampling method to target smaller species, such as Sand Rollers. Minnow traps are a similar effort to fyke netting, which is already included as a sampling method.

Kyger said that after the revised plan had been distributed, Ralph Lampman emailed about euthanizing all invasive species. Douglas PUD has Scientific Collection Permit (WDFW issued permit)

authorization for the lethal removal of invasive species. Aside from the Smallmouth Bass objective, Douglas PUD is supportive of removing any other invasive species encountered.

McLellan said if this is the case, he suggests that all walleye should be lethally sampled for biological data collection. John Ferguson asked whether this is consistent with a statewide plan. McLellan said the FWIN program is a statewide monitoring program implemented by WDFW on several waterbodies with a walleye population, including Lake Roosevelt. The FWIN program is operated cooperatively by the Spokane Tribe of Indians, the CTCR, and WDFW. Every survey uses a standardized net and biological data collection protocol. One of his comments was a suggestion to implement this same protocol to add to this dataset. The CTCR also have a separate walleye removal program specific to Sanpoil River, a tributary of Lake Roosevelt that addresses outmigrating salmonids.

Lampman said the initial draft plan indicated that walleye would be released. Has this changed in the revised version? Kyger said the plan includes standardized methods specific to native fish. The plan specifies that native fish will be released at the location of capture. Explicit language about euthanizing and removing walleye or other invasive species is not included in the plan, but would just be standard protocols, excluding Smallmouth Bass for the mark-recapture effort. Lampman asked whether this language can be added. Kyger said he can add "non-native fish species will be euthanized and removed" in the methods sections. Lampman asked about PIT-tagging walleye—if the chance of recapture is low, so this would not be useful? Kyger said the intent is to just PIT tag bass.

Aquatic SWG representatives present approved the *2024 Resident Fish Assemblage Study Plan*, as revised.

The final plan was distributed to the Aquatic SWG by Geris following the Aquatic SWG conference call on March 13, 2024.

C. PRESENTATION: Adult Pacific Lamprey Approach and Passage Study Report (Mariah Mayfield)

The draft 2022–2023 Adult Pacific Lamprey Approach and Passage Study Report was distributed to the Aquatic SWG by Kristi Geris on March 4 and is available for a 30-day review with edits and comments due to Mariah Mayfield by April 5. Mayfield noted that although comments via email are welcome, she is also available to discuss edits and comments over the phone.

Mayfield shared the presentation *2022–23 Pacific Lamprey Approach and Passage Study Results* (Attachment B), which was distributed to the Aquatic SWG by Geris after the Aquatic SWG conference call on March 13, 2024. Discussions were as follows.

Condition Factor

Ralph Lampman said he can provide Douglas PUD with a lamprey-specific condition factor to eliminate length-based bias, which might make the trends on this slide (Slide 10) even stronger. *(Note: Lampman provided this information to Douglas PUD on April 5, and the information was distributed to the Aquatic SWG by Geris on April 8, 2024.)*

Comparison to Other Dams – Fallback

Mayfield said an interesting consideration not noted here (Slide 11) is fallback. At Bonneville Dam, 60% of fish were making multiple attempts within the ladder. This was not the case for Wells Dam, so perhaps the fishways are not the problem. Five "Acoustic+PIT" fish fell back. One fish was within ladder and fell back to Pool 19, then re-ascended and completed passage through the fishway. One fallback was detected down at Rocky Reach, completed three laps around the Rocky Reach Reservoir, and then ended up in the Entiat River. These fallbacks occurred in June 2023, which could mean these were post-spawn fish drifting downstream.

Lampman agreed fallback in the June time frame could be an indication of post-spawn fish drifting downstream. Sometimes lamprey search for other spawning grounds while falling back. He suggested separating fallbacks by date to differentiate potential causes of fallback. To note, if the lamprey is in its first year, any fallback is likely from the migration.

Comparison to Other Dams – Fishway Passage

Lampman said he is glad to see more adults returning to Wells Dam (Slide 11). For the other PUD dams on this slide, there are more recent data. Within-ladder passage for these dams range from 80% to 90%. He asked whether Douglas PUD had requested updated numbers. Andrew Gingerich said Douglas PUD received more recent reports from Grant PUD, but not Chelan PUD. Mayfield said she will add a note to this slide that there may be more recent data, so this slide is just a general comparison.

Lampman asked about duration within the ladder. How much time did it take lamprey to successfully pass through the fishway? Mayfield said the median was around 7 hours, which is similar and faster than the other mainstem dams. Lampman asked whether these data are summarized in the report, and Mayfield said yes.

Mainstem Spawning

Lampman asked whether the percentages on this slide (Slide 12) include both "PIT only" fish and "Acoustic+PIT" fish. Mayfield said yes, but the report includes encounter histories for each fish. Lampman asked whether the report includes what proportion of study fish stayed in the mainstem Columbia River. Mayfield said yes, in the "Last Seen" tables. Lampman asked, roughly what proportion stayed in the Wells Reservoir versus the Rocky Reach Reservoir and tributaries? Mayfield

said she would need to do this calculation. She added, if there are analyses like this that are not included in the report, please submit these requests during the comment period.

Lampman said he thinks one reason there are not high numbers in the tributaries is that lamprey are using the mainstem for spawning. If pheromones are there, lamprey may just stay. It will be helpful to see what proportion is staying in the mainstem versus the tributaries. RD Nelle noted that some lamprey were detected up near Chief Joseph Dam, and he suggested searching that area for lamprey spawning.

Translocation

Jason McLellan said this was a good presentation. He reviewed the report briefly and noticed there seems to be an interpretation that the higher approach rate in 2022 is because of translocation and increased pheromones, but pheromones have not been measured relative to the 2016 study. He heard a few times, "Now there are good approach rates." To clarify, this is 1 year of data, and it is unknown whether this is related to pheromones and translocation. If comparing 2016 and 2022, this is 1 bad year and 1 good year. He cautioned about drawing too many conclusions about the reason for the improved approach rates in 2022 from a single datapoint. If pheromones were so influential to approach rates and ascension, then he would expect that a higher proportion of fish that did ascend the fishways would have then entered tributaries that had higher concentrations of pheromones. This does not seem to be the case. He suggested a little more discussion and toning down the influence of translocation. He is not saying translocation did not play a role or is not important; rather, right now, be cautious of overemphasizing this. Mayfield said that this is a good point, and she will review the report and edit these statements, as needed.

Lampman said the YN have been conducting eDNA and bile-acid monitoring for the past few years and can provide a comparison of these data, although only partial eDNA results are available, and bile-acid results are not yet available. In 2018, baseline data collection included sample locations upstream of Wells Dam near the Methow and Okanogan rivers and at Wells Dam (four sites total) and at Rocky Reach, McNary, and Bonneville dams. In 2018, there were no detections of Pacific Lamprey at any of the four sites at Wells Dam. The only detection was at the mouth of the Methow River. Now, there are eDNA detections at many more collection sites, including two of four sites at Wells Dam. Mayfield asked whether detections are just presence or absence, or are there concentrations? Lampman said the data are quantitative. The additional monitoring for bile acids is for comparison to the eDNA quantitative results. Other lamprey studies in New Zealand have examined the relationship, and the data seem to correlate well. He does not disagree with McLellan. One year of data is limited. However, there are indicators showing that pheromone levels are changing.

Nelle suggested adding eDNA sample locations below Chief Joseph Dam because some lamprey were detected traveling toward that area.

Environmental Factors

McLellan noted there was little evaluation or comparison of environmental factors between the years. For example, 2022 was a particularly high-flow year.

Lampman said he has reviewed conversion rates related to flow and temperature using Bonneville Dam numbers, and he has not seen a strong relationship between high or low flow, or high or low temperature, influencing how many lamprey reach upstream dams. He is not saying there is no impact, but at least on the surface there does not seem to be a strong relationship.

McLellan said additionally, Pacific Lamprey counts were high in 2022 compared to previous years. Mayfield said in 2022, there were 1,684 Pacific Lamprey counted at Wells Dam and about 10,000 at Rocky Reach Dam. McLellan said, huge water year, huge numbers. There may be other factors to consider.

Next Study

Fishway Entrance

Lampman said the study results seem to suggest the fishway entrance may be the bigger issue, so perhaps this could be the focus of the next project or study.

Head Differential

Lampman also likes the idea of testing reduced fishway entrance head differentials (Slide 13). This could be an easy operational experiment.

Keyhole Entrance

Lampman suggested considering the keyhole entrance design, which has been implemented at Grant PUD dams and lower river dams. This design has shown to be a good way to get lamprey into the fishways. However, this can be expensive. John Ferguson asked for more information about this design. Lampman explained that the entrance is shaped like an hourglass and has different flows throughout the vertical column to help lamprey key in on slower water and other fish key in on faster moving water. Ferguson asked whether this means reshaping the fishway entrance, and Lampman said yes. It is a proven way to improve entrance passage rates for lamprey. Moving to this improved entrance design might be the most effective way to improve passage without needing to conduct additional studies. Mayfield said any structural changes would take quite some time. Also, Wells Dam has a unique hydrocombine design, and a keyhole entrance may not be as effective as it might be at other traditional dams. All things to consider.

Increase Pheromone Signal
Lampman said synthetic pheromone can be expensive (Slide 13). The Sea Lamprey study results showed that this attractant was not as impactful as hoped unless combined with other things.

Lampman said that holding fish in the fishway could work (Slide 13), but if fish are stressed, there can be a negative impact. The YN have tested this, and there is no clear evidence that holding fish in the fishway really helps. However, this is something that can be done inexpensively and could potentially help.

Summary
Ferguson said that these were good discussions, and the Aquatic SWG will have a chance for more discussion of these topics during the Aquatic SWG conference call on April 10, 2024, when Douglas PUD will request approval of the draft report.

D. Brood Year 2023 Wells White Sturgeon Rearing Update (Chas Kyger)

A brood year (BY) 2023 White Sturgeon Rearing Update (Attachment C) was distributed to the Aquatic SWG by Kristi Geris following the Aquatic SWG conference call on March 13, 2024.

Chas Kyger said there are 2,369 BY 2023 White Sturgeon on station at Wells Dam. This includes the 157 White Sturgeon brought from the CTCR Resident Fish Hatchery last month. These fish went through quarantine, have been incorporated into the general population, and are doing well. Hatchery staff are grading fish into tanks based on size. In most of the tanks fish are growing well, averaging over 150 grams. One tank is lagging behind, averaging 65 grams. There are 166 fish in this tank. Chelan PUD program fish are now in the magnum tanks and are all over 250 grams, with one tank averaging 350 grams. The CTCR started conducting blood sampling for spontaneous autopolyploidy over the last 2 weeks. So far, mortality associated with sampling is low. Approximately eight fish were injured during the first week, and no fish were injured last week. Fish numbers are still good and should meet both the 325-fish target for the Douglas PUD program and around the 2,000-fish target for the Chelan PUD program.

Jason McLellan said the week of March 4, 2024, was the first week of sampling. A total of 502 White Sturgeon were screened. This week, another 500 White Sturgeon were screened. After the first week of sampling, there was a switch to shorter needles for the less-experienced staff, which seems to have made a positive difference. There are about 100 fish left to screen. To date, one 12N[1] fish has been identified, resulting in 1 out of 1,000 fish, which has been the norm.

[1] Twelve copies of each chromosome, or irregular fish.

III. Administration

A. Ecology Aquatic SWG Representation (John Ferguson)

John Ferguson said Breean Zimmerman accepted another position and the interim contact will be Chad Brown (Ecology Aquatic SWG Policy Representative).

Andrew Gingerich said Mariah Mayfield is coordinating with Brown regarding water quality topics.

B. Upcoming Meetings (John Ferguson)

The Aquatic SWG meeting on April 10, 2024, will be held by Microsoft Teams conference call.

Other upcoming meetings include May 8 and June 12, 2024 (conference call).

List of Attachments

Attachment A List of Attendees
Attachment B 2022-23 Pacific Lamprey Approach and Passage Study Results
Attachment C BY 2023 White Sturgeon Rearing Update

Attachment A – Attendees

Name	Role	Organization
John Ferguson	Aquatic SWG Chairman	Anchor QEA
Kristi Geris	Administration/Technical Support	Anchor QEA
Andrew Gingerich	Aquatic SWG Technical Representative	Douglas PUD
Chas Kyger	Aquatic SWG Technical Alternate	Douglas PUD
John Rohrback	Aquatic SWG Technical Support	Douglas PUD
Mariah Mayfield	Aquatic SWG Technical Support	Douglas PUD
RD Nelle	Aquatic SWG Technical Representative	U.S. Fish and Wildlife Service
Stuart Fety	Aquatic SWG Technical Alternate	U.S. Fish and Wildlife Service
Patrick Verhey	Aquatic SWG Technical Representative	Washington Department of Fish and Wildlife
Ralph Lampman	Aquatic SWG Technical Representative	Yakama Nation
Jason McLellan	Aquatic SWG Technical Representative	Confederated Tribes of the Colville Reservation

2022-23 Pacific Lamprey Approach and Passage Study Results

DCPUD and Dave Robichaud, LGL Limited

March 13, 2024

Previous Passage Studies

- 2007/2008 – Radio Telemetry
  - Entrance efficiency
  - Fishway passage efficiency
- 2009/2010 – DIDSON
  - Entrance efficiency and effects of reduced fishway head differential
- 2013 – Radio Telemetry
  - Entrance efficiency and effects of reduced fishway head differential
  - Picketed lead and count station enumeration
  - Fishway passage efficiency/ identify bottlenecks or problem areas
- 2015 (Grant PUD) – Acoustic
  - Multi-dam passage/approach
    - Not focused on Wells Dam, but useful information for guiding 2016 study development
- 2016 – Acoustic
  - Approach
  - Low level entrances/lamprey entrance structures

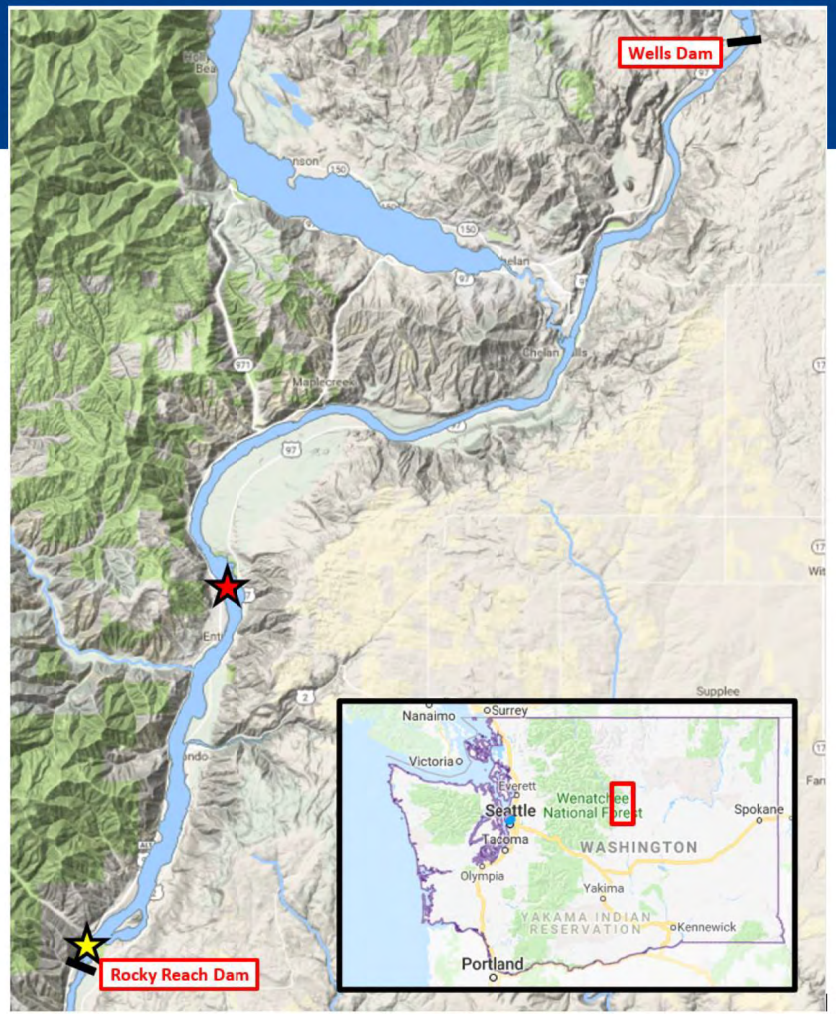
2022 Study Objectives

1. Adult Pacific Lamprey Upstream Passage Evaluation (PLMP, Section 4.1.6).
   - Determine the proportion of acoustic-tagged lamprey released in Rocky Reach Reservoir that approach and interact with the Wells Project.
     - Different from 2016?

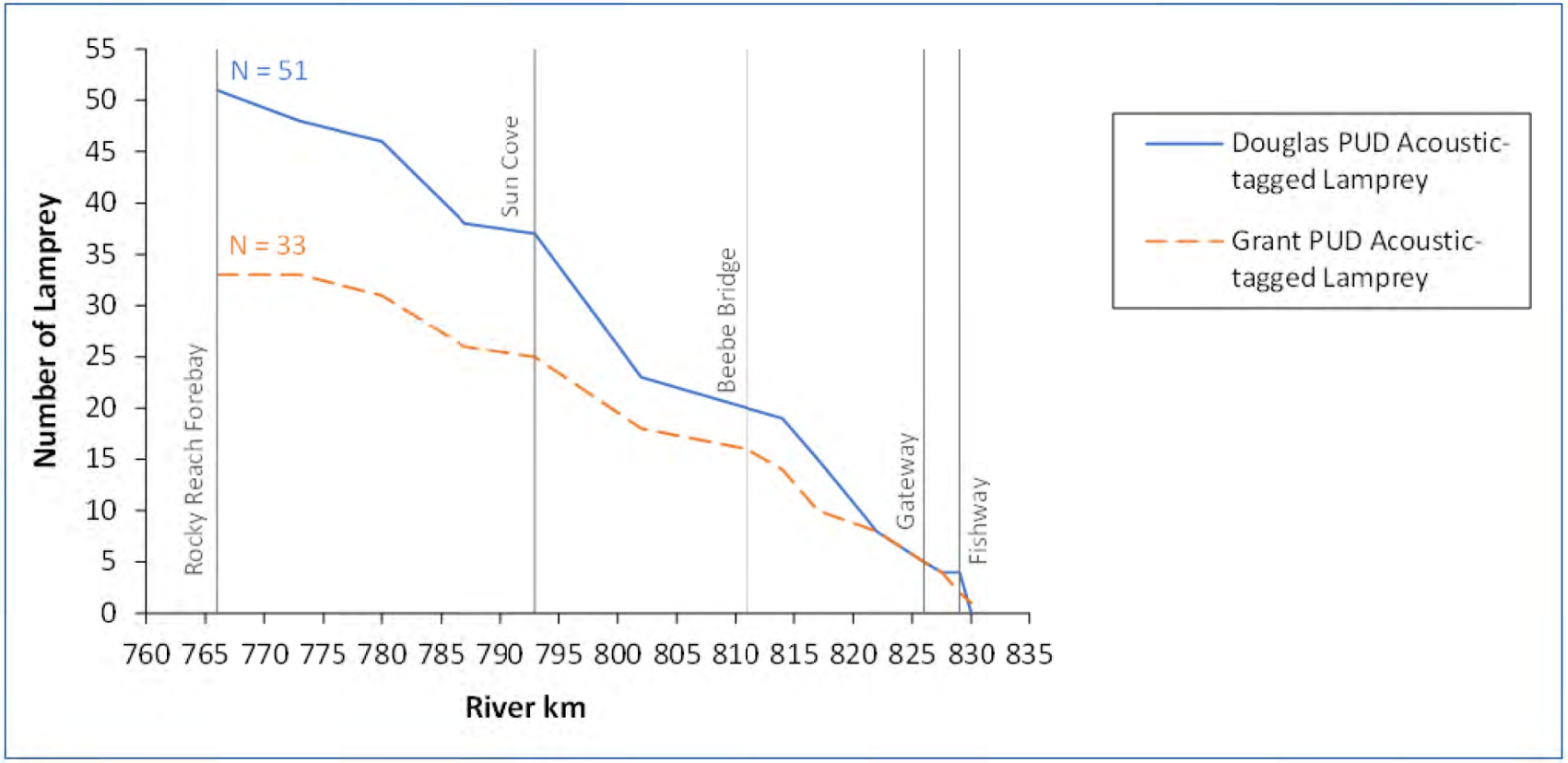
2. Wells Dam Adult Pacific Lamprey Passage Evaluation (PLMP Section 4.1.6)
   - Evaluate Wells Dam upstream passage rates of acoustic-and-PIT-tagged Pacific Lamprey that approach Wells Dam.
   - Passage rates encountered in 2022 will be compared to those reported in previous acoustic and radio tag studies.

Tagging/Release Summary

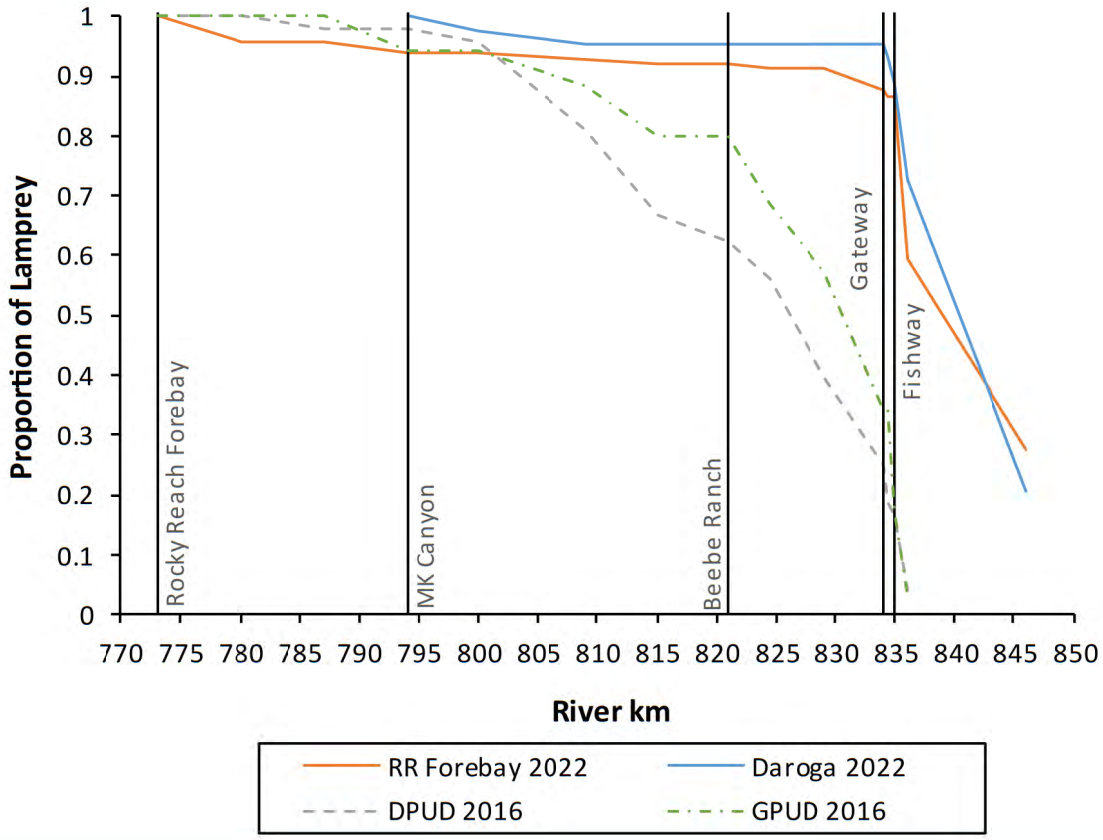
Release Date	Daroga State Park		Rocky Reach Forebay		Total
	Acoustic + PIT	PIT only	Acoustic + PIT	PIT only	
22 July				23	23
29 July			44		44
5 August	25	50	60	70	205
12 August	25	74	16	83	198
19 August		17		158	175
Total	**50**	**141**	**120**	**334**	**645**



2016 Rocky Reach Reservoir Passage

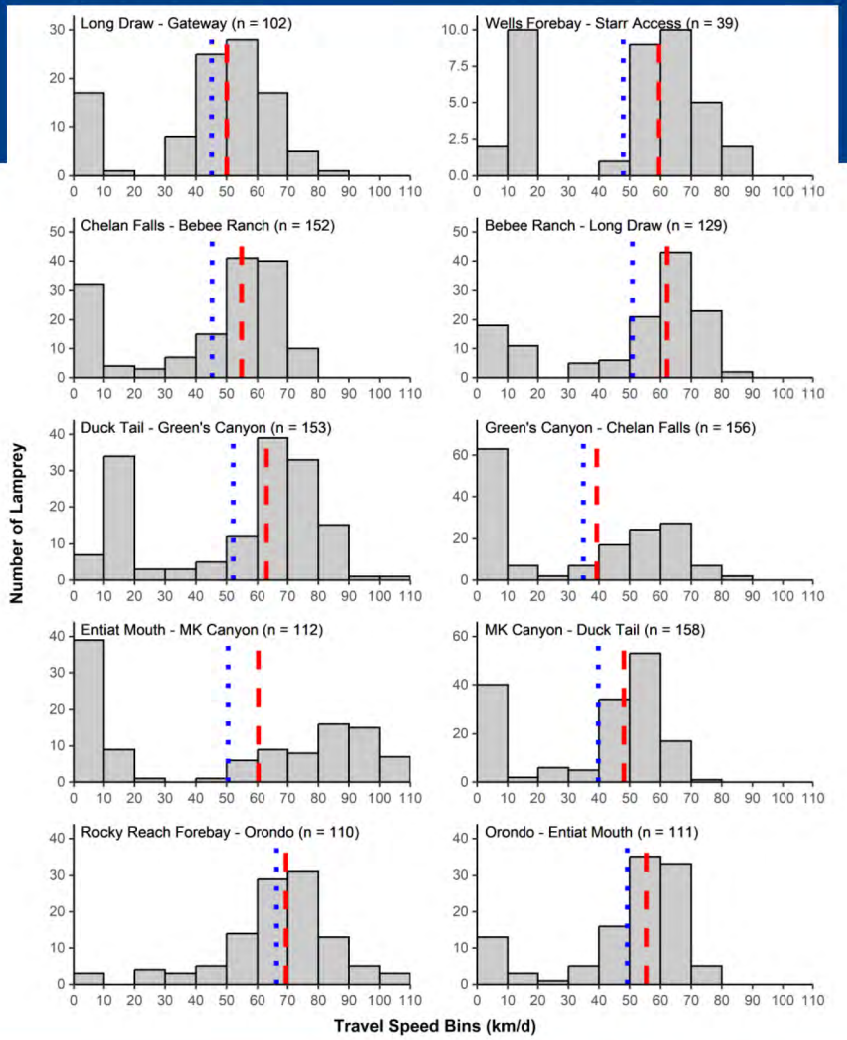


2022 Rocky Reach Reservoir Passage



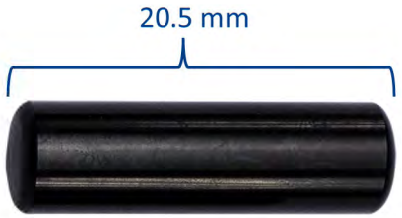
Upstream Migration

River Reach	Start rkm	End rkm	n	Mean (km/d)	Median (km/d)
Wells Forebay – Starr Access	822	826	39	47.9	59.5
Long Draw – Gateway	829	833	102	45.2	50.1
Beebe Ranch - Long Draw	821	829	129	50.9	62.1
Chelan Falls – Beebe Ranch	815	821	152	45.3	54.9
Green's Canyon – Chelan Falls	809	815	156	34.9	39.3
Duck Tail - Green's Canyon	800	809	153	52.1	63.1
MK Canyon – Duck Tail	794	800	158	39.8	48.2
Entiat Mouth - MK Canyon	787	794	112	50.5	60.3
Orondo – Entiat Mouth	780	787	111	49.3	55.5
Rocky Reach Forebay - Orondo	773	780	110	66.4	69.4



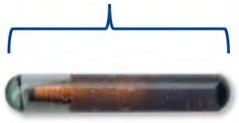
2022 Approach/Passage Results

	Fish with Acoustic + PIT Tags							
Release Site	***Released***		***Interacted with Wells***		***In Wells Fishway***		***Passed Wells***
Daroga SP	50		39		9		9
RR Forebay	120		98		31		31
Total	**170**	80.6%	**137**	29.2%	**40**	100%	**40**

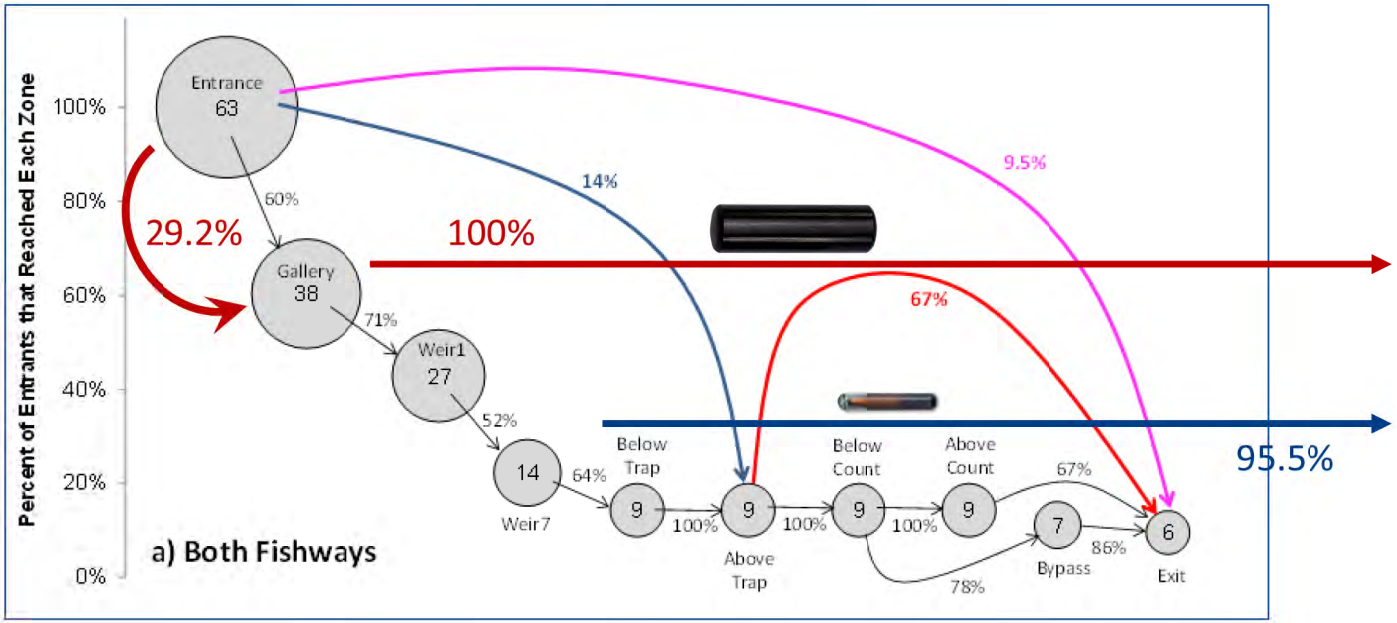


	Fish with only PIT Tags				
Release Site	***Released***		***In Wells Fishway***		***Passed Wells ****
Daroga SP	141		54		52
RR Forebay	334		102		97
Total	**475**	32.8%	**156**	95.5%	**149**

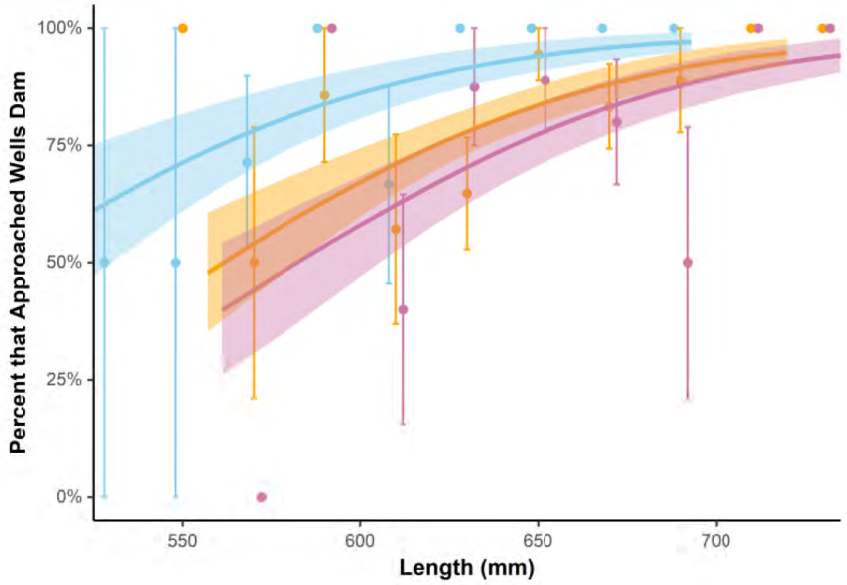
* Includes fish that reached Pool 68.

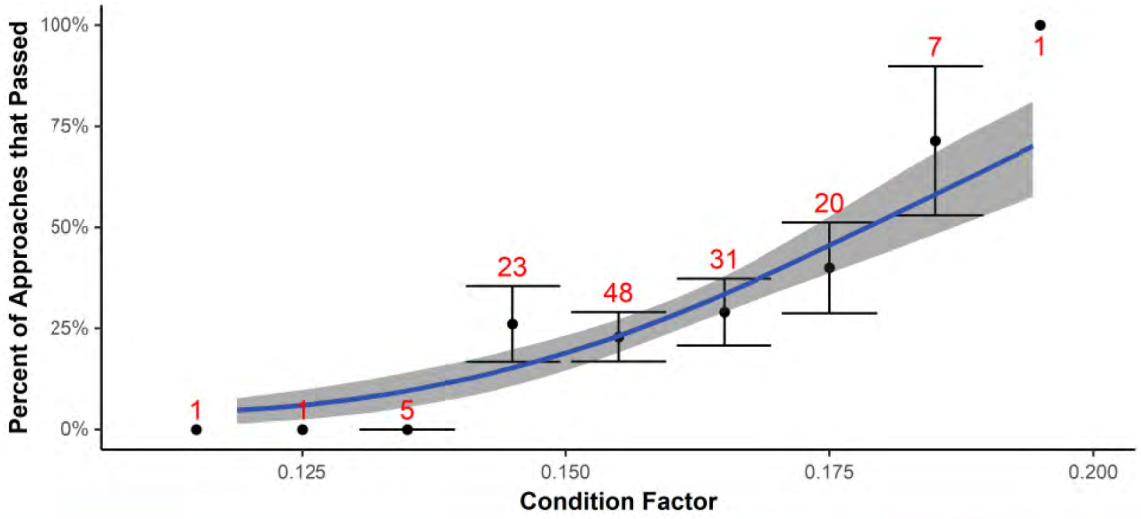


Fishway Passage: 2013 vs. 2022



Size May Matter





Comparison to Other Dams

Project	**Fishway entrance efficiency** (unique fish that entered/unique fish that approached)	**Fishway passage efficiency** (unique fish that passed / unique fish that entered)	**Dam passage efficiency** (unique fish that passed / unique fish that approached)
Bonneville*	0.72 – 0.89	0.41 – 0.58	0.31 – 0.48
The Dalles*	0.75 – 0.96	0.72 – 0.88	0.55 – 0.79
John Day*	0.70 – 1.00	0.00 – 0.56	0.00 – 0.53
McNary*	0.64 – 1.00	0.67 – 1.00	0.54 - 1.00
Ice Harbor*	0.83 - 0.92	0.38 - 0.82	0.38 - 0.82
Priest Rapids^	0.62 - 0.80		0.30 - 0.70
Wanapum^	0.62 - 0.80		0.51 - 1.00
Rocky Reach#	0.94	0.55	0.52
Wells: 2016	0.17	0.33	0.07
Wells: 2022	**0.29**	**0.96 - 1.00**	**0.24**

*Keefer et al. 2012; ^Grant PUD PLMP; #Stevenson et al. 2005. More recent studies may be available, so this table is just for basic reference purposes.

Entry into Tributaries

	Most Upstream Detection Location			PIT only			Acoustic+PIT			All Study fish		
	Zone Name	PTAGIS rkm	rkm	DAR	RRH	TOTAL	DAR	RRH	TOTAL	DAR	RRH	TOTAL
Upstream of Wells Dam	OBF - Omak Creek below Mission Falls	858.052.011	921	1		1	1		1	2		2
	OMK - Omak Creek Instream Array	858.052.000	917									
	SA0 - Salmon Creek below OID Div.	858.041.006	905		1	1					1	1
	SA1 - Salmon Creek Instream Array	858.041.002	901	1	1	2				1	1	2
	OKL - Lower Okanogan Instream Array	858.025	890	5	5	10	1		1	6	5	11
	CRU - Upper Chewuch Instream Array	843.080.028	957.5	4	11	15	2	2	4	6	13	19
	CMU - Chewuch River Middle Upper	843.080.008	937.5	6	14	20		5	5	6	19	25
	CML - Chewuch River Middle Lower	843.080.007	930	1	1	2				1	1	2
	CRW - Chewuch River above Winthrop	843.080.001	930.5	3	1	4				3	1	4
	MRW - Methow River at Winthrop	843.085	928	1	1	2				1	1	2
	MRC - Methow River at Carlton	843.045	895	9	23	32	2	5	7	11	28	39
	LMR - Lower Methow River at Pateros	843.008	858	7	12	19	2	4	6	9	16	25
	WEA - DCPUD Adult Ladder - Pool 68	830	836	14	27	41	1	15	16	15	42	57
	WEA - DCPUD Adult Ladder - Pool 67	830	836									
	WEA - DCPUD Adult Ladder - Pool 19	830	836	2	5	7				2	5	7
	WEH - Wells Dam Hatchery	830	835	4	9	13	3	1	4	7	10	17
Downstream of Wells Dam	*Rls: Daroga*		*790*	77		77	37		37	114		114
	ENA - Upper Entiat River at rkm 17.1	778.017	795		6	6					6	6
	ENL - Lower Entiat River	778.002	788	4	18	22	1	5	6	5	23	28
	Rls: Rocky Reach Forebay		*773*		195	195		83	83		278	278
	Rocky Reach Dam	763	763		3	3					3	3
	LWE - Lower Wenatchee River	754.003	757	1		1				1		1
	Rock Island Dam	730	730	1	1	2				1	1	2
	TOTALS			**141**	**334**	**475**	**50**	**120**	**170**	**191**	**454**	**645**

Okanogan: 16 (2.5%)

Methow (entire basin): 116 (18%)
Chewuch: 50 (7.8%)

57 (9%) passed Wells, not detected elsewhere

Entiat: 34 (5.3%)

Below RR: 6 (<1%)

Recommendations

- Next Study: 2025
  - Similar study design? Change to release sites?
  - Experiment with head differential at collection gallery?
  - Study design: Winter 2024
- Increase pheromone signal in fishway?
  - Hold adults/larvae in the fishway?
  - Synthetic pheromone? Similar to Sea Lamprey attractant?
- Continue Translocation
  - Current SOA ends in 2024
- Explore potential mainstem Columbia spawning?

	14-Feb		13-Mar	
Tank	Population	Grams	Population	Grams
1	147	28.0	166	65.8
2	--	--	95	232.8
3	123	114.9	116	181.6
4	152	96.6	151	156.6
5	--	--	143	174.6
6	--	--	158	129.7
7	102	162.1	123	183.8
8	108	137.6	93	224.8
9	86	175.3	82	283.8
10	146	123.4	82	306.8
11	143	84.7	83	232.8
12	85	174.6	83	262.4
Mag 1	660	228.1	500	262.4
Mag 2	461	302.7	494	349.2
Total	2,213	187.3	2,369	236.4

FINAL

Conference Call Minutes

Aquatic Settlement Work Group

To: Aquatic SWG Parties Date: May 8, 2024

From: John Ferguson, Chair, Anchor QEA

Re: Final Minutes of the April 10, 2024, Aquatic SWG Conference Call

The Aquatic Settlement Work Group (SWG) met by conference call on Wednesday, April 10, 2024, from 10:00 a.m. to 10:30 a.m. Attendees are listed in Attachment A of these conference call minutes.

Summary of Action Items

1. Anchor QEA will follow-up with Tracy Hillman (Rocky Reach Fish Forum [RRFF] and Priest Rapids Fish Forum [PRFF] Facilitator) about the call-in information to attend Pacific Northwest National Laboratory (PNNL's) presentation of their 2023 juvenile Pacific Lamprey passage behavior and survival study during a joint meeting of the RRFF, PRFF, and Aquatic SWG on June 5, 2024 (Item I-C). *(Note: Hillman will provide the start time and call-in information once it is available.)*
2. Douglas PUD will consult the Yakama Nation (YN) about lamprey trap operations for implementation at Wells Dam in 2024, including possibly collecting genetic fin clips and release location for fish collected in the traps, for further discussion with the Aquatic SWG (Item I-C).
3. The Aquatic SWG meeting on May 8, 2024, will be held by conference call (Item III-B).

Summary of Decisions

1. There were no decision items approved during today's conference call.

Agreements

1. There were no agreements discussed during today's conference call.

Review Items

1. The draft *Total Dissolved Gas Water Quality Attainment Plan Year 10 Report* was distributed to the Aquatic SWG by Kristi Geris on November 14, 2023, and is available for review with edits and comments due to Mariah Mayfield.

2. The draft *Annual Report Calendar Year 2023 Activities Under the Aquatic Settlement Agreement* (2023 ASA Annual Report) and appended draft *2023 Annual Report White Sturgeon Management Plan*, draft *2023 Bull Trout Management Plan and Incidental Take Annual Report*, draft *2023 Annual Report Water Quality Management Plan* and appended draft 2023 Water Temperature Annual Report, draft *Pacific Lamprey Management Plan 2023 Annual Report*, draft *Aquatic Nuisance Species Management Plan 2023 Annual Report*, and draft *Resident Fish Management Plan 2023 Annual Report* were distributed to the Aquatic SWG by Kristi Geris on March 8, and are available for a 45-day review with edits and comments due to Geris and Douglas PUD by April 22. The revised reports for approval were distributed on May 1. Douglas PUD will request approval of the draft reports during the Aquatic SWG conference call on May 8, 2024 (Item III-A).

Documents Finalized

1. There are no documents that have been recently finalized.

I. Welcome

A. Review Agenda (John Ferguson)

John Ferguson welcomed the Aquatic SWG members (Attachment A) and reviewed the agenda. Ferguson asked for any additions or changes to the agenda. No additions or changes were requested.

B. Meeting Minutes Approval (John Ferguson)

The revised draft March 13, 2024, conference call minutes were reviewed. Kristi Geris said edits and comments were received from Douglas PUD and the YN. Minor clarifications were incorporated into the revised minutes. There were also a few more remarkable edits retained in tracked changes, which the Aquatic SWG reviewed and approved. Lastly, Geris closed out a couple of action items as items were provided and distributed. Aquatic SWG representatives present approved the March 13, 2024, conference call minutes, as revised.

C. Review of Action Items (John Ferguson)

Action items from the Aquatic SWG conference call on March 13, 2024, are as follows *(Note: The following italicized item numbers correspond to agenda items from the March 13, 2024, meeting)*:

1. *Anchor QEA will contact Tracy Hillman (RRFF and PRFF Facilitator) to request the call-in information to attend PNNL's presentation of their 2023 juvenile Pacific Lamprey passage behavior and survival study during a joint meeting of the RRFF, PRFF, and Aquatic SWG on June 5, 2024, and the YN will provide PNNL's presentation that was shared at the U.S. Army*

Corps of Engineers Anadromous Fish Evaluation Program for distribution to the Aquatic SWG (Item I-C).

Kristi Geris contacted Hillman, who requested a follow-up reminder closer to June 5, when meeting logistics are confirmed. Ralph Lampman provided PNNL's presentations, which were distributed to the Aquatic SWG by Geris on April 8, 2024. The first part of this action item will be carried forward. *(Note: Hillman will provide the start time and call-in information once it is available.)*

2. *Douglas PUD will contact the Washington Department of Fish and Wildlife genetics laboratory regarding* Bull Trout Movement and Life History Investigation 2022–2023, Appendix C. Genetic Analysis for Bull Trout Prepared by Washington Department of Fish and Wildlife Dated June 2023*, notably for clarification about methods used and populations considered in the genetic analysis (Item I-C).*

   Chas Kyger provided this information on March 19, 2024, which was distributed to the Aquatic SWG by Kristi Geris that same day.

3. *Douglas PUD will consult the YN about lamprey trap operations for implementation at Wells Dam in 2024, including possibly collecting genetic fin clips and release location for fish collected in the traps, for further discussion with the Aquatic SWG (Item I-C).*

   This action item will be carried forward.

4. *The YN will provide Douglas PUD with a lamprey-specific condition factor to eliminate length-based bias, for consideration in the draft report* Wells Dam Adult Lamprey Approach and Passage Study, 2022–23 *(2022–2023 Adult Pacific Lamprey Approach and Passage Study Report) (Item II-C).*

   Ralph Lampman provided this information to Douglas PUD on April 5, and the information was distributed to the Aquatic SWG by Kristi Geris on April 8, 2024.

II. Summary of Discussions

A. Adult Pacific Lamprey Approach and Passage Study Report (Mariah Mayfield)

The draft 2022–2023 Adult Pacific Lamprey Approach and Passage Study Report was distributed to the Aquatic SWG by Kristi Geris on March 4 for a 30-day review. Mariah Mayfield said comments were received from the Confederated Tribes of the Colville Reservation, the YN, and U.S. Fish and Wildlife Service (USFWS). Mayfield said, today, Douglas PUD will review the general comments received but will postpone approval of the report to next month, because Dave Robichaud (LGL Limited) is still working on the final analyses to address comments. A final draft report for approval will be distributed before the Aquatic SWG conference call on May 8, 2024.

Mayfield said comments received were straightforward. Of note, Douglas PUD will change the condition factor to the specific condition factor for lamprey provided by the YN. Robichaud is

looking into comments about differences between the east and west fishways. A section will be added about study fish that passed Wells Dam but were never detected in the tributaries. There were comments about considering uncertainties related to environmental factors during the study period. To address this, the report will include alternative hypotheses the study could not control for. All comments received were also provided to the Aquatic SWG, and Mayfield asked that Aquatic SWG members reach out if there are questions about specific comments.

RD Nelle said this report alludes to being a comparison between the present study and the 2016 study, but it does not show a direct comparison between metrics for the two studies such as fish size, environmental conditions, or release timing. This needs to be addressed in the report. Mayfield said she is working with Robichaud on this. She agreed the report can better explain which metrics are comparable, how the two studies are different, and what conclusions can be made confidently versus what is anecdotal. Nelle asked, for example, whether releasing fish earlier or that are larger in size makes a difference in approach and passage rates. These are the types of comparisons he is interested in.

John Ferguson recalled Nelle's question about whether tagged fish were detected near Chief Joseph Dam. Mayfield said based on her cursory review of the data, the farthest upstream location where fish that passed Wells Dam were detected was Brewster. However, Robichaud is taking a closer look at this, because there is a lot of interest in where these fish are going. Nelle said this is his interest, and Brewster is all he could glean from reviewing the draft report, as well. Mayfield noted that there is good detection coverage near Chief Joseph Dam, too, for White Sturgeon monitoring and evaluation, so she guessed study fish would be detected if there were any in the area.

Ferguson asked about Pacific Lamprey behavior for reservoir spawning. How deep can lamprey spawn, or prefer to spawn, shallower or deeper? Salmon spawn only so far down, which is likely light oriented. Are Pacific Lamprey the same? Mayfield guessed that lamprey spawning might be more of a substrate issue. In deeper waters fish are less likely to find rocks they can move. Ferguson agreed and said these areas may be more sedimented in, too. To Nelle's point, maybe lamprey seek out tailwater areas for spawning, where there is more river flow. Mayfield agreed and said she also wonders if there is spawning habitat near Carpenter Island or other areas in the Wells Reservoir with more riverine characteristics. Although it is not in the Wells Project, Mayfield is also interested in whether there is spawning habitat in the Chelan River. Nelle said, many years ago, USFWS collected eDNA samples in upstream locations of the Chelan River and did not detect juvenile or larval lamprey, although things may have changed since then. Samples were not collected in downstream locations. *(Note: Ralph Lampman was experiencing audio trouble but provided input on this topic via email after the conference call on April 10, 2024.)*

Ferguson summarized that Douglas PUD will request approval of this report next month, then this report and the 2016 report will inform thoughts for a 2025 study plan for discussion this summer or early fall.

B. Brood Year 2023 Wells White Sturgeon Rearing Update (Chas Kyger)

A brood year (BY) 2023 White Sturgeon Rearing Update (Attachment B) was distributed to the Aquatic SWG by Kristi Geris prior to the Aquatic SWG conference call on April 10. Chas Kyger said the blue shaded cells (330 fish total) have been scute marked and passive integrated transponder tagged for the Douglas PUD program. These fish have also been screened for spontaneous autopolyploidy, and all results came back normal. Fish lengths and weights will be collected again prior to release. There is one tank of smaller fish in Chelan PUD's program that may not reach the size target at release. All other fish will meet the size targets at release.

The memorandum "Results of 2024 White Sturgeon Autopolyploidy Testing" (Attachment C) was distributed to the Aquatic SWG by Geris on April 15, 2024.

III. Administration

A. 2023 ASA Annual Report – Reminder (John Ferguson)

John Ferguson reminded the Aquatic SWG to submit edits and comments on the draft 2023 ASA Annual Report and six appended management plan annual reports by Monday, April 22. Final draft reports for approval will be distributed on May 1, and Douglas PUD will request approval of the reports during the Aquatic SWG conference call on May 8, 2024.

B. Upcoming Meetings (John Ferguson)

The Aquatic SWG meeting on May 8, 2024, will be held by Microsoft Teams conference call.

On June 5, 2024, PNNL will present results from their 2023 juvenile Pacific Lamprey passage behavior and survival study during a joint meeting of the RRFF, PRFF, and Aquatic SWG.

Other upcoming meetings include June 12 and July 10, 2024 (conference call).

List of Attachments

Attachment A List of Attendees
Attachment B BY 2023 White Sturgeon Rearing Update
Attachment C Results of 2024 White Sturgeon Autopolyploidy Testing

Attachment A – Attendees

Name	Role	Organization
John Ferguson	Aquatic SWG Chairman	Anchor QEA
Kristi Geris	Administration/Technical Support	Anchor QEA
Andrew Gingerich	Aquatic SWG Technical Representative	Douglas PUD
Chas Kyger	Aquatic SWG Technical Alternate	Douglas PUD
John Rohrback	Aquatic SWG Technical Support	Douglas PUD
Mariah Mayfield	Aquatic SWG Technical Support	Douglas PUD
RD Nelle	Aquatic SWG Technical Representative	U.S. Fish and Wildlife Service
Stuart Fety	Aquatic SWG Technical Alternate	U.S. Fish and Wildlife Service
Patrick Verhey	Aquatic SWG Technical Representative	Washington Department of Fish and Wildlife
Laura Heironimus	Aquatic SWG Technical Alternate	Washington Department of Fish and Wildlife
Ralph Lampman	Aquatic SWG Technical Representative	Yakama Nation

	13-Mar		10-Apr	
Tank	Population	Grams	Population	Grams
1	166	65.8	158	168.1
2	95	232.8	62	227.0
3	116	181.6	105	268.6
4	151	156.6	120	211.2
5	143	174.6	118	223.6
6	158	129.7	127	216.2
7	123	183.8	61	165.1
8	93	224.8	66	338.8
9	82	283.8	66	264.0
10	82	306.8	66	386.4
11	83	232.8	66	386.4
12	83	262.4	66	338.8
Mag 1	500	262.4	635	283.8
Mag 2	494	349.2	630	349.2
Total	2,369	236.4	2,346	286.2

Blue shaded cells are fish that have been scute marked and PIT tagged for the Douglas PUD supplementation program

Commissioners:
RONALD E. SKAGEN
MOLLY SIMPSON
AARON J. VIEBROCK

General Manager:
GARY R. IVORY

Public Utility District No. 1 of Douglas County

1151 Valley Mall Parkway · East Wenatchee, Washington 98802-4497 · 509/884-7191 · FAX 509/884-0553 · www.douglaspud.org

Memorandum

To: Aquatic Settlement Work Group

From: Dr. Betsy Bamberger, DCPUD (Fish Veterinarian)

Date: April 8, 2024

Re: **Results of 2024 White Sturgeon Autopolyploidy Testing**

On March 27 and 28, 2024, blood was collected from White Sturgeon juveniles reared at Wells Hatchery in compliance with the Aquatic Settlement Agreement (ASA) requirements for the Wells Hydroelectric Project (FERC No. 2149) for the determination of ploidy. Samples were processed by the Genomic Variation Laboratory at the University of California, Davis. All 330 individuals are confirmed to be 8N (of normal octoploidy). Laboratory results are appended to this memorandum as Exhibit A.

Betsy Bamberger, DVM
Fish Veterinarian
(509) 881-2213 (East Wenatchee Office)
(509) 881-3964 (Wells Hatchery Office)
betsy.bamberger@dcpud.org

Exhibit A

UNIVERSITY OF CALIFORNIA, DAVIS

BERKELEY • DAVIS • IRVINE • LOS ANGELES • MERCED • RIVERSIDE • SAN DIEGO • SAN FRANCISCO SANTA BARBARA • SANTA CRUZ

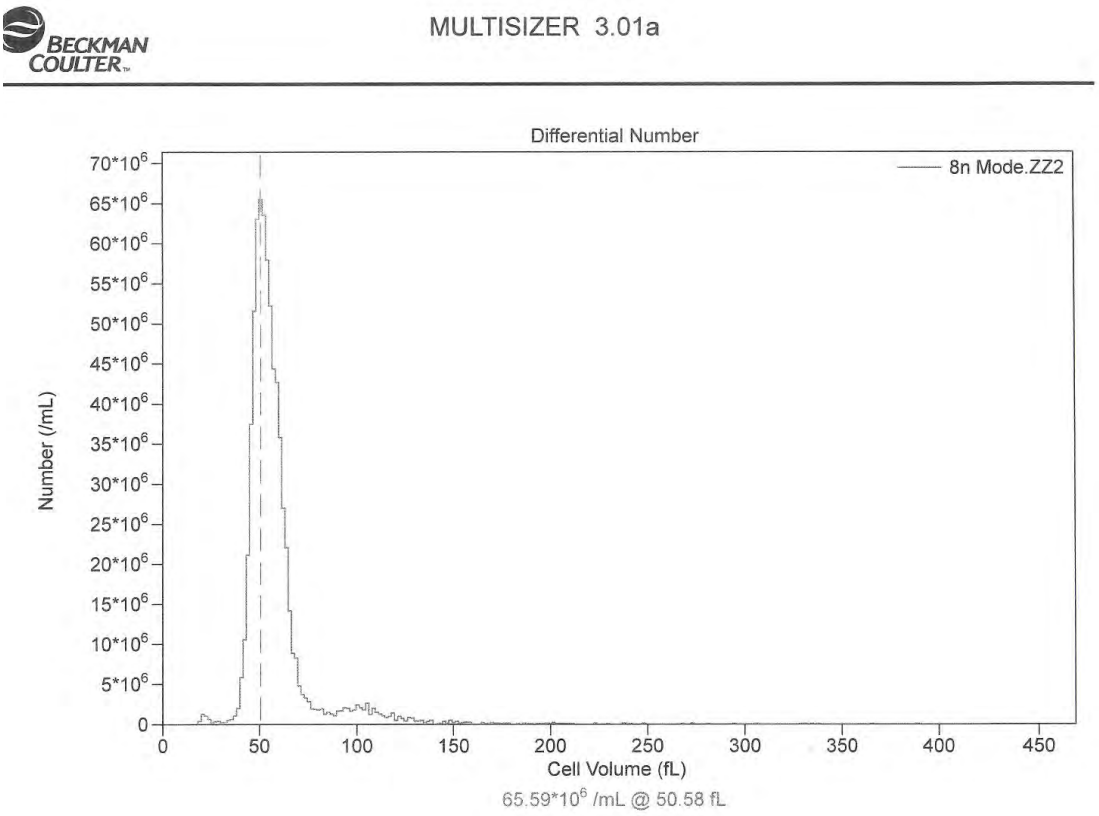
DEPARTMENT OF ANIMAL SCIENCE
ONE SHIELDS AVENUE
DAVIS, CALIFORNIA 95616.8521
TELEPHONE: (530) 752-1250
FAX: (530) 752-0175

April 5, 2024

Dear Dr. Bamberger,

On March 29, 2024, we analyzed 330 juvenile white sturgeon blood samples provided by Douglas County PUD to screen for the presence of spontaneous autopolyploids, or individuals with 1.5x the normal 8N genome size. We used a Beckman Coulter Z2 Coulter® Partler Count and Size Analyzer measure the mode nuclear volume for red blood cells in each sample. Red blood cells in each sample were lysed using Zapoglobin II lytic reagent to free nuclei for analysis and a small volume was loaded into the Z2 instrument.

All individuals analyzed were of normal 8N ploidy. Mode nuclear volumes of the samples ranged from 45.60 – 53.89 femtoliters (fl; equivalent to cubic microns). Below is an example result for an 8N sample, with a mode nuclear volume of 50.58 fl.



Appended to this letter are the mode nuclear volumes recorded for each individual blood sample. Please don't hesitate to reach out with any questions about these results!

Sincerely,

Andrea Schreier, PhD
Adjunct Associate Professor
Department of Animal Science
University of California Davis
amdrauch@ucdavis.edu
Office: 530-752-0664

Sturgeon Ploidy Date = 3/29/24

Blood #	Mode Volume	Blood #	Mode Volume	Blood #	Mode Volume	Blood #	Mode Volume
1	50.5781	39	48.9198	77	48.9198	115	53.8946
2	52.2364	40	53.8946	78	48.9198	116	53.8946
3	52.2364	41	48.9198	79	48.9198	117	45.6032 dark
4	50.5781	42	48.9198	80	48.9198	118	48.9198
5	50.5781	43	48.9198	81	53.8946	119	48.9198
6	48.9198	44	48.9198	82	53.8946	120	48.9198
7	50.5781	45	48.9198	83	48.9198	121	48.9198
8	50.5781	46	48.9198	84	48.9198	122	47.2615
9	48.9198	47	53.8946	85	53.8946	123	53.8946
10	50.5781	48	48.9198	86	48.9198	124	48.9198
11	50.5781	49	48.9198	87	53.8946	125	53.8946
12	52.2364	50	45.6032	88	48.9198	126	53.8946
13	48.9198	51	53.8946	89	48.9198	127	50.5781
14	52.2364	52	48.9198	90	48.9198	128	50.5781
15	48.9198	53	48.9198	91	48.9198	129	50.5781
16	48.9198	54	48.9198	92	48.9198	130	50.5781
17	53.8946	55	53.8946	93	53.8946	131	47.2615
18	48.9198	56	48.9198	94	48.9198	132	50.5781
19	48.9198	57	53.8946	95	53.8946	133	50.5781
20	48.9198	58	53.8946	96	53.8946	134	50.5781
21	48.9198	59	48.9198	97	48.9198	135	47.2615
22	48.9198	60	53.8946	98	48.9198	136	50.5781
23	48.9198	61	48.9198	99	53.8946	137	47.2615
24	53.8946	62	48.9198	100	48.9198	138	50.5781
25	53.8946	63	53.8946	101	48.9198	139	53.8946
26	53.8946	64	48.9198	102	48.9198	140	50.5781
27	53.8946	65	48.9198	103	48.9198	141	53.8946
28	48.9198	66	53.8946	104	48.9198	142	50.5781
29	48.9198	67	48.9198	105	53.8946	143	48.9198
30	53.8946	68	48.9198	106	48.9198	144	48.9198
31	53.8946	69	48.9198	107	48.9198	145	50.5781
32	48.9198	70	48.9198	108	48.9198	146	50.5781
33	53.8946	71	48.9198	109	53.8946	147	50.5781
34	53.8946	72	48.9198	110	53.8946	148	53.8946
35	53.8946	73	48.9198	111	48.9198	149	53.8946
36	48.9198	74	53.8946	112	53.8946	150	50.5781
37	48.9198	75	48.9198	113	48.9198	151	50.5781
38	48.9198	76	48.9198	114	50.5781	152	50.5781

Sturgeon Ploidy Date = 3/29/24

Blood #	Mode Volume	Blood #	Mode Volume	Blood #	Mode Volume	Blood #	Mode Volume
153	50.5781	191	53.8946	229	53.8946	267	53.8946
154	53.8946	192	53.8946	230	53.8946	268	47.2615
155	50.5781	193	50.5781	231	48.9198	269	48.9198
156	50.5781	194	50.5781	232	53.8946	270	50.5781
157	50.5781	195	50.5781	233	48.9198	271	53.8946
158	50.5781	196	53.8946	234	48.9198	272	47.2615
159	50.5781	197	50.5781	235	48.9198	273	48.9198
160	53.8946	198	50.5781	236	53.8946	274	53.8946
161	53.8946	199	50.5781	237	48.9198	275	50.5781
162	50.5781	200	50.5781	238	48.9198	276	48.9198
163	50.5781	201	53.8946	239	48.9198	277	50.5781
164	50.5781	202	53.8946	240	48.9198	278	53.8946
165	50.5781	203	52.2364	241	48.9198	279	50.5781
166	47.2615	204	53.8946	242	48.9198	280	48.9198
167	50.5781	205	53.8946	243	53.8946	281	50.5781
168	50.5781	206	52.2364	244	53.8946	282	53.8946
169	53.8946	207	53.8946	245	48.9198	283	50.5781
170	50.5781	208	48.9198	246	48.9198	284	53.8946
171	53.8946	209	53.8946	247	48.9198	285	50.5781
172	50.5781	210	53.8946	248	48.9198	286	50.5781
173	50.5781	211	48.9198	249	48.9198	287	50.5781
174	50.5781	212	53.8946	250	53.8946	288	53.8946
175	53.8946	213	53.8946	251	53.8946	289	53.8946
176	53.8946	214	48.9198	252	53.8946	290	48.9198
177	50.5781	215	53.8946	253	53.8946	291	50.5781
178	53.8946	216	53.8946	254	53.8946	292	53.8946
179	50.5781	217	53.8946	255	53.8946	293	50.5781
180	50.5781	218	53.8946	256	53.8946	294	50.5781
181	50.5781	219	53.8946	257	53.8946	295	50.5781
182	53.8946	220	48.9198	258	53.8946	296	50.5781
183	50.5781	221	48.9198	259	53.8946	297	50.5781
184	53.8946	222	53.8946	260	48.9198	298	53.8946
185	50.5781	223	53.8946	261	53.8946	299	53.8946
186	50.5781	224	53.8946	262	48.9198	300	50.5781
187	50.5781	225	48.9198	263	53.8946	301	53.8946
188	47.2615	226	48.9198	264	53.8946	302	53.8946
189	50.5781	227	53.8946	265	50.5781	303	50.5781
190	50.5781	228	48.9198	266	53.8946	304	50.5781

Sturgeon Ploidy			Date = 3/29/24
Blood #	Mode Volume	Blood #	Mode Volume
305	53.8946	343	
306	50.5781	344	
307	50.5781	345	
308	50.5781	346	
309	50.5781	347	
310	53.8946	348	
311	50.5781	349	
312	53.8946	350	
313	50.5781	351	
314	53.8946	352	
315	50.5781	353	
316	50.5781	354	
317	53.8946	355	
318	50.5781	356	
319	50.5781	357	
320	50.5781	358	
321	53.8946	359	
322	50.5781	360	
323	50.5781	361	
324	50.5781	362	
325	53.8946	363	
326	50.5781	364	
327	50.5781	365	
328	50.5781	366	
329	50.5781	367	
330	50.5781	368	
331		369	
332		370	
333		371	
334		372	
335		373	
336		374	
337		375	
338		376	
339		377	
340		378	
341		379	
342		380	

FINAL

Conference Call Minutes

Aquatic Settlement Work Group

To: Aquatic SWG Parties Date: June 12, 2024

From: John Ferguson, Chair, Anchor QEA

Re: Final Minutes of the May 8, 2024, Aquatic SWG Conference Call

The Aquatic Settlement Work Group (SWG) met by conference call on Wednesday, May 8, 2024, from 10:00 a.m. to 11:00 a.m. Attendees are listed in Attachment A of these conference call minutes.

Summary of Action Items

1. Douglas PUD will consult the Yakama Nation (YN) about lamprey trap operations for implementation at Wells Dam in 2024, including possibly collecting genetic fin clips and release location for fish collected in the traps, for further discussion with the Aquatic SWG (Item I-C).
2. Aquatic SWG representatives will submit questions, if any, on the *Wells Dam Adult Lamprey Approach And Passage Study, 2022–23* (2022–2023 Adult Pacific Lamprey Approach and Passage Study Report) comment/response table by close-of-business (COB) Wednesday, May 22, with a goal of resolving questions before voting to approve the report during the Aquatic SWG conference call on June 12, 2024 (Item II-B).
3. A joint session of the Rocky Reach Fish Forum (RRFF), Priest Rapids Fish Forum (PRFF), and Aquatic SWG will convene on June 5, for Pacific Northwest National Laboratory (PNNL) to present results from their 2023 juvenile Pacific Lamprey passage behavior and survival study. The start time and call-in information are forthcoming (Item III-A).
4. The Aquatic SWG meeting on June 12, 2024, will be held by conference call (Item III-A).

Summary of Decisions

1. Aquatic SWG representatives present approved the *Annual Report Calendar Year 2023 Activities Under the Aquatic Settlement Agreement* (2023 ASA Annual Report), as revised, and appended *2023 Annual Report White Sturgeon Management Plan* (2023 WSMP Annual Report), as revised; *2023 Bull Trout Management Plan and Incidental Take Annual Report* (2023 BTMP Annual Report), as revised; *2023 Annual Report Water Quality Management Plan* (2023 WQMP Annual Report), as revised, and appended 2023 Water Temperature Annual Report; *Pacific Lamprey Management Plan 2023 Annual Report* (2023 PLMP Annual Report), as revised; *Aquatic Nuisance Species Management Plan 2023 Annual Report* (2023 ANSMP Annual Report),

as revised; and the *Resident Fish Management Plan 2023 Annual Report* (2023 RFMP Annual Report). The Confederated Tribes of the Colville Reservation (CTCR) approved the reports via email prior to the conference call on May 8, 2024 (Item II-A).

Agreements

1. There were no agreements discussed during today's conference call.

Review Items

1. The draft *Total Dissolved Gas Water Quality Attainment Plan Year 10 Report* was distributed to the Aquatic SWG by Kristi Geris on November 14, 2023, and is available for review with edits and comments due to Mariah Mayfield.
2. The revised draft 2022–2023 Adult Pacific Lamprey Approach and Passage Study Report and comment/response table were distributed to the Aquatic SWG by Kristi Geris on May 6. Questions on the comment/response table are due by COB Wednesday, May 22. Douglas PUD will request approval of the revised report during the Aquatic SWG conference call on June 12, 2024 (Item II-B).

Documents Finalized

1. The final 2023 ASA Annual Report and appended six resource management plan annual reports were filed with the Federal Energy Regulatory Commission on May 15, and were distributed to the Aquatic SWG on May 16, 2024 (Item II-A).

I. Welcome

A. Review Agenda (John Ferguson)

John Ferguson welcomed the Aquatic SWG members (Attachment A) and reviewed the agenda. Ferguson asked for any additions or changes to the agenda. No additions or changes were requested.

B. Meeting Minutes Approval (John Ferguson)

The revised draft April 10 conference call minutes were reviewed. Kristi Geris said no edits and comments were received from Aquatic SWG representatives. Geris updated one action item and noted distribution of the revised annual reports. Aquatic SWG representatives present approved the April 10 conference call minutes, as revised. The CTCR abstained via email prior to the conference call on May 8, because a representative did not participate in the April 10, 2024, conference call.

C. Review of Action Items (John Ferguson)

Action items from the Aquatic SWG conference call on April 10, 2024, are as follows *(Note: The following italicized item numbers correspond to agenda items from the April 10, 2024, meeting)*:

1. *Anchor QEA will follow-up with Tracy Hillman (RRFF and PRFF Facilitator) about the call-in information to attend PNNL's presentation of their 2023 juvenile Pacific Lamprey passage behavior and survival study during a joint meeting of the RRFF, PRFF, and Aquatic SWG on June 5, 2024 (Item I-C).*
   The presentation will be held at 10:00 a.m., and Hillman will provide call-in information once it is available. *(Note: the PRFF agenda with call-in information was distributed to the Aquatic SWG by Kristi Geris on May 29, 2024.)*
2. *Douglas PUD will consult the YN about lamprey trap operations for implementation at Wells Dam in 2024, including possibly collecting genetic fin clips and release location for fish collected in the traps, for further discussion with the Aquatic SWG (Item I-C).*
   This action item will be carried forward.

II. Summary of Discussions

A. DECISION: 2023 ASA Annual Report (John Ferguson)

The draft 2023 ASA Annual Report and six appended draft aquatic resource management plan annual reports were distributed for a 45-day review with edits and comments due on April 22. The revised reports for approval were distributed on May 1. John Ferguson suggested that Kristi Geris review comments received on the draft 2023 ASA Annual Report and then Douglas PUD cover the six aquatic resource management annual reports. Ferguson noted that late comments were also submitted by Ralph Lampman about 1 hour before today's conference call, which will be reviewed last.

Kristi Geris said for the draft 2023 ASA Annual Report, the only comments received were from Jason McLellan. Edits were made to address McLellan's comments, which have already been reviewed and approved by Douglas PUD and McLellan, and the edits were distributed to the Aquatic SWG in Microsoft's *Track Changes*. The Aquatic SWG reviewed these edits, and no further comments were expressed.

Chas Kyger said for the draft 2023 WSMP, BTMP, and ANSMP annual reports, the only comments received were from McLellan, and all were minor clarifications fixing typos. In the draft 2023 ANSMP Annual Report, Douglas PUD also added language about the eDNA detection process. This was general language, applicable to any species, copied from the Northern Pike Monitoring Plan. All edits were accepted, and the final draft reports were distributed to the Aquatic SWG. No comments were received on the draft 2023 RFMP Annual Report.

Mariah Mayfield said no comments were received on the draft 2023 WQMP and PLMP annual reports. Lampman noted that his comments were to these two reports, and he reviewed each comment. Douglas PUD agreed to incorporate one minor edit in each report. However, Ferguson and Mayfield suggested, in fairness of Aquatic SWG review and process timing, that Douglas PUD consider and address all other comments in next year's reports. Andrew Gingerich added that these comments and edits are helpful, and it would be nice to receive these during the requested review period. Lampman agreed.

Aquatic SWG representatives present approved the 2023 ASA Annual Report, as revised, and appended 2023 WSMP Annual Report, as revised; 2023 BTMP Annual Report, as revised; 2023 WQMP Annual Report, as revised, and appended 2023 Water Temperature Annual Report; 2023 PLMP Annual Report, as revised; 2023 ANSMP Annual Report, as revised; and the 2023 RFMP Annual Report. The CTCR approved the reports via email prior to the conference call on May 8.

The final 2023 ASA Annual Report and appended six resource management plan annual reports were filed with the Federal Energy Regulatory Commission on May 15, and were distributed to the Aquatic SWG on May 16, 2024.

B. 2022–2023 Adult Pacific Lamprey Approach and Passage Study Report (Mariah Mayfield)

The draft 2022–2023 Adult Pacific Lamprey Approach and Passage Study Report was distributed for a 30-day review. Comments were received from the CTCR, the YN, and U.S. Fish and Wildlife Service. The final draft report for approval, along with comment/response table were distributed on May 6. Mariah Mayfield said Douglas PUD tried incorporating as many comments as possible. Many edits were clarifying language in the report. More significant edits included the updated condition factor, changing movement speed from kilometers per day to kilometers per hour, addressing what happened to fish that passed Wells Dam but were not detected in the tributaries, consideration of environmental factors, and adding caveats that this was a 1-year study. In the comment/response table, the green cells were incorporated, and the red cells were not incorporated and include an explanation as to why not.

Ralph Lampman said he reviewed the comment/response table, and appreciates the work put into it. He has not yet reviewed the revised report. RD Nelle said he has not yet reviewed the table or the revised report. Mayfield acknowledged the lengthy comment/response table and said Douglas PUD is supportive of postponing the vote until next month. Douglas PUD prefers to give representatives adequate time for review before voting. John Ferguson suggested that Aquatic SWG representatives submit questions, if any, on the comment/response table by COB Wednesday, May 22, with a goal of resolving questions before voting to approve the report during the Aquatic SWG conference call on June 12, 2024. Douglas PUD agreed with this path forward.

Lampman suggested beginning discussions for the next adult passage study during next month's Aquatic SWG conference call. Andrew Gingerich agreed, and Mayfield said she also plans to begin discussing lamprey trap operations for this summer. Kristi Geris said she will add Adult Lamprey Study Planning to next month's agenda.

Lampman asked whether, in the 2022–2023 Adult Pacific Lamprey Approach and Passage Study, the tagged fish approaching Wells Dam struggled to get into the collection gallery entrance, or did these fish get into the entrance and then could not get into the first ladder? Mayfield said there was some confusion in the draft report with the use of "fishway" versus "ladders," which has been standardized in the revised report. There is a receiver in the collection gallery, but this receiver detects fish both inside and outside of the collection gallery, so it is unclear how many fish entered the gallery versus how many made it to Pool 1 of the ladder. More discussion was added to the report on this, and this is a potential objective for the next study.

C. Brood Year 2023 Wells White Sturgeon Rearing Update (Chas Kyger)

A brood year (BY) 2023 White Sturgeon Rearing Update (Attachment B) was distributed to the Aquatic SWG by Kristi Geris prior to the Aquatic SWG conference call on May 8, 2024. Chas Kyger said the blue shaded cells are fish marked for the Douglas PUD program. These 330 fish will be released in the first week in June 2024. A few days before release, fish will be measured, weighed, and scanned for a passive integrated transponder (PIT) tag. Currently, nearly all fish exceed the 350-gram size threshold, and he guesses the final tank of smaller fish will exceed this threshold by release, as well.

Ralph Lampman asked whether the 350-gram threshold is the average weight or a minimum weight. The Aquatic SWG reviewed the current statement of agreement.[1] John Ferguson said it looks like this threshold is a minimum; however, in the past, there has been general consensus to release all fish. Kyger said this is correct, so long as the majority exceed the size threshold and all fish are large enough to receive a PIT tag.

III. Administration

A. Upcoming Meetings (John Ferguson)

A joint session of the RRFF, PRFF, and Aquatic SWG will convene on June 5 for PNNL to present results from their 2023 juvenile Pacific Lamprey passage behavior and survival study. The start time and call-in information are forthcoming. Ralph Lampman said the presentation will be about 20 minutes followed by questions and answers for about 20 minutes.

[1] *Statement of Agreement (SOA) Regarding Wells Reservoir White Sturgeon Supplementation 2023-2026*, approved on August 10, 2022.

The Aquatic SWG meeting on June 12 will be held by Microsoft Teams conference call.

Other upcoming meetings include July 10 and August 14, 2024 (conference call).

List of Attachments

Attachment A List of Attendees
Attachment B BY 2023 White Sturgeon Rearing Update

Attachment A – Attendees

Name	Role	Organization
John Ferguson	Aquatic SWG Chairman	Anchor QEA
Kristi Geris	Administration/Technical Support	Anchor QEA
Andrew Gingerich	Aquatic SWG Technical Representative	Douglas PUD
Chas Kyger	Aquatic SWG Technical Alternate	Douglas PUD
Mariah Mayfield	Aquatic SWG Technical Support	Douglas PUD
RD Nelle	Aquatic SWG Technical Representative	U.S. Fish and Wildlife Service
Stuart Fety	Aquatic SWG Technical Alternate	U.S. Fish and Wildlife Service
Patrick Verhey	Aquatic SWG Technical Representative	Washington Department of Fish and Wildlife
Ralph Lampman	Aquatic SWG Technical Representative	Yakama Nation

	10-Apr		8-May	
Tank	Population	Grams	Population	Grams
1	158	168.1	109	241.5
2	62	227.0	103	259.4
3	105	268.6	34	298.7
4	120	211.2	102	193.2
5	118	223.6	107	253.6
6	127	216.2	106	250.8
7	61	165.1	--	--
8	66	338.8	66	381.5
9	66	264.0	66	311.0
10	66	386.4	66	445.1
11	66	386.4	66	375.2
12	66	338.8	66	388.0
Mag 1	635	283.8	723	292.9
Mag 2	630	349.2	708	394.8
Total	2,346	286.2	2,322	324.4

Blue shaded cells are fish that have been scute marked and PIT tagged for the Douglas PUD supplementation program

FINAL

Conference Call Minutes

Aquatic Settlement Work Group

To: Aquatic SWG Parties Date: July 10, 2024

From: John Ferguson, Chair, Anchor QEA

Re: Final Minutes of the June 12, 2024, Aquatic SWG Conference Call

The Aquatic Settlement Work Group (SWG) met by conference call on Wednesday, June 12, 2024, from 10:00 a.m. to 11:30 a.m. Attendees are listed in Attachment A of these conference call minutes.

Summary of Action Items

1. Douglas PUD will verify whether any study fish from the *Wells Dam Adult Lamprey Approach and Passage Study, 2022–23* (2022–2023 Adult Pacific Lamprey Approach and Passage Study) were last detected in the zone around Chelan Falls (Item II-A). *(Note: Mariah Mayfield verified that one fish was last detected in this area, as distributed to the Aquatic SWG by Kristi Geris on June 18, 2024.)*
2. Douglas PUD will provide photographs of the perforated plates installed at the bottom of the orifices at the lamprey trap locations (in Weir 40) at Wells Dam (Item II-B). *(Note: Mariah Mayfield provided a photograph and drawing of the plates, as distributed to the Aquatic SWG by Kristi Geris on June 18, 2024.)*
3. The Yakama Nation (YN) will ask the Columbia River Inter-Tribal Fish Commission (CRITFC) about receiving the genetics results for tissue samples submitted by Douglas PUD from adult Pacific Lamprey collected at Wells Dam in 2024 (Item II-B).
4. The Aquatic SWG meeting on July 10, 2024, will be held by conference call (Item III-A).

Summary of Decisions

1. Aquatic SWG representatives present approved the 2022–2023 Adult Pacific Lamprey Approach and Passage Study Report, as revised (Item II-A).

Agreements

1. There were no agreements discussed during today's conference call.

Review Items

1. The draft *Total Dissolved Gas Water Quality Attainment Plan Year 10 Report* was distributed to the Aquatic SWG by Kristi Geris on November 14, 2023, and is available for review with edits and comments due to Mariah Mayfield.

Documents Finalized

1. The final 2022–2023 Adult Pacific Lamprey Approach and Passage Study Report was distributed to the Aquatic SWG by Kristi Geris on July 2, 2024 (Item II-A).

I. Welcome

A. Review Agenda (John Ferguson)

John Ferguson welcomed the Aquatic SWG members (Attachment A) and introduced Josanna Korcz (Douglas PUD Intern). Andrew Gingerich said Korcz will be an observer on today's conference call. She is finishing her studies at California State Polytechnic University, Humboldt. This summer, she will assist with actions under the Aquatic Settlement Agreement and other Natural Resources tasks. Mariah Mayfield said Korcz is interested in assisting with White Sturgeon larval collection if the Confederated Tribes of the Colville Reservation (CTCR) can use her help. Jason McLellan asked that Korcz email him to coordinate dates and times. McLellan said his crew does not need extra help, but he always welcomes staff out to get the experience.

Ferguson reviewed the agenda and asked for any additions or changes to the agenda. McLellan added brood year (BY) 2024 Wells White Sturgeon Larval Collection Update and BY 2023 Chelan White Sturgeon Spontaneous Autopolyploidy (SAP) Screening Update. Later in the meeting, Ralph Lampman walked on Juvenile Lamprey Collection for Passage Survival Studies, and Laura Heironimus walked on a Washington Department of Fish and Wildlife (WDFW) Coulter Counter update.

B. Meeting Minutes Approval (John Ferguson)

The revised draft May 8 conference call minutes were reviewed. Kristi Geris said edits and comments were received from Douglas PUD. Edits were minor clarifications that were incorporated into the revised minutes. Aquatic SWG representatives present approved the May 8 conference call minutes, as revised. The CTCR abstained because a representative did not participate in the May 8, 2024, conference call.

C. Review of Action Items (John Ferguson)

Action items from the Aquatic SWG conference call on May 8 are as follows *(Note: The following italicized item numbers correspond to agenda items from the May 8, 2024, meeting)*:

1. *Douglas PUD will consult the YN about lamprey trap operations for implementation at Wells Dam in 2024, including possibly collecting genetic fin clips and release location for fish collected in the traps, for further discussion with the Aquatic SWG (Item I-C).*
   This will be discussed during today's conference call.
2. *Aquatic SWG representatives will submit questions, if any, on the 2022–2023 Adult Pacific Lamprey Approach and Passage Study Report comment/response table by close of business (COB) Wednesday, May 22, with a goal of resolving questions before voting to approve the report during the Aquatic SWG conference call on June 12, 2024 (Item II-B).*
   This will be discussed during today's conference call.
3. *A joint session of the Rocky Reach Fish Forum (RRFF), Priest Rapids Fish Forum (PRFF), and Aquatic SWG will convene on June 5 for Pacific Northwest National Laboratory (PNNL) to present results from their 2023 juvenile Pacific Lamprey passage behavior and survival study. The start time and call-in information are forthcoming (Item III-A).*
   This will be discussed during today's conference call.

II. Summary of Discussions

A. DECISION: 2022–2023 Adult Pacific Lamprey Approach and Passage Study Report (Mariah Mayfield)

The draft 2022–2023 Adult Pacific Lamprey Approach and Passage Study Report was distributed for a 30-day review. Comments were received from the CTCR, the YN, and U.S. Fish and Wildlife Service (USFWS). The final draft report for approval, along with a comment/response table and a Microsoft's *Track Changes* version showing edits made to the report were distributed on May 6. Questions on the comment/response table were due to Douglas PUD by COB Wednesday, May 22.

Mariah Mayfield said the only questions received on the table were from USFWS, which were related to comments previously submitted by USFWS. These clarifications were provided, with no additional changes to the report. RD Nelle agreed with this recap and had nothing further to add.

Ralph Lampman asked whether the lamprey-specific condition factor (to eliminate length-based bias) was applied. Mayfield said yes. Lampman said a typical condition factor range for adult lamprey is from 1.4 to 3.2, with an average of 2.2. Figure 21 in the report shows a condition factor range from 0.5 to 1.0. He is curious about the calculation, but it is not explained in the report. Mayfield said she sent the condition factor that Lampman provided to Dave Robichaud (LGL Limited) to apply to the analysis.

Lampman said he is also curious about whether any study fish were last detected in the zone around Chelan Falls. He is curious whether study fish may have migrated into the Chelan River. Mayfield said she can verify this with Robichaud. *(Note: Mayfield verified that one fish was last detected in this area, as distributed to the Aquatic SWG by Kristi Geris on June 18.)*

Lampman asked whether, during this study period, bypass spill was provided 24 hours a day or only during certain times of the day. Mayfield said during the bypass period, some amount of spill is provided 24 hours a day, but this is variable depending on inflow, reservoir level, power demand, how many units are operating, and other factors.

Lampman said he has more minor questions but can reach out to Mayfield about these another time. Mayfield welcomed this, and noted that Robichaud is also available, as needed.

Aquatic SWG representatives present approved the 2022–2023 Adult Pacific Lamprey Approach and Passage Study Report, as revised.

The final report was distributed to the Aquatic SWG by Geris on July 2, 2024.

B. Lamprey Trap Operations at Wells Dam (Mariah Mayfield)

Mariah Mayfield said that this year, Douglas PUD plans to operate lamprey traps in both fish ladders at Wells Dam (in Weir 40). Perforated plates were installed at the bottom of the weir orifice to help increase trap efficiency. Trap operations will start each Sunday night, and traps will be checked Monday through Thursday mornings. All lamprey collected will be fin-clipped for genetic analysis, receive a passive integrated transponder (PIT) tag, and will be released in the tailrace. Again, this is not a formal study. Operation of the traps is pilot testing for future studies. Releasing PIT-tagged lamprey back into the tailrace may inform the question about how lamprey enter the fishways. Currently, the Pacific Lamprey run is off to a slow start. At the end of May, counts at Bonneville Dam were only 400 fish, which was lower than the 10-year average for that date of over 2,000 fish. Counts are now over 1,300 fish. The slow start could be related to the low-water year. To note, last year was a high-return year, which also had a slow start. Trap operations will begin in August.

Ralph Lampman asked whether two traps will be operated in each fish ladder. Mayfield said this is correct. Lampman asked whether there are photographs of the perforated plates installed at the bottom of the orifices. Mayfield said she will provide photographs for distribution. She also noted that, per Lampman's recommendation, more zip ties will be added to the entrance of the lamprey trap boxes so that individuals inside the trap cannot escape. Mechanics also made improvements to the trap infrastructure, so everything is in good working order. *(Note: Mayfield provided a photograph and drawing of the plates, as distributed to the Aquatic SWG by Kristi Geris on June 18, 2024.)*

RD Nelle asked how late the traps will be operated. Mayfield recalled that the Wells Habitat Conservation Plan (HCP) Coordinating Committee approved nighttime trapping in both fish ladders from August 1 to September 30.[1] If the run tapers off early, trap operations may be ended early.

John Ferguson asked where Douglas PUD sends the tissue clips. Mayfield said to CRITFC, for use in their larger parentage study that Lampman is involved with. Ferguson asked whether CRITFC reports the results back to Douglas PUD. Mayfield said she believes Jon Hess (CRITFC) published a paper last year about parentage analysis of returns to the Snake River. The study is looking at long-term trends of returning fish, so it may just be a matter of collecting enough data to publish a report. Lampman said this is correct: Hess produces annual reports each year. It would be interesting to better understand the genetic makeup of adults collected at Wells Dam, because these are the farthest migrating adult Pacific Lamprey in the system. He will ask CRITFC about receiving the genetics results for tissue samples submitted by Douglas PUD from adult Pacific Lamprey collected at Wells Dam in 2024. Ferguson said he understood that Pacific Lamprey are one big metapopulation. Lampman yes, but Columbia River basin lamprey are different than coastal lamprey, and Willamette River basin lamprey are different than Columbia River basin lamprey. The reaches farthest upstream have the largest lamprey, so there are differences in genetic makeup among the basins. The Bonneville reach has the most diversity.

C. Joint PNNL Juvenile Lamprey Study Presentation Recap (Mariah Mayfield)

On June 5, the PRFF, RRFF, and Aquatic SWG convened a joint session for PNNL to present results from their 2023 juvenile Pacific Lamprey passage behavior and survival study. PNNL's presentation was distributed to the Aquatic SWG by Kristi Geris following the session on June 5, 2024.

Mariah Mayfield said most Aquatic SWG representatives were able to join the presentation, which was also presented during the last U.S. Army Corps of Engineers Anadromous Fish Evaluation Program review. She went into the presentation thinking about what a juvenile lamprey study might look like for the Wells Project compared to the Snake River. She found it interesting that overall survival at Lower Granite Dam (LGR) went from 91% in 2022 down to 81% in 2023. This suggests there will be a range in survival. When Douglas PUD and the Aquatic SWG undertake a juvenile study in the Wells Project, what will the survival goals be? No one knows what normal passage rates or reservoir survival will look like, and she suggested keeping this in mind. Perhaps there are no specific targets—maybe the first study is more of an investigation of baseline data. In the PNNL study, survival through different passage routes was similar. Given the Wells Dam hydrocombine design, there will be no need to separate out powerhouse (PH) and spillway (SW) passage. Study fish appeared to survive via turbine passage. She asked about availability of acoustic tags, and Daniel

[1] The Wells HCP Coordinating Committee approved the activities described in the memorandum "Wells Dam Lamprey Trapping and Fishway Modifications 2024" on November 28, 2023.

Deng (PNNL) said tags may be available for other studies, but certain agencies will have priority (i.e., early adopters/funders). PNNL now has increased production capabilities, but the tags are not yet commercially available. A new battery may increase the longevity of battery life, which might lend itself to coordinating a study with the other PUDs.

Andrew Gingerich said there was an investigation about using hatchery surrogates, which found that hatchery fish did not perform quite as well as the run-of-river (ROR) fish. There is more work to be done here, but these findings speak to Douglas PUD's interest in adhering to the Pacific Lamprey Management Plan, which emphasizes using fish captured above Wells Dam. Gingerich recalled Mayfield noting the lower survival of hatchery-origin fish from LGR through Ice Harbor Dam (IHR); in addition, despite the different LGR dam passage rates, cumulative survival was fairly consistent (LGR to IHR in 2023 and 2022 for ROR juveniles). Gingerich said Bob Mueller (PNNL) talked about approach depths as fish entered the forebay. Gingerich has always assumed juvenile lamprey move at the bottom of the water column, but Mueller said although most fish migrated along the bottom, some also used the SW at LGR and Lower Monumental Dam (LMN). At Wells Dam, the SWs occupy the top 71 to 75 feet of the water column, so perhaps most lamprey passing Wells Dam will pass via the SW. Mayfield added that Deng shared an extra slide showing that about 75 meters upstream of the dam, there is a separation of fish that pass deep via the PH or pass near the surface via the SW. Gingerich said lastly, in a comparison of larval versus juvenile lamprey, detection of larval lamprey was not high. He suspects larval lamprey might not be moving. The detection of juvenile lamprey was much higher.

John Ferguson asked what "PS" and "GC" represent in this presentation, and Mayfield replied, "performance standard" and "gas cap" spill. Gingerich noted the higher survival in ROR juveniles during GC spill versus PS spill, but he is unsure whether survival is being impacted by other covariates here. During the presentation, Gingerich asked whether, given PS and GC spill occur during a certain time of day, and fish migration is different diurnally, this could really just be diel changes in behavior and survival rather than a spill regime effect. This remains a question. Ferguson noted the large standard error on these data. Gingerich said Ryan Harnish (PNNL) speculated that during GC spill, high discharge through the SW flushes fish out of the tailrace quicker, perhaps resulting in the higher survival. There were longer egress times for fish passing during PS spill.

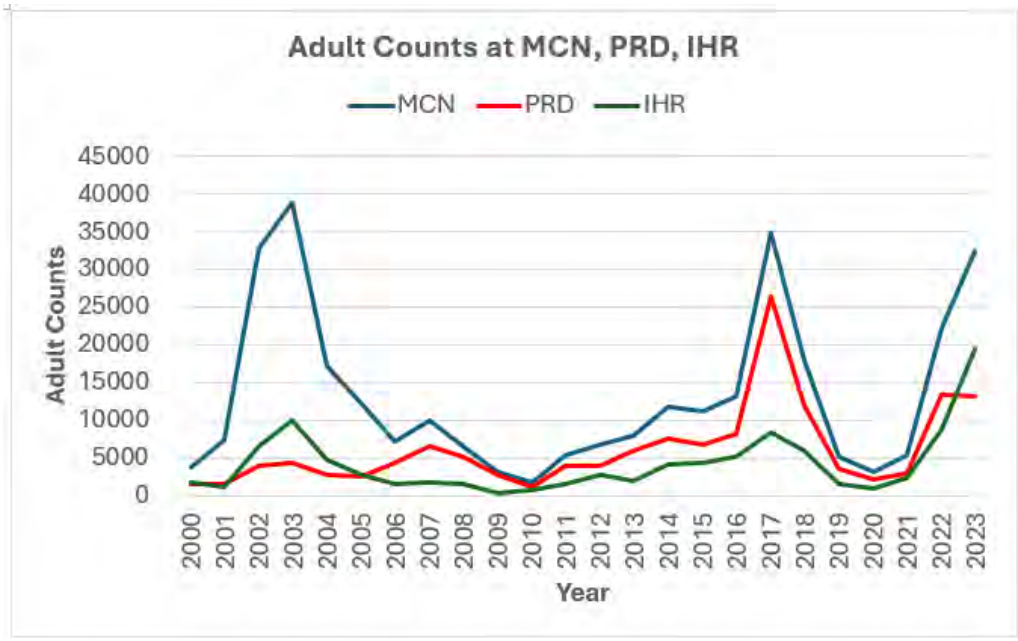
Mayfield said that, historically, there has not been a consistent source of macrophthalmia juveniles above Wells Dam to obtain for a study. This year, for the first time, the Lower Methow River rotary screw trap (RST) was successful at catching juvenile lamprey, collecting over 600 juveniles. Previously, the maximum number collected was 180 juveniles. If these numbers continue over the next few years, there may be potential for a study. Lampman thanked Mayfield for this update.

Lampman said, regarding the presentation, that he was curious about river depth, but this information was not available. There were definitely day-versus-night differences. More fish used SW passage at night and PH passage during the day. Regarding the difference in survival for artificially propagated fish versus wild fish, artificially propagated fish were released later in the season after most of the run had passed. Although wild fish were also released with the artificially propagated fish, there was a size difference between the two groups, so this year the YN provided larger artificially propagated juveniles to try and match the wild fish size. He is curious whether artificially propagated fish and wild fish selected different or similar passage routes. He was surprised about a lot of fish movement during the day. Early in the season, according to Mueller fish movement was mostly split evenly between day and night, and later in the season there was more movement at night.

D. Juvenile Lamprey Collection for Passage Survival Studies (Ralph Lampman)

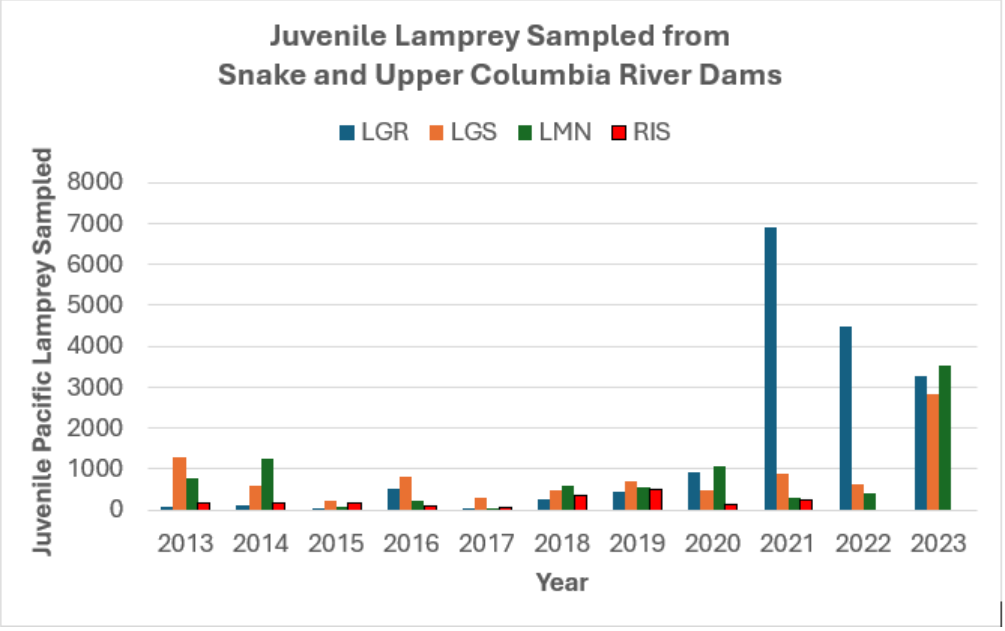
Ralph Lampman shared on Microsoft Teams three figures, which were distributed to the Aquatic SWG by Kristi Geris following the Aquatic SWG conference call on June 12, 2024.

Lampman said the first figure shows that Priest Rapids Dam (PRD) has slightly more adult counts than the Snake River system. It seems adults are splitting roughly 50/50 at the confluence.

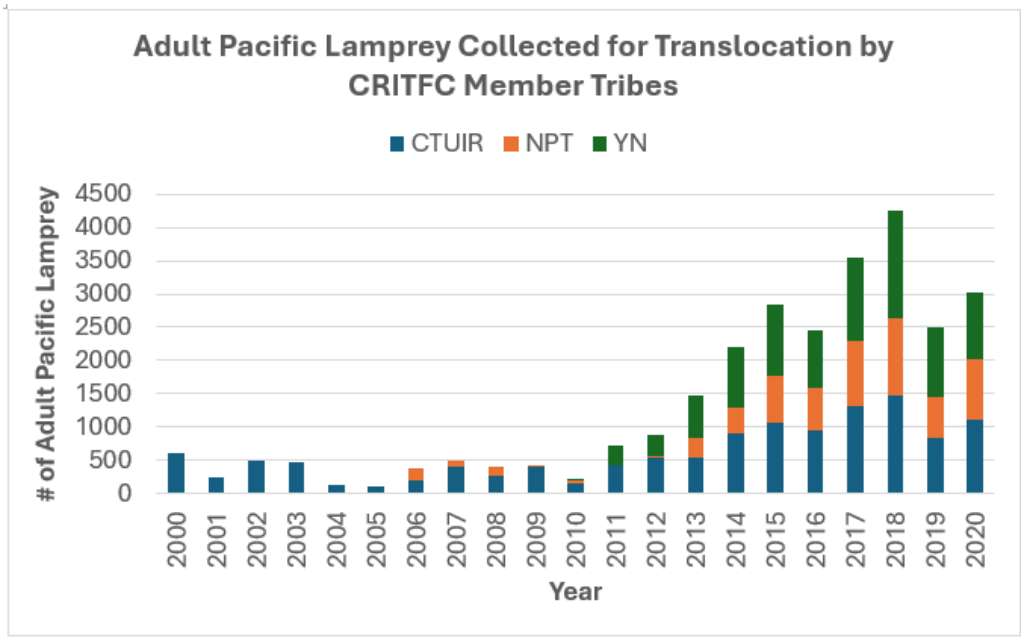


Lampman said the second figure shows that juvenile lamprey sampled at Rock Island Dam (RIS) is always lower. John Ferguson noted that RIS has a completely different collection system, so it is expected that numbers would be a fraction of those at LGR, Little Goose Dam, and LMN. Lampman agreed. He said his point is that he does not think the number of juveniles collected in a system is necessarily a reflection of the number of adults counted in the system. Both Snake and Upper

Columbia rivers likely have very similar juvenile production. The key is to ensure there is a good system in place to collect the juveniles.



Lampman said the third figure shows adult Pacific Lamprey translocated by CRITFC member tribes. The Nez Perce Tribe releases fish in the Snake River, the Confederated Tribes of the Umatilla Indian Reservation release fish in the Snake and Columbia rivers, and the YN releases approximately 50% in the Yakima River, 25% in the Wenatchee River, and 25% in the Methow River. Over the years, these releases have increased in numbers in both the Snake and Upper Columbia rivers.



Lampman said the YN submitted a funding proposal to the Bureau of Indian Affairs (BIA) for the purchase and design of juvenile lamprey traps, including the following: 1) either RSTs or an inclined plane trap; and 2) a prototype lamprey-specific trap designed by PNNL. The proposal includes contracting a vendor, such as West Fork Environmental, to modify the traps for juvenile lamprey. The prototype by PNNL is a design specific for raceway and bypass environments, and there is discussion about how to modify this design to be used in river environments. The proposal includes testing this in canal systems, such as the Dryden Canal.[2] Ferguson asked about the timing for a funding decision. Lampman said the proposal was submitted under BIA's Hydropower Compliance Program for fiscal year 2024. He is unsure about the timeline, but BIA is currently reviewing the proposal.

Ferguson noted that in the first figure, in 2003, a lot of fish did not convert from McNary Dam (MCN) to the upper basins, but in 2017, most did. What changed? Lampman said that at MCN, counts used to be estimated based on daytime counts only. Now there are day and night counts. He has not looked into this gap, but typically when there are high numbers downstream, fish continue upstream in higher proportions. This is contrary to the 2003 data.

E. Adult Lamprey Study Planning (Mariah Mayfield)

Mariah Mayfield said Douglas PUD has been discussing the results of the 2022–2023 Adult Pacific Lamprey Approach and Passage Study and has identified the following draft 2025 Adult Pacific Lamprey Study objectives for Aquatic SWG discussion:

1. Assess approach and passage rates and compare to 2016 and 2022 studies.

[2] Refers to the head of the Dryden diversion intake of the Highline Irrigation Canal

   a. Release at Rocky Reach/Daroga State Park.
   b. Determine whether approach and in-ladder passage is consistently higher than in 2016.
2. Determine where the bottleneck between the tailrace and the fish ladder might be.
   a. Focus data collection on tailrace, collection gallery entrance, inside the collection gallery, and the entrance to ladder Pool 1 locations.
3. Potentially look at changes to (reducing) the head differential at the entrance to the collection gallery and how fishway entrance rates may change.

Mayfield said Objective 1 looks at approach rates using releases in the Rocky Reach Reservoir. In 2022, there was a higher approach rate than in 2016, and this objective looks at whether this higher approach rate is consistent for another year. This is based on report comments received from the Aquatic SWG cautioning about drawing conclusions on approach based on 1 year of data. Objective 2 looks at where the bottleneck is. Previous studies did not have the resolution to show whether fish struggled to get from the tailrace into the collection gallery or whether fish entered the gallery but could not get into the fish ladder (weir 1). This objective also includes figuring out logistics, such as whether acoustic telemetry is the best option considering the noisy environment in a tailrace. For Douglas PUD, Objectives 1 and 2 are the highest priority. The last potential objective looks at head differentials in the collection gallery. Modifying head differentials has been successful at other dams, where lamprey have shown a behavioral preference for certain head differentials.

Andrew Gingerich recalled testing modified head differentials in the past. After years of translocating adults above Wells Dam, it appears there is now more juvenile production in the Okanogan and Methow river basins. If these fish are attracted to juvenile pheromones, modified head differentials might be worth retesting. The last test was during a time when there did not seem to be as much production above Wells Dam. It seems there is curiosity about whether fish are not finding the collection gallery due to velocity issues. If so, modified head differentials may help improve this condition.

John Ferguson asked whether Objective 3 modifies the head differentials only at the entrance of the collection gallery. Gingerich said yes. As a reminder, Wells Dam typically operates at a 1.5-foot head differential between the collection gallery and the tailrace, which was established by National Marine Fisheries Service to encourage salmonids to enter the fish ladders. In the past, this has been reduced to 1.0-foot and 0.5-foot at night; however, results during past studies were limited due to low sample size. There was no statistical difference on a percent basis. There was slightly higher entrance efficiency with the reduced head, but overall passage success was a little lower, again not significantly different in either case. Ferguson asked about the study design used previously. Chas Kyger said this was a block design that alternated every other day and operated only at night.

Ferguson noted that Wells HCP Coordinating Committee approval would be needed for this objective should the Aquatic SWG choose to pursue it. *(Note: Kristi Geris redistributed the 2009 and 2013 study plans and reports, which tested modified head differentials, following the Aquatic SWG conference call on June 12, 2024.)*

Ralph Lampman said this is a good start. He is less interested in Objective 1 because this information will continue to be collected from PIT-tagged adults. He is primarily interested in the bottleneck at the collection gallery entrance. He thinks as a second priority, it is a good time to re-examine modified head differentials now that it seems there is a good number of fish that are motivated to interact with the dam. Balancing attraction and reduced attraction can be tricky. In the Lower Columbia River, this has worked at some locations, but not at others. He agreed a block design will help make side-by-side comparisons.

Mayfield suggested multiple release groups, including one downstream to look at approach and one in the tailrace to have more control on timing of fish interacting with the dam. Lampman said if the approach rate is 80%, the sample size will not change much. Lampman asked whether there was a difference in passage success depending on approach time. Mayfield said there was no statistical difference. Some fish approached quickly and passed, while some approached slowly and passed.

Mayfield said Douglas PUD is considering both acoustic and radio telemetry options. For radio tags, she is looking into internal antennas as opposed to external ones, because the latter seems to cause issues with swimming. For acoustic tags, she is exploring options better suited for tailrace environments. Lampman said he has not heard about radio tags with internal antennas. Mayfield said Advanced Telemetry Systems has some, but these tags are relatively large. She has reached out to them about the tag specifications and battery life. She also reached out to Lotek. Lampman suggested reaching out to PNNL, too, which has newer acoustic tags that work well in dam environments, as tested at LGR.

Ferguson suggested continuing this discussion next month. Mayfield encouraged representatives to contact her between meetings to discuss the objectives.

Lampman asked if the lamprey traps at Wells Dam are successful, will these fish be used for a 2025 study? Mayfield said perhaps. Douglas PUD has an agreement with Grant PUD to use fish collected at PRD, but using fish collected at Wells Dam could be an option. The Aquatic SWG also needs to decide whether to continue translocation or use all fish for a study.

F. BY 2024 Wells White Sturgeon Larval Collection Update and BY 2023 Chelan White Sturgeon SAP Screening Update (Jason McLellan)

Jason McLellan said, regarding BY 2024 Wells White Sturgeon larval collection, river temperatures are cooler than normal, at just over 13°C. Colleagues in British Columbia, Canada, are monitoring the Wanita spawning site at the Pend Oreille River confluence with the Columbia River, and no spawning has been observed. This location is warmer, so fish spawn here first, and about 2 weeks later spawning begins at the CTCR collection reaches. He suspects temperatures will rise any day now, and he guessed the CTCR will start fishing around June 25. This is a low-flow year, similar to last year. While not ideal, hatchery staff should expect more deliveries of smaller numbers of fish. The CTCR will try to minimize this as much as possible.

McLellan said, regarding BY 2023 Chelan White Sturgeon SAP screening, this year, there was an uptick in the number of 12N[3] fish, and fish thought to be 10N[4] were observed for the first time. The CTCR screened a total of 2,003 fish, and 20 fish (or 1%) were suspected of having abnormal ploidy. There were nine 12N fish and a series of fish with modal nuclei volumes (cubic micrometer [μm^3]) in the 60s, and a handful in the high 50s, indicating these were 10N fish. Last year, there was one 4N fish, which is rare. This year, there was a haploid-diploid mosaic fish (i.e., producing half 4N [haploid] blood cells and half 8N [diploid] blood cells), which is also rare. All abnormal ploidy fish were retained at the CTCR Resident Fish Hatchery and will be rescreened, along with screening the BY 2023 White Sturgeon for release in Rufus Woods. The CTCR are working with the Washington State University veterinarian laboratory to perform validation screening of the abnormal ploidy fish using flow cytometry. *(Note: McLellan later clarified that the Phenomics Laboratory uses the veterinarian school's flow cytometer, and it is the Phenomics Laboratory faculty that the CTCR are working with.)*

Andrew Gingerich asked how SAP results of BY 2023 Chelan White Sturgeon compared with BY 2023 Sherman Creek Hatchery White Sturgeon. McLellan said the Sherman Creek Hatchery fish have not yet been screened. This facility does not have heated water, so these fish are much farther behind in growth. The facility also does not have chilled water, so it is not desirable to screen the fish in the summer. This facility has a history of columnaris because fish were formerly sampled in the summer when reservoir temperatures were high. To remedy this, the comanagers decided to postpone screening of fish at this facility to late September or early October. There are just over 500 fish at this facility.

Gingerich asked, for the BY 2024 White Sturgeon larval collection effort, has the lack of draft at Grand Coulee Dam affected or complicated planning? McLellan said not yet, and he does not expect it to because the reservoir will be close to full by the time the effort starts. The issue is when there is

[3] Twelve copies of each chromosome, or irregular fish
[4] Ten copies of each chromosome, or irregular fish

a backwater effect due to a full reservoir combined with lower flows, which influences the way the gear fishes. Videography was collected to see how the frames were oriented upon deployment on substrate, and the frames were adjusted based on these results. During conditions of a full reservoir and lower flows, there is not enough pressure to make the frames set properly, so weights were added to the frames. Additionally, crews looked at collecting larvae higher in the water column by stacking an upper frame on top of the lower frame. Approximately 50% of the total catch was collected in the lower frame, and 50% was collected in the upper frame. This year, the height of the frame was increased, and the frame orientation was modified. It has the same net opening, but it is now narrower and taller. This should result in a 33% increase in catch per frame.

G. BY 2023 Wells White Sturgeon Fish Health Report, Release, and Outreach Update (Chas Kyger)

A BY 2023 White Sturgeon Pre-Release Size Histogram (Attachment B) was distributed to the Aquatic SWG by Kristi Geris following the Aquatic SWG conference call on June 12, 2024.

Chas Kyger said that on May 30, students from Bridgeport High School participated in the release of 330 BY 2023 Wells White Sturgeon. The pre-release average fish weight was 375 grams (g); however, some fish were under the size target of 350 g each. The growth (size) trajectory in the hatchery exceeded the size target, so hatchery staff reduced the water temperature to slow growth and put warmer water on the smaller Chelan PUD fish. This resulted in missing the size target for some of the Douglas PUD fish.

John Ferguson asked how many fish were under the size target. Kyger said about 100 fish were under 350 g but were still over 300 g. Again, this was due to a miscalculation. In the future, hatchery staff will make sure fish reach the size target before reducing temperatures.

Kyger recalled that SAP screening of BY 2023 Wells White Sturgeon was performed last February during tagging and marking, and no abnormal ploidy was detected. *(Note: the memorandum* "Notification of Fish Pre-Release/Transfer Health Inspection" *[Attachment C] for BY 2023 Wells White Sturgeon was distributed to the Aquatic SWG by Geris on May 29, 2024.)*

Ralph Lampman asked whether Wells Hatchery typically sees any fin deformities. Kyger said he has seen a few, but not as many in recent years. He believes this is a product of more frequent grading and sorting of fish. No fin issues were observed this year.

H. WDFW Coulter Counter Update (Laura Heironimus)

Laura Heironimus recalled that last year WDFW purchased a Coulter counter, which is housed at Sherman Creek Hatchery. A technician was hired to help operate the counter and assist with White Sturgeon work in Lake Roosevelt. This update is to share that WDFW has the capacity to help with

SAP testing. The technician is already coordinating with the CTCR and the Spokane Tribe of Indians to make sure screening protocols are consistent.

III. Administration

A. Upcoming Meetings (John Ferguson)

The Aquatic SWG meeting on July 10 will be held by Microsoft Teams conference call.

Other upcoming meetings include August 14 and September 11, 2024 (conference call).

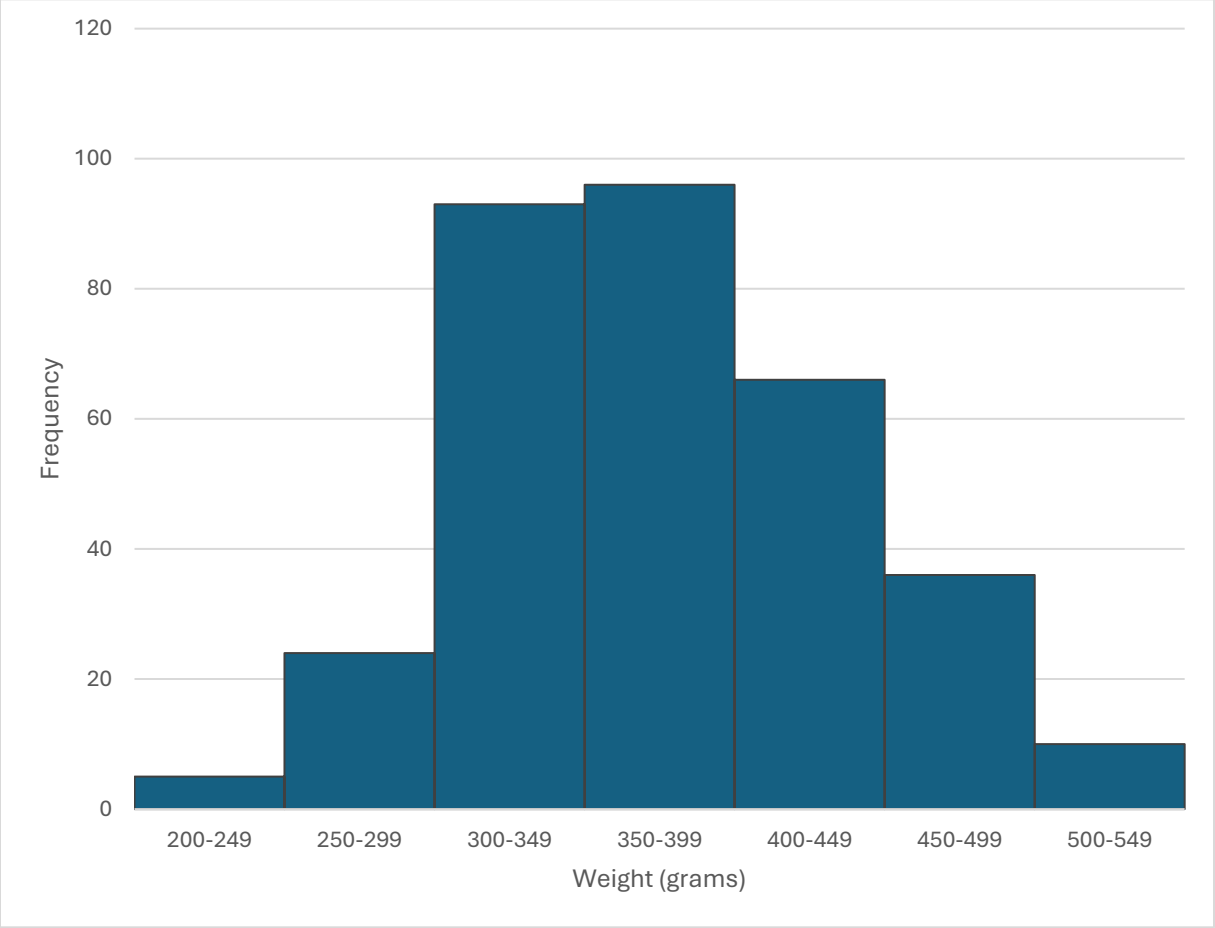
List of Attachments

Attachment A List of Attendees
Attachment B BY 2023 White Sturgeon Pre-Release Size Histogram
Attachment C *Notification of Fish Pre-Release/Transfer Health Inspection* for BY 2023 Wells White Sturgeon

Attachment A – Attendees

Name	Role	Organization
John Ferguson	Aquatic SWG Chairman	Anchor QEA
Kristi Geris	Administration/Technical Support	Anchor QEA
Andrew Gingerich	Aquatic SWG Technical Representative	Douglas PUD
Chas Kyger	Aquatic SWG Technical Alternate	Douglas PUD
Mariah Mayfield	Aquatic SWG Technical Support	Douglas PUD
Josanna Korcz	Observer	Douglas PUD (Intern)
RD Nelle	Aquatic SWG Technical Representative	U.S. Fish and Wildlife Service
Stuart Fety	Aquatic SWG Technical Alternate	U.S. Fish and Wildlife Service
Patrick Verhey	Aquatic SWG Technical Representative	Washington Department of Fish and Wildlife
Laura Heironimus	Aquatic SWG Technical Alternate	Washington Department of Fish and Wildlife
Jason McLellan	Aquatic SWG Technical Representative	Confederated Tribes of the Colville Reservation
Ralph Lampman	Aquatic SWG Technical Representative	Yakama Nation

Mean	375.8387879
Median	371.25
Minimum	209.3
Maximum	545.4
Count	330



Commissioners:
RONALD E. SKAGEN
MOLLY SIMPSON
AARON J. VIEBROCK

General Manager:
GARY R. IVORY

Public Utility District No. 1 of Douglas County

1151 Valley Mall Parkway · East Wenatchee, Washington 98802-4497 · 509/884-7191 · FAX 509/884-0553 · www.douglaspud.org

Memorandum

To: Dr. Megan Finley, WDFW (Senior Aquatic Veterinarian)

From: Dr. Betsy Bamberger, DCPUD (Fish Veterinarian)

Date: May 28th, 2024

Re: **Notification of Fish Pre-Release/Transfer Health Inspection**

Intended Fish Movement: Transfer and release of white sturgeon to the Columbia River over the next two weeks.

Please find the attached documentation attesting to the health status of stocks intended for release and/or transfer within the next 30 days as permitted by WDFW-approved stocking permits, transfer permits, and/or as described in the relevant Future Broodstock Document.

Fish health reports provided herein include:

1) Pre-transfer inspection at Wells Fish Hatchery (completed 5/28/24)
   Pertinent findings: Within normal limits. Fish approved for transfer.
2) Diagnostic examination at Wells Fish Hatchery (completed 8/21/23)
   Pertinent findings: Failure to thrive, drop-outs.

Please note that any viral testing requirements for white sturgeon have been indefinitely suspended by WDFW fish health pending revision of white sturgeon iridovirus (WSIV) disease surveillance protocols and development of an appropriate molecular assay. We request that WDFW contact us as soon as possible if more information is needed to approve this transfer.

Enclosures:

Attachment 1: Wells Fish Hatchery Fish Health Report 160 (completed 5/28/24)
Attachment 2: Wells Fish Hatchery Fish Health Report 147 (completed 8/21/23)

Betsy Bamberger

Betsy Bamberger, DVM
Fish Veterinarian
(509) 881-2213 (East Wenatchee Office)
(509) 881-3964 (Wells Hatchery Office)
betsy.bamberger@dcpud.org

Attachment 1

Commissioners:
RONALD E. SKAGEN
MOLLY SIMPSON
AARON J. VIEBROCK

General Manager:
GARY R. IVORY

Public Utility District No. 1 of Douglas County

1151 Valley Mall Parkway · East Wenatchee, Washington 98802-4497 · 509/884-7191 · FAX 509/884-0553 · www.douglaspud.org

#160

Fish Health Report

Location
Wells Hatchery

Date
May 28th, 2024

Species
WS:NA:ROOS:2023:W (~1 fpp, 330 fish total)

Holding Area
RT 7-12

Background: Sturgeon are to be transferred to and released from the Marina Park in Bridgeport, WA into the Columbia River this week and the next. Fish with negligible average daily mortality rates were visually assessed to avoid the unnecessary sacrifice of healthy fish in a stable population. Water temp: mid 50s-low 60s °F (100% well water); flow 12 gpm; density index 0.03-0.12.

Disease Assessment:

*** Moribund and/or select fish were netted from their corresponding tanks, euthanized with MS-222 (tricaine methanesulfonate) buffered with sodium bicarbonate ($NaHCO_3$), and necropsied on site. Only abnormalities are noted below. ***

White Sturgeon: There have been no mortalities this month thus far. Fish are feeding well, behaving normally, and in generally good condition upon visual inspection.

Diagnosis:

White Sturgeon: Within normal limits (visual inspection and mortality records only).

Recommendations:

White Sturgeon: None.

Comments:

White Sturgeon: Fish are approved for transfer.

Submitted By:
Betsy Bamberger, DVM
Fish Veterinarian
(509) 881-2213 (Office), (509) 881-3964 (Wells Hatchery)
betsy.bamberger@dcpud.org

Attachment 2

Commissioners:
RONALD E. SKAGEN
MOLLY SIMPSON
AARON J. VIEBROCK

General Manager:
GARY R. IVORY

Public Utility District No. 1 of Douglas County

1151 Valley Mall Parkway · East Wenatchee, Washington 98802-4497 · 509/884-7191 · FAX 509/884-0553 · www.douglaspud.org

#147

Fish Health Report

Location
Wells Hatchery

Date
August 21st, 2023

Species
WS:NA:ROOS:2023:W (~31-165 fpp, ~4,000 fish in population)

Holding Area
RT 1-12

Background: There has been persistent low-level mortality since the beginning of this month (reported as unusual by hatchery staff this week). A certain level of attrition is expected during the initial phases of the rearing process, but at this size it is considered (historically) unusual for fish to expire consistently at the current rate. Saprolegniasis (water mold) was first reported as the primary issue, but at inspection, most moribund individuals present with buoyancy loss (swimming upside down at the top of the water column) with no evident pathogen load. Some are laterally compressed (thin) and others have mild coelomic distention. Hatchery staff would like to rule out any contributing infectious causes. Reportedly, fish are being sorted twice weekly (during which feed is withheld and many individuals [possibly hundreds] are moved to assorted tanks based on size throughout the course of the day); it is possible that some level of grading is happening on a daily basis as deemed necessary. Feed sheets are being updated multiple times a week (if not daily). In an attempt to curtail loss, hatchery staff has reduced feeding (specific details are unknown) and decreased water temperature from 64 to 60°F last week over the course of three days. There is some concern that program quota goals will not be met with the current rate of loss (rearing targets are 325 fish 300 grams for DCPUD, 2,250 fish at 200 grams for Chelan County PUD via interlocal agreement). Fish arrived on station in batches beginning in late June and ending in early July (original number totaled 7,522). Water temp: 60°F (100% well water), flow 2.5-4.0 gpm, density index 0.04-0.13, 20-24% BW feed.

Disease Assessment:

Moribund and/or select fish were netted from the corresponding tanks, euthanized with MS-222 (tricaine methanesulfonate) buffered with sodium bicarbonate ($NaHCO_3$), and necropsied on site. Only abnormalities are noted below.

White Sturgeon: There has been approximately 27% loss in the sturgeon population just in the month of August (last three weeks) thus far. Eighty-seven morts were recovered collectively from all program tanks today (~2% loss); most (28) were retrieved from the "dink" tank (RT4) (~4% daily mortality). Numerous moribund fish were examined from a number of representative tanks. The vast majority look laterally compressed (thin). Others have pronounced coelomic distention. One fish has a grey soft flocculent tuft of material (*Saprolegnia*) overlaying a small focal skin abrasion (presumed trauma with secondary water mold growth). Those fish with noticeable bloat have enlarged, thin-walled stomachs filled with a mixture of air (gas) and clear fluid. The gallbladders in fish with these findings are also large and filled with green bile

(indicative of anorexia). No parasites or bacteria of concern were appreciated in skin scrapes or gill clips.

Diagnosis:

White Sturgeon:

1) Failure to thrive (anorexia)
2) Gastric bloat/tympany
3) Saprolegniasis, rare (one fish)

Recommendations:

Mitigate stress by decreasing handling (namely grading frequency, if allowable) and time spent in sturgeon room with the lights on.

Comments:

Because the chronic, low-level mortality cannot be readily attributed to any known infectious agent, it must be assumed that the gradual consistent loss observed to some degree in all size groups is the result of nonspecific suboptimal rearing conditions/environmental factors that have stressed the fish and affected their appetites. The recurrent disruption in routine caused by frequent grading (during which fish are netted, taken off feed, and then assigned a new feeding regime based on the updated stocking numbers) is the most probable source of stress for these fish. It is hoped that a reduction in the time spent grading overall lessens the stress experienced in the population. Although grading is recognized as a standard practice in sturgeon culture as a means to reduce competitive and bullying behavior, it should be performed judiciously (especially as the fish mature) and recognized as an intrusion with possible adverse effects.

Addendums:

8/30/23: Seven moribund fish were euthanized, fixed in 10% buffered formalin, and sent to the WA Animal Disease and Diagnostic Lab (WADDL) for histopathological analysis to rule-out the presence of pathogens not yet detected. Results are pending.

Hatchery staff will begin to implement a change in grading frequency beginning next week.

9/5/23: Losses have held steady over the weekend, ranging in total from the low twenties to mid-thirties (~0.5-1% daily loss). (Note: the population on the most recently updated available loading form is estimated at 3915). The majority of the loss comes from the “dink tank”, RT 4. Moribund fish were present in most tanks (both smaller, emaciated drop-outs and larger fish with the previously described bloated bellies). Hatchery staff thinks the fish look better after the long weekend and are about to turn the corner.

9/11/13: There are reports that grading is still continuing frequently and extending over multiple days during the workweek despite explicit instructions from hatchery manager(s). It is not clear whether the recommendation to limit interaction with the sturgeon is being adopted.

9/13/23: Histology results from WADDL (via voicemail) indicate that there are no pathogens present in the specimens evaluated. The livers are small, a finding indicative of low energy reserves (inadequate nutrition). See Attachment 1 for the finalized report.

9/18/23: Loss has gone down significantly over the last week; average daily mortality over the last five days is 0.30% (assuming the total population is now 2,781 individuals). Hatchery staff is optimistic that the fish are over the worst of it.

10/10/23: Mortality has vastly reduced overall; only RT 4 (the "dink tank") has had any appreciable loss over the last few weeks. During the last week of September, average daily loss in all tanks (except RT4) was only 0.07% (only 11 fish total). RT4 is still very high (31 fish lost in the last week of September with only 78 fish remaining today) and may soon deplete itself. Note that these calculations were based on the total population number (and number of fish in tanks) in the most current loading form sheet* which has been recently updated with a more accurate population number after a complete inventory check was made last week. This new number is much less than previously thought and naturally distorts all previously made mortality estimates.

10/19/23: Recent losses have been minimal; only four fish total have expired in the last week (three of which came from RT4) (average daily mortality 0.025%). The current loading form now indicates there are 2,303 individuals left in the program (roughly thirty more than reported last week) and this number was used to make the above calculation. There have been persistent issues regarding inventory numbers; this needs to be addressed internally so that accurate health monitoring can occur. Assuming the 2,303 number is correct, and earlier population counts were accurate**, there has been an estimated 41% total mortality in the program since the creation of this report on August 21st.

*There appears to have been an inventory adjustment in the Wells Stock inventory sheet, the latter stating there were 2,848 individuals in the population at the end of the month. The current loading form has 2,277 fish in all round tanks; this number has been verified by hatchery staff as correct to-date.

**Per available records: 1442 losses Aug 1 to Aug 21; 5369 fish total on Aug 1st. Originally 7522 fish after initial transfers.

Submitted By:

Betsy Bamberger, DVM
Fish Veterinarian
(509) 881-2213 (Office), (509) 881-3964 (Wells Hatchery)
betsy.bamberger@dcpud.org

Attachment 1

WASHINGTON STATE UNIVERSITY
Washington Animal Disease Diagnostic Laboratory

Accession Number: W232430059
Account Number: 10274

Testing Lab:	WADDL - Pullman	**Client:**	Douglas County Public Utility District
Case Coordinator:	Kevin Snekvik, DVM, PhD, DACVP		1151 Valley Mall Parkway
Date Received:	08/31/2023		East Wenatchee, WA 98802
Report Date:	09/29/2023	**PO #:**	38653
		Owner:	Wells Hatchery
		Veterinarian:	Betsy Bamberger

FINAL REPORT

Animal ID: WS:NA:R005:2023:W White Sturgeon :: NFS
Specimen: Whole Fish **Collection Date:**

HISTOPATHOLOGY

Test: Aquatic Histopathology, Urgent

Report Type Final Histo Report
Histopathology report

Primary Histologic Diagnoses:

1. Intestinal tympany, acute, regionally extensive, all fish, intestine/ pylorus
2. Hepatocellular atrophy, subacute, diffuse, moderate to severe, liver, all fish

Histologic Description:

One container is submitted and contains seven whole fish (white sturgeon per submitter). Three fish are randomly selected, sectioned into 10-11 whole body transverse sections and one paramedial section of the tail and a separate section of barbell. Fish 1 is included in slides 1-3, Fish 2 in slides 4-6 and Fish 3 in slides 7-9. All slides are stained and evaluated with a routine hematoxylin and eosin stain. Tissues range from excellent preservation to fair preservation in one fish. All fish essentially lack ingesta and digesta within the stomach and intestinal tract respectively. All three fish have similar changes and will be described together.

Gastrointestinal tract: The pyloric region of the stomach and anterior intestine, and in the most severely affected fish the distal (spiral) intestine, are moderately to greatly dilated up to 4mm in diameter. The mucosal epithelium in these areas is attenuated, lined by minimal mucous and the lumen lacks ingesta/ digesta. The proximal stomach has mild accumulations of mucous, rare fragments of ingested feed and low numbers of mixed bacteria. The cecum is normal.

Liver: Diffusely, the hepatocytes are shrunken with a nuclear to cytoplasmic ratio of 1:1 or less (atrophy). There are extensive regions in which the hepatocytes lack intracytoplasmic glycogen or lipid vacuoles. There is frequent congestion of sinusoids and portal vasculature.

The following tissues are normal: tail, cartilage, bone, nasal pits, eyes including rete mirabile, brain, lateral line system, pancreas, gills, heart, spinal cord, anterior kidney, posterior kidney, barbell, swim bladder (contracted), and skin

Comments:

The mortality in this group of white sturgeon is attributed to pyloric and intestinal tympany, anorexia and subsequent negative energy balance as evidenced by the hepatocellular atrophy. Unfortunately, there is no evidence of an underlying cause as the well-preserved sections reveal an attenuated but otherwise normal epithelium in the gastrointestinal tract. And while low numbers of

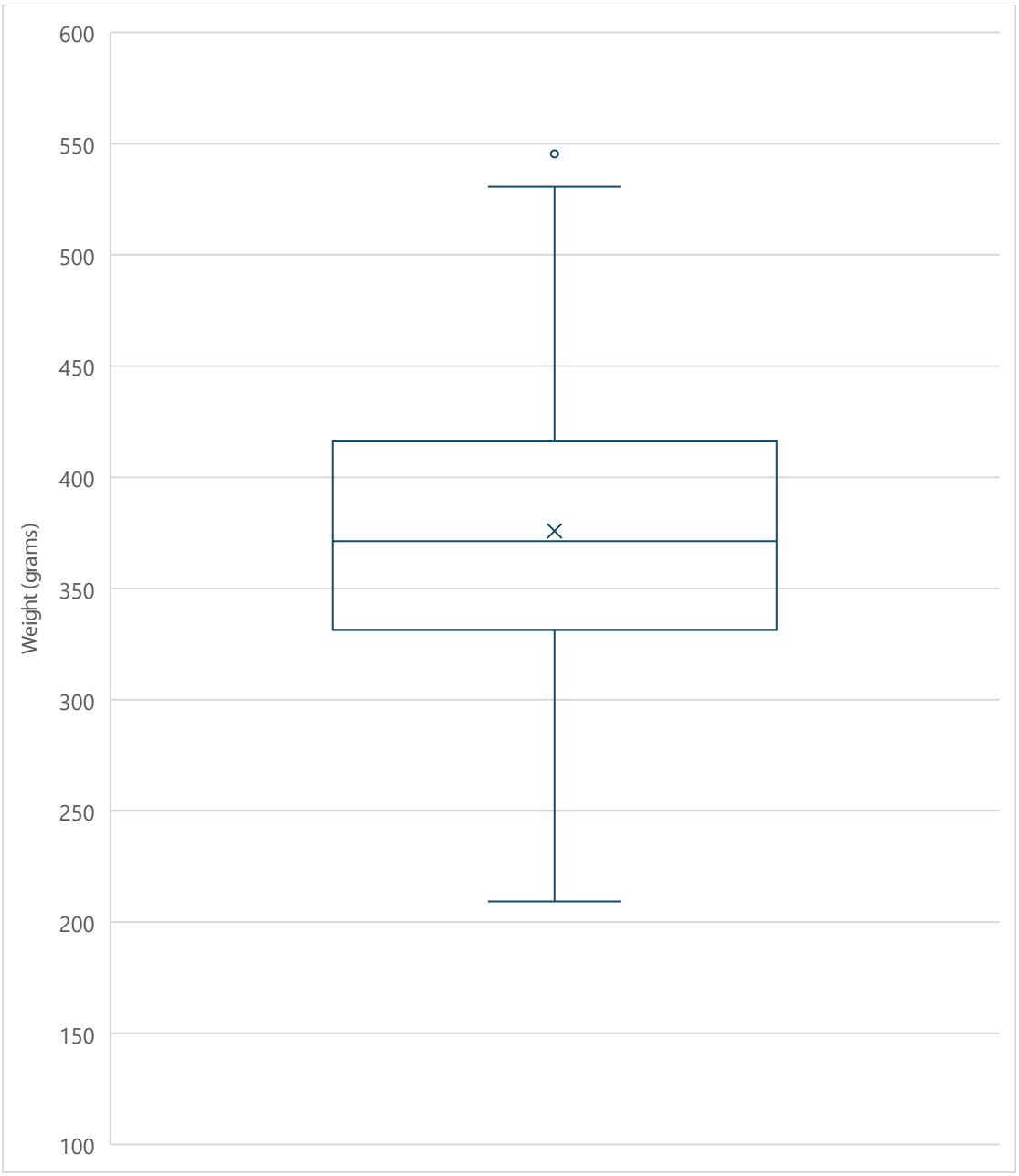
mixed bacteria are present in the anterior stomach similar organisms are not evident in the distended regions. While infectious causes are not evident, other stressors including altered environmental parameters, variation in feed or feed management, or other husbandry factors cannot be ruled out. There are reports of tympany in the literature, but these reports are typically associated with necrotizing enteritis, bacterial infections or alternatively barotrauma. I have seen similar lesions in juvenile sturgeon in Washington state previously, however there were no connections to a particular cause.

Phone Contact:
Voicemail of results left for Dr. Betsy Bamberger on 08 September 2023.

Authorized by: Dr. Kevin Snekvik, DVM, PhD, DACVP
Section Head

Notice: *This report contains information that is confidential and is intended for the use of the individual or entity named on page 1. If you have received this report in error, please notify WADDL staff immediately.*

Previous versions of this report
We have previously issued interim and/or final reports for this accession with the following names:
preliminary_report_W232430059_2023-09-28_13-58-12.pdf


600
550
500
450
400
350
300
250
200
150
100
Weight (grams)

FINAL

Conference Call Minutes

Aquatic Settlement Work Group

To: Aquatic SWG Parties Date: August 14, 2024

From: John Ferguson, Chair, Anchor QEA

Re: Final Minutes of the July 10, 2024, Aquatic SWG Conference Call

The Aquatic Settlement Work Group (SWG) met by conference call on Wednesday, July 10, 2024, from 10:00 a.m. to 11:00 a.m. Attendees are listed in Attachment A of these conference call minutes.

Summary of Action Items

1. The Yakama Nation (YN) will ask the Columbia River Inter-Tribal Fish Commission (CRITFC) about receiving the genetics results for tissue samples submitted by Douglas PUD from adult Pacific Lamprey collected at Wells Dam in 2024 (Item I-C). *(Note: Ralph Lampman confirmed with Jon Hess [CRITFC] that CRITFC can summarize the natal origins of these adults including fitness traits, as distributed to the Aquatic SWG on July 15, 2024.)*
2. Douglas PUD will further develop the 2025 Adult Pacific Lamprey Study, including the following: a) inquire about obtaining test tags from Advanced Telemetry Systems (ATS), and ask about the turn-around time for filling equipment and tag orders; b) look into deploying radio telemetry receivers below the collection gallery between the western and eastern auxiliary water supply (AWS) receiver locations; and c) develop an outline of a study plan which summarizes objectives, methods, and a draft schedule for finalizing a study plan, including a thorough Aquatic SWG review ahead of equipment ordering deadlines, for discussion during the Aquatic SWG conference call on August 14, 2024 (Item II-B).
3. The Aquatic SWG meeting on August 14, 2024, will be held by conference call (Item III-A).

Summary of Decisions

1. There were no decisions approved during today's conference call.

Agreements

1. There were no agreements discussed during today's conference call.

Review Items

1. The draft *Total Dissolved Gas Water Quality Attainment Plan Year 10 Report* was distributed to the Aquatic SWG by Kristi Geris on November 14, 2023, and is available for review with edits and comments due to Mariah Mayfield.
2. The draft memorandum *2025 Adult Lamprey Study Plan Overview* was distributed to the Aquatic SWG by Kristi Geris on August 13, and will be discussed during the Aquatic SWG conference call on August 14, 2024.

Documents Finalized

1. There are no documents that have been recently finalized.

I. Welcome

A. Review Agenda (John Ferguson)

John Ferguson welcomed the Aquatic SWG members (Attachment A) and reviewed the agenda. Ferguson asked for any additions or changes to the agenda. No additions or changes were requested. Later in the meeting, Ralph Lampman walked on "Juvenile Salmonid Studies at Wells Dam."

B. Meeting Minutes Approval (John Ferguson)

The revised draft June 12 conference call minutes were reviewed. Kristi Geris said edits and comments were received from Douglas PUD. Edits were minor clarifications that were incorporated into the revised minutes. Ralph Lampman provided edits prior to the Aquatic SWG conference call on July 10. The Aquatic SWG reviewed and approved these edits. Geris noted that Jason McLellan reviewed and provided clarifying edits to the "Brood Year (BY) 2023 Chelan White Sturgeon Spontaneous Autopolyploidy (SAP) Screening Update" prior to distributing the draft minutes for review. Aquatic SWG representatives present approved the June 12, 2024, conference call minutes, as revised.

C. Review of Action Items (John Ferguson)

Action items from the Aquatic SWG conference call on June 12 are as follows *(Note: The following italicized item numbers correspond to agenda items from the June 12, 2024, meeting)*:

1. *Douglas PUD will verify whether any study fish from the Wells Dam Adult Lamprey Approach and Passage Study, 2022–23, were last detected in the zone around Chelan Falls (Item II-A).* Mariah Mayfield verified that one fish was last detected in this area, as distributed to the Aquatic SWG by Kristi Geris on June 18.

2. *Douglas PUD will provide photographs of the perforated plates installed at the bottom of the orifices at the lamprey trap locations (in Weir 40) at Wells Dam (Item II-B).*
   Mayfield provided a photograph and drawing of the plates, as distributed to the Aquatic SWG by Kristi Geris on June 18, 2024.
3. *The YN will ask CRITFC about receiving the genetics results for tissue samples submitted by Douglas PUD from adult Pacific Lamprey collected at Wells Dam in 2024 (Item II-B).*
   Ralph Lampman said he sent an email but has not yet heard back. This action item will be carried forward.

II. Summary of Discussions

A. 2024 Adult Pacific Lamprey Translocation Schedule Update (Mariah Mayfield)

Mariah Mayfield said trapping at Priest Rapids Dam began last week. Next Thursday, July 18, will be Douglas PUD's first day of translocating adult Pacific Lamprey upstream of Wells Dam. Douglas PUD will send updates with numbers and any issues encountered. She reached out to the Confederated Tribes of the Colville Reservation (CTCR) about translocating fish farther upstream, which may happen in the first weeks of the program to avoid temperature issues.

Ralph Lampman asked when water temperatures peak in the Upper Columbia mainstem. Mayfield said the river remains fairly cool in July, and temperatures peak around August. Currently, river temperatures are around 60°F. In August, Douglas PUD will monitor temperatures closely and release fish deeper in the water column. Lampman recalled previously discussing the high river temperatures at the boat launch (release location). There is no easy alternative, and he agreed releasing fish deeper might be the best solution.

Mayfield said there have been 11,000 adult Pacific Lamprey counted over Bonneville Dam, which is lower than the 10-year average. Counts are increasing at Priest Rapids Dam, and the current total is just over 500 fish. Douglas PUD's program goal is to trap no more than 200 fish per week, for a total of 1,000 fish translocated over the 2024 season.

B. Draft 2025 Adult Pacific Lamprey Study Plan Update (Mariah Mayfield)

Mariah Mayfield said the proposed study objectives, as discussed last month, were distributed to the Aquatic SWG by Kristi Geris on June 12. After last month's discussion, it seemed there was general agreement on these objectives. Since then, Douglas PUD has been discussing what logistics are needed to address the study objectives, and Douglas PUD believes radio telemetry is the best option

for this study. Mayfield shared on Microsoft Teams a schematic of the radio telemetry antennas deployed in the Wells Dam fishways for the 2013 radio telemetry study.[1]

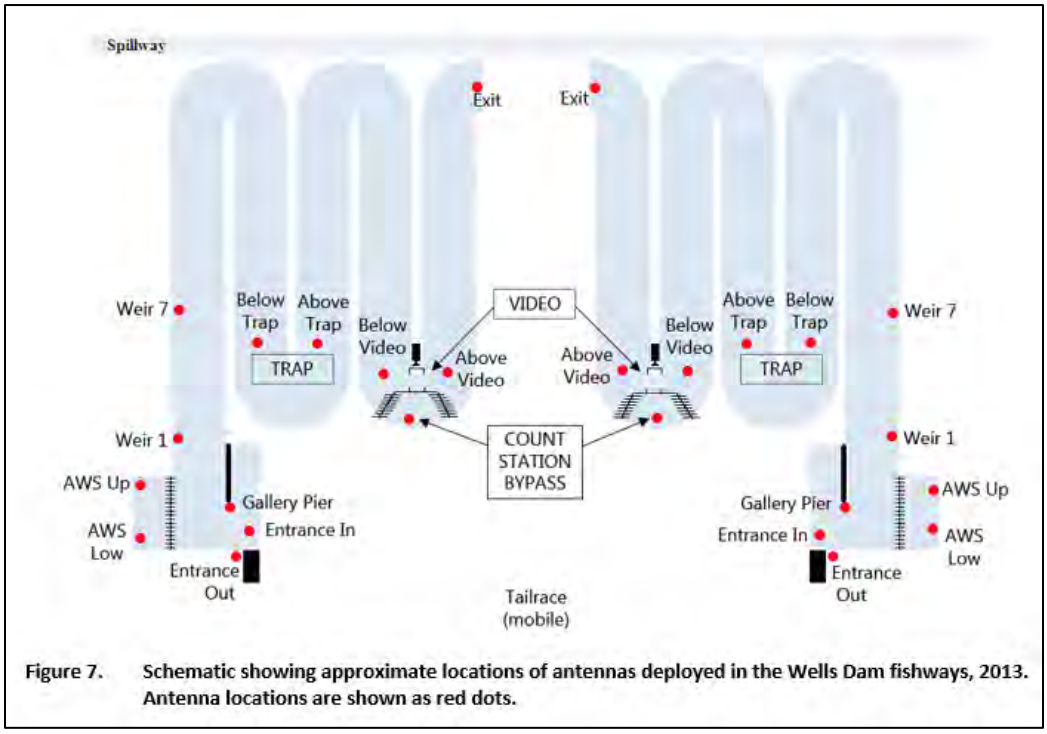


Figure 7. **Schematic showing approximate locations of antennas deployed in the Wells Dam fishways, 2013. Antenna locations are shown as red dots.**

Mayfield proposed keeping the same configuration for the 2025 study. This is likely more locations than are needed to meet the study objectives, but these locations are already in place and can provide supplemental data, such as passage rates through different pathways and fishway components. Douglas PUD is still contemplating where the tailrace antenna locations should be.

John Ferguson asked about Douglas PUD's decision to use radio telemetry instead of acoustic telemetry. Mayfield said that acoustic telemetry does not provide the precision that is needed in a noisy tailrace environment to meet the study objective in the tailrace and collection gallery. Acoustic tags cannot show whether a detection is inside or outside of the collection gallery. With radio telemetry, the range can be reduced so there is certainty that a detection is inside or outside of the collection gallery. The main concern with radio telemetry was that the external antennas might affect the swimming ability of the fish, but ATS has developed a radio tag with an internal antenna. This tag weighs 4 grams, and the dimensions are similar to the acoustic tags that have been used in previous studies, so there are no concerns about inserting these tags into lamprey. These tags may not have

[1] 2013 Adult Pacific Lamprey Passage and Enumeration Study, as outlined in the study plan, *Adult Lamprey Passage and Enumeration Study, Wells Dam — 2013* (Long View 2012), distributed on September 21, 2012, and as reported in the final report, *Adult Lamprey Passage and Enumeration Study, Wells Dam, 2013: The Effects of Head Differential on Entrance Efficiency, and of Picketed Leads on Count Window Enumeration Efficiency* (Robichaud and Kyger 2014), distributed on September 9, 2014.

as large of a range as those with an external antenna, but a large range is not needed for this study because the focus is more on small ranges of movements. These tags also have a long battery life—more than 600 days—which will capture any study fish that overwinters in the reservoir.

Ralph Lampman asked about the confidence in these tags to detect fish in the tailrace, considering the reduced detection range. Mayfield said ATS is very confident, and Dave Robichaud (LGL Limited [LGL]) is confident so long as antennas are deployed on both sides of the river, which is what Douglas PUD plans to do. RD Nelle asked whether there is a way to test the tags before the study to make sure there is adequate read range to meet the dam approach objective, and he asked whether LGL has used these tags. Mayfield said LGL has used similar tags and there was a slight reduction in range, but not enough to cause concern. Chas Kyger said Douglas PUD typically conducts range testing once a radio telemetry station is set up. A "pinger" (or beacon) tag is deployed that pings every hour, which can be used to calculate the detection efficiency of the receivers. This testing can be included in the study plan. Nelle said he would appreciate this.

Lampman asked whether the antenna configuration in the fishways can show what percentage of fish pass the count windows undetected. Mayfield said this was discussed internally, and the current configuration can evaluate count window efficiency.

Jason McLellan asked whether Douglas PUD can pilot one or two tags before committing to the complete purchase. Mayfield said the stations would not yet be set up, but testing could be done by mobile tracking. Is the ask to pilot the tags in fish or just test tags? McLellan said, at a minimum, test tags. Mayfield said she can look into this. John Ferguson said that, alternatively, Douglas PUD could just order a few tags to verify detection in the tailrace and that the antennas work. Kyger said this has been the process in the past. Once the stations are set up, test tags are used to detect gaps, then additional stations can be set up to fill these gaps. There will be extra receivers and equipment available if there is a need to bolster detection in the tailrace. Mayfield said setting up the stations in the fishways will happen during the annual winter maintenance period. In the tailrace, depending on snow, Douglas PUD and LGL plan to investigate locations for the fixed stations in the winter and set up in spring.

McLellan recalled Douglas PUD mentioning a preference for radio telemetry because it is more accurate than acoustic in a tailrace environment, so he is wondering whether Douglas PUD knows how accurate it is with these tags that have not been used before. There are acoustic telemetry solutions, such as those produced by Vemco, that have 2D and 3D positional system capabilities. Mayfield said Douglas PUD did talk about acoustic 3D positional systems. One concern was needing to set up an entirely new acoustic array to address study objectives that Douglas PUD feels can already be addressed using the existing radio telemetry configuration. With radio telemetry, the range can be increased or decreased to evaluate both the finer scale movements in the fishways and

the larger scale movements in the tailrace. Kyger said the greater benefit of radio telemetry is in the fish ladder, where the gain can be turned down to know when a fish passes within a few feet of a location. Acoustic telemetry cannot do this because there is a lot of echoing. In the tailrace, acoustic telemetry might be a better tool, but at the collection gallery entrance and in the lower fishway, radio telemetry is the better tool. McLellan agreed radio telemetry is the better tool within the gallery and fishway, but he questions whether it is better in the tailrace.

McLellan asked whether Douglas PUD has given thought to tracking lamprey versus predators. Sturgeon predation on lamprey has been a topic in these forums before. If a tag does not enter the collection gallery, how does one know this is not a predator? There are acoustic tags available that detect a predation event. Mayfield said there are radio predator tags, too, but with the internal antennas, only basic data collection is available for this tag size.

Lampman said there are a lot of places where lamprey can get into the AWS below the collection gallery entrance, and he suggested installing arrays to monitor these entry points. Mayfield said the AWS is being monitored via the western and eastern AWS receiver locations, as shown in the schematic. Lampman said this is helpful, but what about underneath the collection gallery? Kyger said these areas all lead to the same chamber. If fish enter the AWS through the floor grating, it will be detected on the side receivers. Lampman said it would be helpful to understand where the fish originally entered and whether these fish are holding in certain places. Mayfield said she can think about this, and Kyger said there may be a way to run conduit under the gallery entrance.

Lampman said he is also interested in monitoring all floor diffuser grating throughout the fish ladders. Mayfield suggested focusing on the study objectives. After the last study, there is less concern with ladder passage, although the proposed antenna configuration in the fishways will likely detect any passage issues. If a study fish disappears between one location and another, the data will show this without monitoring every location.

Mayfield said there will be receivers in the Wells Dam tailrace; however, there are no plans to deploy receivers in the Rocky Reach Reservoir. Study fish will be passive integrated transponder (PIT)-tagged too, so entry into the Methow and Okanogan rivers will be monitored, as well. She welcomed comments and suggestions from Aquatic SWG members.

Ferguson suggested for next steps that Douglas PUD take comments and formulate a draft study plan for discussion next month. Mayfield said considering current workloads, she is unsure Douglas PUD can produce an internally reviewed draft plan by the next meeting. She also still needs to work with vendors on what might be needed in terms of system updates. She suggested producing a draft outline to start. Lampman asked whether this can include a release plan that outlines a paired release design to evaluate different head differentials. Mayfield said she envisioned this outline would mainly

focus on the methods. Ferguson agreed and suggested outlining how the objectives and methods come together. McLellan said his concern is making sure there is enough time to fully vet and agree on a full study plan before running up against equipment ordering and other deadlines. Mayfield said she can ask ATS about this. Ferguson suggested that Douglas PUD further develop the 2025 Adult Pacific Lamprey Study, including the following: a) inquire about obtaining test tags from ATS and ask about the turn-around time for filling equipment and tag orders; b) look into deploying radio telemetry receivers below the collection gallery between the western and eastern AWS receiver locations; and c) develop an outline of a study plan that summarizes objectives, methods, and a draft schedule for finalizing a study plan, including a thorough Aquatic SWG review ahead of equipment ordering deadlines, for discussion during the Aquatic SWG conference call on August 14, 2024.

Lampman recalled discussing sonar in the past, and asked whether this might be an option to evaluate approach at the collection gallery entrance. Mayfield does not believe sonar alone can evaluate all study objectives, and doing both sonar and radio telemetry would be a lot. She suggested focusing on the proposed objectives. If there are still concerns, maybe sonar could be used in the next study design. Kyger recalled that past radio telemetry data suggested there might be one specific area at the collection gallery entrance where a sonar camera could be aimed to collect data, but he agreed if sonar was used, this would be a future study. Lampman asked whether radio telemetry can identify where in the water column lamprey are approaching. Mayfield said this can be inferred by the signal strength. There are radio tags that collect depth information, but again, these tags with internal antennas are limited by tag size.

Lampman appreciates the longer battery life in the proposed tags because this is important for monitoring overwintering fish. He said these can probably be switched to sleep mode during the winter, when fish are likely not moving, to get even more battery life. Mayfield said the 600-day battery life includes keeping the tags live during the winter, which could be a benefit for tracking any movement that might occur during winter months. Ferguson asked whether the plan is to monitor for two seasons. Mayfield said, similar to the last study, the plan is to release fish in July or August 2025 and continue monitoring through the spawning season of 2026. Ferguson noted that if there is interest, these fish will be radio tagged, and parties can conduct mobile tracking in the Methow and Okanogan rivers. Mayfield agreed this would be interesting, as well as mobile tracking in the upper reservoir to address the question about fish approaching Chief Joseph Dam.

C. Juvenile Salmonid Studies at Wells Dam (Ralph Lampman)

Ralph Lampman asked about any forthcoming juvenile salmonid studies at Wells Dam. Andrew Gingerich said the next planned study will be in 2030. Lampman asked whether this will be a 1-year study. Gingerich said this will be a spring study in April or May. Lampman asked about the species to be studied. Gingerich said this is unknown. One species will be selected. This could be spring Chinook

Salmon, understanding there may be issues with Endangered Species Act-listed populations. Coho Salmon is a likely alternative, based on feedback from the Wells Habitat Conservation Plan Coordinating Committee. This could also possibly be a yearling summer/fall Chinook Salmon or steelhead study. It is unlikely that Sockeye Salmon will be studied. Lampman asked whether this will be an acoustic telemetry study. Gingerich said not necessarily, and Douglas PUD might prefer a verification of past studies, which are PIT-tag based survival studies. Lampman asked whether these studies occur every 10 years. Gingerich said yes, unless the project does not meet the survival standard criteria, and in this situation, there would be a second-year study.

D. BY 2024 Wells White Sturgeon Larvae Collection Update (Chas Kyger)

Chas Kyger said Wells Hatchery is ready to receive BY 2024 White Sturgeon larvae.

Jason McLellan said sampling started on June 29, 2024, and has continued every night since. Total catch of live larvae is just over 3,000, of which all but 100 have been taken to Sherman Creek Hatchery. Catch has been fairly low, debris is high, and river flow increased when sampling started. It has not been ideal collection conditions, but the effort is going okay. The maximum catch per night was just under 1,000 fish. He expects catch to increase toward the end of this week and into next week, based on free embryo catch last week. He suspects the CTCR will be contacting Chelan PUD and Douglas PUD to transfer fish late this week or over the weekend to Wells Hatchery.

III. Administration

A. Upcoming Meetings (John Ferguson)

The Aquatic SWG meeting on August 14 will be held by Microsoft Teams conference call.

Other upcoming meetings include September 11 and October 9, 2024 (conference call).

List of Attachments

Attachment A List of Attendees

Attachment A – Attendees

Name	Role	Organization
John Ferguson	Aquatic SWG Chairman	Anchor QEA
Kristi Geris	Administration/Technical Support	Anchor QEA
Andrew Gingerich	Aquatic SWG Technical Representative	Douglas PUD
Chas Kyger	Aquatic SWG Technical Alternate	Douglas PUD
Mariah Mayfield	Aquatic SWG Technical Support	Douglas PUD
RD Nelle	Aquatic SWG Technical Representative	U.S. Fish and Wildlife Service
Patrick Verhey	Aquatic SWG Technical Representative	Washington Department of Fish and Wildlife
Laura Heironimus	Aquatic SWG Technical Alternate	Washington Department of Fish and Wildlife
Jason McLellan	Aquatic SWG Technical Representative	Confederated Tribes of the Colville Reservation
Ralph Lampman	Aquatic SWG Technical Representative	Yakama Nation

FINAL

Conference Call Minutes

Aquatic Settlement Work Group

To: Aquatic SWG Parties Date: September 11, 2024

From: John Ferguson, Chair, Anchor QEA

Re: Final Minutes of the August 14, 2024, Aquatic SWG Conference Call

The Aquatic Settlement Work Group (SWG) met by conference call on Wednesday, August 14, 2024, from 10:00 a.m. to 12:00 p.m. Attendees are listed in Attachment A of these conference call minutes.

Summary of Action Items

1. The Confederated Tribes of the Colville Reservation (CTCR) will provide written comments on the draft memorandum "2025 Adult Lamprey Study Plan Overview" that were discussed during today's conference call, and Aquatic SWG members will provide any additional edits and comments to Douglas PUD by September 10 for discussion during the Aquatic SWG conference call on September 11, 2024 (Item II-C). *(Note: Jason McLellan provided complete CTCR comments on August 20, as distributed to the Aquatic SWG by Kristi Geris that same day.)*
2. Douglas PUD will consider additional options for monitoring and preventing Pacific Lamprey from entering the plant drain at Wells Dam, beyond the perforated plating recently installed above the high-water mark, and will report back to the Aquatic SWG (Item II-D).
3. The Aquatic SWG meeting on September 11, 2024, will be held by conference call (Item III-A).

Summary of Decisions

1. There were no decisions approved during today's conference call.

Agreements

1. There were no agreements discussed during today's conference call.

Review Items

1. The draft *Total Dissolved Gas Water Quality Attainment Plan Year 10 Report* was distributed to the Aquatic SWG by Kristi Geris on November 14, 2023, and is available for review with edits and comments due to Mariah Mayfield.

2. The draft memorandum "2025 Adult Lamprey Study Plan Overview" was distributed to the Aquatic SWG by Kristi Geris on August 13, and is available for review with edits and comments due to Douglas PUD by September 10, for discussion during the Aquatic SWG conference call on September 11, 2024 (Item II-C).

Documents Finalized

1. There are no documents that have been recently finalized.

I. Welcome

A. Review Agenda (Kristi Geris)

Kristi Geris welcomed the Aquatic SWG members (Attachment A) and introduced Shannon Adams (Yakama Nation [YN] Aquatic SWG Policy Alternate). Adams said she is taking over the YN Technical Service Coordinator role, previously held by David Blodgett, III (YN Aquatic SWG Policy Representative, and now YN Fisheries Program Manager), and she is attending today's meeting to better understand her role in this forum.

Geris reviewed the agenda and asked for any additions or changes to the agenda. Ralph Lampman added Wells Dam Outfall.

B. Meeting Minutes Approval (Kristi Geris)

The revised draft July 10 conference call minutes were reviewed. Kristi Geris said edits and comments were received from Douglas PUD. Edits were minor clarifications that were incorporated into the revised minutes. Geris also added distribution of the draft memorandum "2025 Adult Lamprey Study Plan Overview," which will be discussed during today's conference call. Aquatic SWG representatives present approved the July 10, 2024, conference call minutes, as revised.

C. Review of Action Items (Kristi Geris)

Action items from the Aquatic SWG conference call on July 10 are as follows *(Note: The following italicized item numbers correspond to agenda items from the July 10, 2024, conference call)*:

1. *The YN will ask the Columbia River Inter-Tribal Fish Commission (CRITFC) about receiving the genetics results for tissue samples submitted by Douglas PUD from adult Pacific Lamprey collected at Wells Dam in 2024 (Item I-C).*
   Ralph Lampman confirmed with Jon Hess (CRITFC) that CRITFC can summarize the natal origins of these adults, including fitness traits, as distributed to the Aquatic SWG on July 15, 2024.
2. *Douglas PUD will further develop the 2025 Adult Pacific Lamprey Study, including the following: a) inquire about obtaining test tags from Advanced Telemetry Systems (ATS), and ask about the turnaround time for filling equipment and tag orders; b) look into deploying*

radio telemetry receivers below the collection gallery between the western and eastern auxiliary water supply receiver locations; and c) develop an outline of a study plan that summarizes objectives, methods, and a draft schedule for finalizing a study plan, including a thorough Aquatic SWG review ahead of equipment ordering deadlines, for discussion during the Aquatic SWG conference call on August 14, 2024 (Item II-B).
This will be discussed during today's conference call.

II. Summary of Discussions

A. 2024 Adult Pacific Lamprey Translocation Update (Andrew Gingerich)

Andrew Gingerich said an email update from Mariah Mayfield was distributed to the Aquatic SWG last Friday, August 9, 2024, that summarized the 2024 Douglas PUD adult Pacific Lamprey translocation effort to date. In total, 499 adult Pacific Lamprey have been translocated upstream of Wells Dam. This concludes the first 4 weeks of translocation where Douglas PUD collected fish from Priest Rapids Dam. Over the next 4 weeks, Grant PUD will continue collecting adult Pacific Lamprey at Priest Rapids Dam as part of their most recent translocation statement of agreement, and Douglas PUD will collect these fish from Grant PUD at Kirby Billingsley Hydro Park to translocate farther upstream above Wells Dam, toward Douglas PUD's 1,000-fish season target. To note, in Weeks 1 and 2, after Douglas PUD collected fish from Priest Rapids Dam and passive integrated transponder (PIT) tagged these fish at Wells Dam, the CTCR collected a portion of these fish to translocate farther upstream into the Okanogan River Basin. In Week 1, the CTCR collected all fish, and in Week 2, the CTCR collected 40 fish. In total, about 22% of the 499 fish translocated were released in the Okanogan River Basin. These locations and totals will be summarized at the end of the season. The CTCR effort has now concluded, so the final percentage translocated into the Okanogan will be something less than 22%, and the rest will be released at Starr Boat Launch.

B. Wells Dam Pacific Lamprey Trapping Operations Update (Andrew Gingerich)

Andrew Gingerich said lamprey trapping operations began last week. During the first 2 nights, there were complications due to miscommunication with operation staff about how to properly deploy the traps. This was resolved, and all traps were operating successfully by the end of the week. There are encouraging data from nights of trapping so far. To date, the traps have collected 20 individual Pacific Lamprey—the traps only collected 4 individuals total last year. One difference this year is that perforated plating was installed during the winter maintenance ladder outage below the submerged orifice to encourage lamprey to go up and over the weir and where the traps are located. There have been two fish with subsequent PIT detections. These fish were collected in the traps, PIT-tagged, released in the Wells Dam tailrace, and subsequently detected on a PIT array. This includes one fish that was collected, PIT-tagged, and released on August 8; subsequently detected in Pool 68 on August 9; and last detected in the Methow on August 13. The second fish was a recapture that was

collected, tagged, and released on August 12; subsequently detected in Pool 19 on August 13; and recaptured in the west ladder trap (Pool 40) on August 13. Gingerich thinks this is only the front portion of the run at Wells Dam. Douglas PUD will continue trapping and providing weekly updates. Recall, this is piloting whether these traps can collect study fish for use in future passage studies at Wells Dam.

Ralph Lampman asked about the complications. Chas Kyger explained that there are four traps total: two traps on each ladder. On the west ladder, the traps were not seated all the way down, so they were not fully deployed. Weights were added to the traps to help deploy the traps lower. This seems to have worked, because these traps are now collecting fish when they were not before. On the east ladder, the traps have been successfully deployed and have collected most of the fish.

Kristi Geris recalled that the lamprey traps will be operating through September. Gingerich said this is correct. The Wells Habitat Conservation Plan (HCP) Coordinating Committee approved trapping operations from August 1 to September 30, 2024. Additionally, Douglas PUD is conducting an analysis of steelhead PIT-tag data to monitor passage timing during trap operations. This was a condition of the Wells HCP Coordinating Committee's approval of these operations. The first weekly update was emailed to the Wells HCP Coordinating Committee last week, and weekly updates will continue during trap operations. Last year, this same analysis was performed that suggested no difference in passage timing for steelhead during trap operations versus no trap operations. Geris noted that this topic is on the HCP Coordinating Committees agenda for discussion this month.

C. Draft 2025 Adult Pacific Lamprey Study Plan Update (Andrew Gingerich)

Andrew Gingerich said the draft memorandum "2025 Adult Lamprey Study Plan Overview" was distributed to the Aquatic SWG yesterday, on August 13. Douglas PUD had committed to developing this short document outlining themes discussed to date. Ralph Lampman distributed YN comments this morning. Jason McLellan said he also has verbal comments to share. The draft memorandum and next steps were discussed, as follows.

Objective 1. Adult Pacific Lamprey Upstream Passage Evaluation (PLMP Section 4.1.6)
Gingerich said this evaluation uses radio and PIT tags and releases in the Rocky Reach Reservoir. While drafting the last report for the most recent acoustic telemetry study, there was feedback cautioning not to draw conclusions about improved approach based on only 2 years of data when this could just be annual variability, and the exact mechanisms are unknown. This was reasonable feedback. Internally, Douglas PUD is optimistic that translocation is improving the desire for fish to interact with the project, but this objective will provide a third data point to consider regarding how fish approach the dam.

Lampman asked whether comparing passage efficiency (Objective 1.b) is at dam or the approach to dam. If at dam, he suggested moving this language to Objective 2. Gingerich confirmed this is dam-centric and can be moved to Objective 2. The placement here was to build into the comparison to 2022 and 2016.

McLellan asked whether "approach" and "interact" (Objective 1.a) are considered one activity or two. How are these measured? He suggested defining "approach" and "interact"—what specifically constitutes one or the other—and including language to determine whether one occurred or not.

McLellan cautioned about comparing 2025 to 2016 and 2022, when different methods were used. The previous studies used acoustic telemetry; this study uses radio telemetry, receiver deployment was different, and there were different releases, among other factors. He suggested inserting language to provide confidence any comparisons are "apples to apples."

Objective 2. Wells Dam Adult Pacific Lamprey Passage Evaluation (PLMP Section 4.1.6)
Gingerich said this looks at overall passage but focuses on the lower section of the fish ladders.

Objective 3. Fishway Modifications to Improve Upstream Passage (PLMP 4.1.5)
Gingerich said modified head differentials have shown to be advantageous for migrating lamprey at other projects. At Wells Dam, this evaluation has been hampered by small sample size and has shown little difference in entrance and passage success for fish exposed to different head differentials. If translocation has increased interest in migrating upstream and interacting with the dam, this may provide a better opportunity to evaluate modified head differentials.

Objective 4. Determine Fishway Count Efficiency for Active Lamprey (PLMP 4.1.3)
Gingerich said this is the only new objective not previously discussed. This is based on feedback from Lampman last month, and it seems to be something that can be reasonably accomplished.

Lampman said it seems there could be a margin of error if an untagged fish passes the window at the same time as a tagged fish. Is there a way to record the exact time a fish passes the window? Gingerich said this was discussed internally. There is antenna capability above and below the window, there is floy tagging, or an option to spray paint the radio antenna.[1] When a radio-tagged fish passes through a count window, in most cases it is clear there is an antenna because it dangles down and is fairly long. If it is not clear, there is video for every passage event that can be reviewed frame by frame. For the past few years, fish counters have also been inserting time stamps in the fish count record. Between the antenna hanging out of the fish and the locations of the receivers, Douglas PUD is optimistic in the ability to verify a fish is heard and seen at the count windows. He is hesitant about floy tagging because the fish will already have a radio tag and PIT tag. There is also

[1] This study plan is now proposing to use the more traditional radio tags with external antennas, opposed to the previously proposed internal antennas (see *Methods: Fish Tagging* below).

the spray-paint option. Lampman questioned whether floy tagging or spray painting is worse and agreed the dangling antenna should be sufficient.

Lampman asked about PIT-tagged fish. Gingerich said there is detection at Pool 19 and Pool 67/68; however, there is no detection at the count window. The current count window and crowder design makes it difficult to install detection here because the crowder is made of metal. There needs to be a shield to minimize communication interference. Radio tags can be used to get at enumeration, but PIT-tagged fish cannot be used to meet this objective.

Methods (General Comment)
McLellan suggested providing further clarification about how the methods address or achieve the objectives. If there are objectives for the 2025 study that were not fully addressed in 2016 and 2022, it needs to be clear that these are different studies to answer these specific questions. He suggested downplaying the comparative aspect of this study versus previous studies and being careful not to overemphasize comparability. Gingerich acknowledged that using radio telemetry makes it impossible to make a complete "apples-to-apples" comparison, but the PIT-tag group can provide some of this since there was a PIT-tag-only group in the most recent approach study. The feedback is valid, and this will not be a perfect comparison for the fish carrying active tags. He suggested including these caveats in the study plan and report to acknowledge there are dissimilarities between the studies. McLellan said his concern is that some readers may just look at the rates and not consider possible reasons for these rates related to study design, and then these biases are not considered in decision-making. Gingerich said he understands, this is a good point, and these details will be clarified.

Methods: Fish Tagging
Gingerich said PIT tags will help evaluate tag burden and will also boost sample size. For the radio tags, Douglas PUD was investigating tags with an internal antenna; however, after additional conversations with ATS, it does not seem this option will work. Chas Kyger explained that the tags with internal antennas lack the ability to have individual codes. To differentiate between fish, each tag would need to be on a different frequency, which also requires larger tags. Two hundred frequencies are a lot to manage with the receivers, and the larger tags are beyond what is ideal in terms of tag burden. Therefore, the plan now is to use the more traditional tags with external antennas. Gingerich said these more conventional tags have been used in the past.

Gingerich said this study proposes using fish collected at Priest Rapids Dam and Wells Dam, however, it is not known how successful fish collection will be at Wells Dam. Ideally, this can be a 50/50 split. Douglas PUD is still contemplating the strategy to use and prioritize these tags. Is it better to tag 50 fish per week and release 200 tags over 4 weeks, or should releases occur over 6 weeks to better prioritize fish collected at Wells Dam, understanding there is a delay in the peak

migration at Priest Rapids Dam versus Wells Dam? If all study fish are collected at Priest Rapids Dam, then there will be no study fish from Wells Dam. At the same time, it is unknown how successful trapping will be at Wells Dam.

Lampman suggested including an early run release, mid-run release, and late run release to capture all the different behaviors. He reviewed count data included in his comments that were distributed before today's meeting. He suggested including a May release and said the YN could provide overwintering adults if needed. Gingerich said this adds more complications to the study design, and Douglas PUD would need to think more on this. Kyger noted that the tag life would encompass any fish that overwinter in the Rocky Reach Reservoir, but there is no way of knowing how many may do this. Gingerich said that, historically, there have been relatively few. A study start day in the spring will also likely raise concerns for the Wells HCP Coordinating Committee regarding impacts to the spring Chinook Salmon migration, both in terms of lamprey trap operations and the head differential evaluation. Lampman asked about the radio tag battery life. Kyger said this is in excess of 360 days, and he believes the tags can be programmed to sleep mode to extend this battery life. Lampman agreed this should be adequate to capture overwintering fish.

Lampman recalled discussing possibly two release groups: one downstream in the Rocky Reach forebay and one in the Wells tailrace. This study plan only has one release group in the Rocky Reach forebay. Gingerich said there was some resistance to separating the release locations. In 2022, fish released at Daroga State Park versus the Rocky Reach forebay approached Wells Dam at a similar rate. Lampman asked about the percentages in 2022 and 2016. Gingerich recalled that just over 80% approached in 2022, versus less than 30% in 2016.

McLellan thinks it is a great idea to use study fish collected at Wells Dam, but suggested including guidelines about how these fish will be used to provide statistical power and clarifying if a certain threshold is not met, how this will be treated in the analysis. Gingerich agreed and said the Pacific Lamprey Management Plan (PLMP) states that passage rates at Wells Dam must be similar or better than passage rates at other Mid-Columbia River mainstem dams. Traditionally, those studies are completed using fish collected at the respective dam and released below the dam. To make an "apples-to-apples" comparison about how Wells Dam performs against other projects, this means collecting study fish at Wells Dam. The complication is adding other treatments when there may already be issues with sample size and statistical power. It would be ideal if the lamprey traps at Wells Dam can collect all of the study fish. But short of this, there really is no way to get away from using study fish from another source. He agreed this will need some explanation about how this is handled.

McLellan recalled one reason for using radio telemetry was to have the ability of mobile tracking, but this is not included in the memorandum. Does Douglas PUD intend to do this? If so, he suggested

including language about how this will inform the objectives. What metrics are being measured? How will this inform the overall study? Gingerich said he will discuss this internally.

McLellan said evaluation of potential tag burden is listed as a secondary benefit of using PIT-only fish. He suggested adding this as an objective if this study is truly trying to make this assessment and clarify what the specific metrics would be to address this. Gingerich said this can be added.

RD Nelle echoed McLellan's comments about needing to clarify how study fish collected at Wells Dam will be incorporated into the analysis. Gingerich agreed.

Nelle asked whether there will be mobile tracking at upstream gates, or beyond this into the tributaries. Gingerich said as proposed, this study is not suggesting deploying radio telemetry equipment in the tributaries or at the mouth. The focus is at the dam. He does not see the benefit of deploying infrastructure in the tributaries for this study. There will be some tributary entrance information gained from the PIT-tag data. If there is interest, there will be the ability to develop summaries from those data. Nelle asked whether the mobile tracking will be in the reservoir or downstream of the dam. Gingerich said this has not yet been thoroughly discussed internally, but he believes the focus is on the project in the Wells Dam area. Certainly, below Wells Dam is of interest. If there is interest in mobile tracking above the dam, maybe this is something to consider. However, he expects detection in the ladders to be high, so he does not see a benefit of mobile tracking upstream.

Lampman cautioned about using too many study fish collected from the Wells Dam fish ladders because these fish were already successful in getting through the entrance, which was the largest bottleneck based on previous studies. He thinks it is great to include some of these fish, but he suggested separating these fish from those collected at Priest Rapids Dam and advised developing an upper limit for using that portion of fish. At Bonneville Dam and other studies, the preference has been to collect study fish in the tailrace, but no traps have been successful in doing this, which is why these studies had to use fish from the ladder itself. It is ideal to collect study fish before entering the ladder. Gingerich said he understands Lampman's point, but the PLMP requires Douglas PUD to compare Wells Dam against other projects. If other projects do it one way, and Douglas PUD does it another way, this is not a similar evaluation of passage success. Lampman disagreed that collecting study fish in the fish ladder is better. Gingerich said he is not trying to belittle Lampman's concern. He is trying to be conscientious of the language in the Aquatic Settlement Agreement and PLMP. This is what Douglas PUD and the Aquatic SWG is tasked with.

Nelle suggested testing fish naïve to Wells Dam compared to fish already detected in the Wells fishways to see which group has better passage success. Gingerich said he thinks it would be feasible to run this comparison, but this is not explicitly required in the PLMP. Lampman said if this study

strives for a 50/50 mix and dam passage is the key objective, if the design changes, such as fish source, there will be mixed results, and this affects the comparability to previous studies. Gingerich said if the analysis can show there is no statistical difference between these two groups, the groups can be combined into one group to give more statistical power to evaluate the other objectives.

Lampman asked whether Aquatic SWG members are supportive of only one release in the Rocky Reach forebay and no release in the Wells tailrace. McLellan said this depends on the overall objectives. If there is a strong desire to compare 2025 to 2016 and 2022, then he thinks members need to reconsider a release group farther downstream. If the main objective is to evaluate passage efficiency and members have faith in the approach rate from the 2022 study, maybe one release is adequate. His concern is basing decisions on one study. Was 2022 an anomaly? Lampman said another risk is if there is a lower approach rate this year, will there be enough study fish that reach the dam to do a thorough study at the dam. Gingerich likes the Rocky Reach forebay release location so that tagged individuals mimic natural behavior (untagged fish will have exited Rocky Reach prior to approaching Wells) as much as possible, recognizing that lamprey are not salmon and are not necessarily destined to a natal stream. He also believes that having an understanding of approach rate may be an important part to understanding the fish.

Methods: Radio Antenna Locations
Gingerich reviewed figures showing the following: 1) the locations of antennas deployed in the Wells Dam fishways; 2) the location of a fixed station antenna downstream of the Wells Dam tailrace, or "gateway" location; and 3) the locations of fixed station antennas deployed in the Wells Dam tailrace. He noted that the gateway location is located on a vineyard property that requires landowner permission, which has been requested and granted in the past. There also may be more receivers deployed in the tailrace based on tag testing and feedback.

Lampman asked whether the gateway location has 100% detection through the lower reach, or can another antenna be deployed on the other side? Gingerich said detection efficiency will be unknown until tag testing. Logistically, it will be easier to add a secondary station on the same side of the river because it is boat access only on the other side. Another way to determine detection efficiency on the gateway array is via the two detection locations in the tailrace. If a fish is detected in the tailrace but not at the gateway location, this will inform detection efficiency. Douglas PUD is not opposed to adding an additional receiver if there is inadequate coverage. However, Gingerich does not believe this location is as important as, for example, the tailrace locations.

Lampman asked whether the tailrace locations have 100% detection. Gingerich said this is the goal; however, keep in mind the ultimate objective is to know whether fish are interacting with the collection gallery. If the antennas can hear fish that are 500 meters away, this does not speak to understanding when fish enter the collection gallery. The Aquatic SWG needs to decide what the

study is trying to accomplish with detection in the tailrace. Douglas PUD was hoping to turn down the gain on the antennas so there is more confidence in detecting fish approaching and entering the collection gallery. Lampman said he would like 100%, or close to 100%, detection efficiency in the tailrace.

Methods: Head Differential Testing
Gingerich said this evaluation tests two different head differentials: high (normal 1.5 foot) and low (reduced 0.5 foot). As a reminder, the head differential is the difference in water elevation in the collection gallery versus the tailrace that creates a waterfall to help fish find the fishway. Douglas PUD was contemplating either nightly treatments or multiple night blocks. For example, two nights at a 1.5-foot head differential and two nights at a 0.5-foot head differential. This block treatment is in case lamprey may be migrating through the ladder over more than one day. Douglas PUD is unsure about the best design. The treatments can only occur during night hours and are dependent on Wells HCP Coordinating Committee approval, because modified head differentials are outside the National Marine Fisheries Service specifications for salmonid passage. He is optimistic the Wells HCP Coordinating Committee will approve modified head differentials because these have been approved in the past. Douglas PUD has been able to show these past evaluations have not affected migration patterns at night. The bulk of steelhead passage is during the daytime.

Lampman asked whether each fish ladder can have different treatments on the same night and alternate these treatments over the entire study period. The radio tags will provide site-specific data, and it would be interesting to include non-tagged fish, but he does not believe there would be a way to know when these fish entered the collection gallery. He is trying to think of ways to learn as much as possible. Is the plan to only use radio tags for this evaluation? Gingerich said yes, and this is all good feedback. Douglas PUD has also contemplated what is the best design. From a logistics standpoint, yes, it is possible to have different head differentials in each ladder. He is unsure about the best strategy, such as 1-day blocks versus 3-day blocks, and there are probably tradeoffs. Lampman said there is some tendency for fish to pass via the east or west fish ladder. By alternating treatments over the entire season, this can inform whether there are more fish entering the collection gallery during low or high head differentials. Some days there will be higher numbers of fish passing, but there is no way to separate this out. By alternating treatments, this also gives a larger number of fish the chance to pass via one or the other ladder. This will help differentiate the fish's tendency better. Gingerich said he does not foresee pushback on this, and he does not have knowledge against this suggestion. Based on the past decade of data, the east ladder is preferred about 60/40, but this does not persist every year. Gingerich asked Lampman if this observation matters in Lampman's proposed design? Lampman does not believe this matters if the evaluation tests both ladders with alternating head differentials. Not having the same treatments on the same day helps distinguish daily fluctuation.

Lampman asked about the head differential treatment hours. Pacific Lamprey passage generally peaks around midnight. He suggested capturing the bulk of the nighttime hours before and after midnight. Gingerich said he believes in the past, treatment timing was based on count window timing. As long as the Wells HCP Coordinating Committee approves starting earlier than midnight, there should be no issues. Lampman suggested 2000 hours to 0400 hours. Gingerich believes the timing in the past was something similar. These details were not included in this memorandum but will be included in the study plan. Lampman recalled a time graph that was developed and suggested reviewing this. Gingerich said Douglas PUD can include this in the justification for timing.

Lampman suggested clarifying that the ideal head differential treatment setup may change depending on whether the study is evaluating radio tags, PIT tags, untagged fish, or a combination of these. Gingerich agreed that this needs to be differentiated. PIT-tag data are limited when it comes to count window efficiency and entrance timing and head differential treatments. Rather, radio telemetry fish will serve as study fish for these evaluations. PIT-tag fish will serve as a pseudo control for detection and approach to Pool 19. If some portion of PIT-only fish detected at Pool 19 is higher than the radio telemetry fish, this may suggest the radio telemetry fish are compromised in some way. He does not expect to see a difference, but this metric will be evaluated just in case. PIT tags also increase the 200-fish sample size to 400 fish. Additionally, he believes the Aquatic SWG is supportive of continued translocation, and the PIT-only fish mean twice the number of fish to move upstream and into the tributaries.

Next Steps

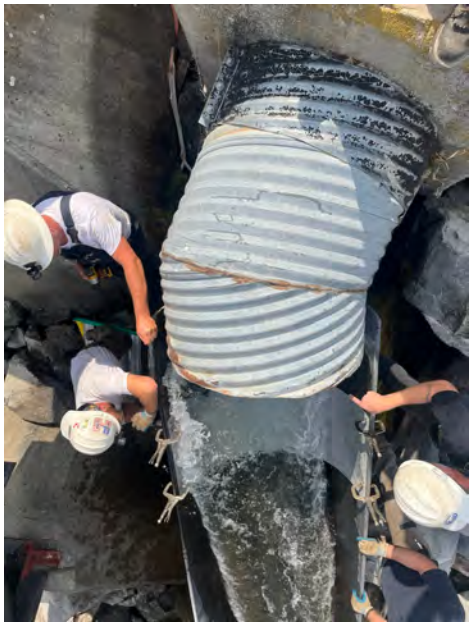
Geris said this memorandum was distributed on August 13, so a 30-day review would end September 12, which is 1 day after the next Aquatic SWG meeting. She asked whether members might be amenable to a slightly shortened review period, with comments due to Douglas PUD before the meeting, so all comments can be discussed during the Aquatic SWG conference call on September 11. Gingerich agreed it would be helpful to have all comments ready for discussion next month, so Douglas PUD can then begin drafting the study plan.

Geris asked whether this proposed timing aligns with Lotek equipment turnaround times. Gingerich said Douglas PUD is sending in receivers for upgrades now, and he is confident about tag order timing. The only possible complication is if the study proposes tagging fish in the spring. Normally, tagging starts in August. May is still 8 to 9 months away, so there is time to further discuss this. Geris suggested revisiting this next month when all comments are received. McLellan said he just wanted to be sure there was enough time to flesh out a well-developed study plan before ordering equipment. If the Aquatic SWG decides the objectives are better addressed using acoustic telemetry, he wants to be sure there is enough time to do this and not be forced into a design due to equipment orders.

The CTCR will provide written comments on the draft memorandum "2025 Adult Lamprey Study Plan Overview" that were discussed during today's conference call, and Aquatic SWG members will provide any additional edits and comments to Douglas PUD by September 10, for discussion during the Aquatic SWG conference call on September 11, 2024. *(Note: McLellan provided complete CTCR comments on August 20, as distributed to the Aquatic SWG by Geris that same day.)*

D. Wells Dam Outfall (Ralph Lampman)

Kristi Geris shared the email from Mariah Mayfield that was distributed to the Aquatic SWG on August 1, 2024, regarding the newly installed perforated plating on the Wells Dam plant drain.[2] The Aquatic SWG reviewed the following photographs included in this email.



Ralph Lampman said he appreciates Douglas PUD adding the perforated plating. However, he is still concerned that adult Pacific Lamprey may spend time ascending the lower portion of the outfall only to need to turn around and come back out. He asked whether it might be possible to install another section of plating farther down somewhere between the high-water mark (blue line) and bottom of the outfall.

Andrew Gingerich asked whether lamprey entering these pipes is a problem at other projects. Douglas PUD agreed to install this plating as a preemptive action, but there is no evidence

[2] During the Aquatic SWG conference call on January 10, 2024, the YN requested that Douglas PUD consider options for monitoring whether Pacific Lamprey enter the plant drain and return-to-river pipe at Wells Dam. Douglas PUD installed perforated plating on the plant drain (shorter outfall) to prevent Pacific Lamprey from entering the outfall. No perforated plating was installed on the return-to-river pipe (longer outfall) because fish are returned to the river from the adult handling facility via this outfall.

documenting lamprey trying to access these pipes at Wells Dam. What is the risk? He needs justification before asking Douglas PUD mechanics to go back out onto this steep riprap, which poses various safety concerns. Lampman said there is similar smaller piping on the Yakima River, where two to three adults were documented trying to ascend the pipes; however, he is unsure about the fate of these fish. There are other examples of lamprey using these outlet pipes. Acoustic results show adults hanging around this area, which causes concern.

Douglas PUD will consider additional options for monitoring and preventing Pacific Lamprey from entering the plant drain at Wells Dam, beyond the perforated plating recently installed above the high-water mark, and will report back to the Aquatic SWG.

E. BY 2024 Wells White Sturgeon Larvae Collection and Rearing Update (Chas Kyger)

Chas Kyger said the CTCR collected larvae from Lake Roosevelt from July 12 to July 15, and delivered 8,629 larvae to Wells Hatchery over the course of three batches. Hatchery staff are rearing and sorting. It is typical to experience the highest losses during this time. As of this morning, there were 6,870 larvae on station, which is typical and as expected.

F. 2024 White Sturgeon Monitoring and Evaluation Update (Chas Kyger)

Chas Kyger said Douglas PUD will conduct White Sturgeon monitoring and indexing later this fall. This effort is scheduled to start mid-September and will use the same methods as previous efforts. This includes one 5-week session, 4 days per week, 12 lines per day, and lines will include a mix of large and small gear sizes. This effort looks at Wells White Sturgeon growth and survival in the Wells Reservoir. At this stage in the White Sturgeon Management Plan, monitoring and indexing switches to every 3 to 5 years; however, to avoid long data gaps, Douglas PUD chose to switch to every other year sampling events. The most recent effort was conducted in 2022, there was no indexing in 2023, and indexing will continue in 2024.

III. Administration

A. Upcoming Meetings (Kristi Geris)

The Aquatic SWG meeting on September 11 will be held by Microsoft Teams conference call.

Other upcoming meetings include October 9 and November 13, 2024 (conference call).

List of Attachments

Attachment A List of Attendees

Attachment A – Attendees

Name	Role	Organization
Kristi Geris	Administration/Technical Support	Anchor QEA
Andrew Gingerich	Aquatic SWG Technical Representative	Douglas PUD
Chas Kyger	Aquatic SWG Technical Alternate	Douglas PUD
Josanna Korcz	Observer	Douglas PUD (Intern)
RD Nelle	Aquatic SWG Technical Representative	U.S. Fish and Wildlife Service
Laura Heironimus	Aquatic SWG Technical Alternate	Washington Department of Fish and Wildlife
Jason McLellan	Aquatic SWG Technical Representative	Confederated Tribes of the Colville Reservation
Ralph Lampman	Aquatic SWG Technical Representative	Yakama Nation
Shannon Adams	Aquatic SWG Policy Alternate	Yakama Nation

FINAL

Conference Call Minutes

Aquatic Settlement Work Group

To: Aquatic SWG Parties Date: November 14, 2024

From: John Ferguson, Chair, Anchor QEA

Re: Final Minutes of the September 11, 2024, Aquatic SWG Conference Call

The Aquatic Settlement Work Group (SWG) met by conference call on Wednesday, September 11, 2024, from 10:00 a.m. to 11:15 a.m. Attendees are listed in Attachment A of these conference call minutes.

Summary of Action Items

1. Douglas PUD will provide additional information about the Wells Hatchery volunteer channel system, including the following: 1) photographs of the system, including the upwell area and passive integrated transponder (PIT)-tag array locations; and 2) how and when the system operates (Item II-B).
2. Douglas PUD will provide additional information about the 17 fish last detected at the Wells Hatchery volunteer channel in the 2022 Adult Pacific Lamprey Study Report, including the following: 1) the current last detection locations of these fish; and 2) what time of year the last detections were (Item II-B). *(Note: Mariah Mayfield provided this additional information, which was distributed to the Aquatic SWG by Kristi Geris on September 12, 2024.)*
3. Douglas PUD will target having a draft 2025 Adult Pacific Lamprey Study Plan for Aquatic SWG review by the Aquatic SWG conference call on November 13, 2024 (Item II-D).
4. The Aquatic SWG meeting on October 9, 2024, will be held by conference call (Item III-A).

Summary of Decisions

1. There were no decisions approved during today's conference call.

Agreements

1. There were no agreements discussed during today's conference call.

Review Items

1. The draft *Adult White Sturgeon Upstream Passage Evaluation* was distributed to the Aquatic SWG by Kristi Geris on November 7, and is available for a 30-day review with edits and comments due to Douglas PUD by December 9, 2024.

Documents Finalized

1. There are no documents that have been recently finalized.

I. Welcome

A. Review Agenda (John Ferguson)

John Ferguson welcomed the Aquatic SWG members (Attachment A) and reviewed the agenda. Ferguson asked for any additions or changes to the agenda. Andrew Gingerich added Wells Dam Fishway Operations.

B. Meeting Minutes Approval (John Ferguson)

The revised draft August 14 conference call minutes were reviewed. Kristi Geris said edits and comments were received from Douglas PUD. Edits were minor clarifications that were incorporated into the revised minutes. There are two outstanding items regarding clarification of the tag vendor or vendors contacted for the 2025 Adult Pacific Lamprey Study. Mariah Mayfield clarified that the vendor for the radio tags with internal antennas was Advanced Telemetry Systems, and the vendor for the radio tags with external antennas was Lotek. These corrections were made. Aquatic SWG representatives present approved the August 14 conference call minutes, as revised. Jason McLellan and RD Nelle provided the Confederated Tribes of the Colville Reservation's (CTCR's) and U.S. Fish and Wildlife Service's (USFWS's) approvals, respectively, via email prior to the Aquatic SWG conference call on September 11, 2024.

C. Review of Action Items (John Ferguson)

Action items from the Aquatic SWG conference call on August 14 are as follows *(Note: The following italicized item numbers correspond to agenda items from the August 14, 2024, conference call)*:

1. *The CTCR will provide written comments on the draft memorandum "2025 Adult Lamprey Study Plan Overview" that were discussed during today's conference call, and Aquatic SWG members will provide any additional edits and comments to Douglas PUD by September 10 for discussion during the Aquatic SWG conference call on September 11 (Item II-C).*
   Jason McLellan provided complete CTCR comments on August 20, 2024, as distributed to the Aquatic SWG by Kristi Geris that same day.
2. *Douglas PUD will consider additional options for monitoring and preventing Pacific Lamprey from entering the plant drain at Wells Dam, beyond the perforated plating recently installed above the high-water mark, and will report back to the Aquatic SWG (Item II-D).*
   Mariah Mayfield said Douglas PUD needs to further investigate this before making additional changes, such as determining the elevation of the bottom end of the pipe, how frequently the tailrace reaches this elevation, and during what time periods. Douglas PUD

wants to determine how much of an issue this might be to provide justification for asking the mechanics to perform any additional work. Ralph Lampman suggested installing a plastic material and said the fix does not need to be metal or expensive. He asked about a timeline for possible changes to the pipe. Mayfield said considering Douglas PUD's current workload, there may be more on this in November or December 2024.

II. Summary of Discussions

A. 2024 Adult Pacific Lamprey Translocation Update (Mariah Mayfield)

Lamprey Summary Slides (Attachment B) were distributed to the Aquatic SWG by Kristi Geris prior to the Aquatic SWG conference call on September 11, 2024.

Mariah Mayfield said the Douglas PUD 2024 translocation effort is now complete (Slide 1). In total, 860 fish were translocated upstream of Wells Dam, which is less than the 1,000-fish target but is still good considering the low run this year throughout the basin. Most fish were released at Starr Boat Launch, and some have already entered the tributaries, and the data will soon be uploaded to the PIT Tag Information System (PTAGIS). Douglas PUD transferred 129 fish to the CTCR for translocation farther upstream into four tributaries in the Okanogan Basin. The photographs on Slide 1 show a dwarf Pacific Lamprey that was collected, which was less than 400 millimeters. Per an email from Ralph Lampman, dwarf Pacific Lamprey rarely migrate into the Mid and Upper Columbia River but comprise approximately 1% of the total adult returns. Lampman added that there seems to be more recently. The cause is unknown, but this might be due to the new traps at Bonneville Dam (BON) or ocean trends. John Ferguson asked whether these are precocious males. Lampman said dwarf Pacific Lamprey include both males and females.

Mayfield said this year's daytime counts at BON was only 22,000 fish, compared to the 10-year average of 41,000 fish (Slide 2). The run at Priest Rapids Dam (PRD) is not yet complete but so far is also lower than average. The run at Rocky Reach Dam (RRH) is also about 50% of the 10-year average. At Wells Dam, because the 10-year average is so low, this year's run is doing well in comparison and is still not yet complete. While not a true conversion rate, approximately 18% of fish detected at RRH were also detected at Wells Dam.

B. 2024 Wells Dam Pacific Lamprey Trapping Operations Update (Mariah Mayfield)

Lamprey Summary Slides (Attachment B) were distributed to the Aquatic SWG by Kristi Geris prior to the Aquatic SWG conference call on September 11, 2024.

Mariah Mayfield said Wells Dam nighttime lamprey trapping operations are now complete (Slide 3). Recall, this was a pilot effort to determine whether these traps can collect a sufficient number of study fish for use in future passage studies at Wells Dam. Trap operations started on August 8,

ended on August 28, and targeted trapping 4 nights per week, which did not always happen due to miscommunication with dam personnel. In total, the traps collected 63 individuals and five recaptures. The graphs on Slide 3 show estimated ladder efficiency. The blue shading represents total fish counts through the fishway, and orange shading represents the proportion of fish that entered the traps. The west ladder had the most data, and there were not enough data for the east ladder alone, so efficiency for both ladders combined is shown. Of note, there was 1 day where all fish counted through the east fishway were also collected in the traps. Additionally, toward the end of trapping, there were higher fish counts through the fishways, but fish collected in the traps did not increase proportionally. Douglas PUD would have liked to continue trapping operations to capture the peak of the run but could not due to staff availability.

Ralph Lampman asked whether trap operations from 2130 hours to 0800 hours is a requirement, or can the traps be operated into the daylight hours? Mayfield said this was the timing approved by the Wells Habitat Conservation Plan (HCP) Coordinating Committee. John Rohrback is simultaneously analyzing passage timing through the fishways to verify trap operations did not impact steelhead passage through the ladders. A proposal to trap longer would require a solid rational to obtain Wells HCP Coordinating Committee approval. Lampman asked about the timing of trap operations at PRD. Mayfield said trap operations at PRD are in the evening as well, but she is unsure about the exact hours. Additionally, at PRD, there is an ability to close off the bottom orifices, which increases trap efficiency. Andrew Gingerich agreed with Lampman that longer trap operation hours would be ideal, not only for the opportunity to collect more fish, but from a logistical standpoint, it would be nice to set the traps and leave them for longer periods. However, two-thirds of the steelhead passing Wells Dam migrate during daylight hours, and longer trap operation hours may run into staffing issues. He believes it may be possible to obtain Wells HCP Coordinating Committee approval for longer hours, but as Mayfield said, this would require a solid rational. Mayfield noted that lamprey are passing at 2100 hours when trapping was initiated and are likely passing earlier. Then passage increases around 2200 to 2300 hours. John Ferguson said trap operations will also depend on the study requirements. Given the required sample size, perhaps there could be a proposal to trap on a more aggressive schedule up to a point, then back off. Ultimately, Douglas PUD and the Aquatic SWG will need to show the Wells HCP Coordinating Committee there is no impact to salmonid passage.

Lampman asked, with 35% trap efficiency and recaptures accounting for less than 10% of the total collected, does this mean fish avoided the traps during the second migration through the ladders? Mayfield said she is unsure but guessed that with trap operations only occurring on 4 of 7 days, fish may have migrated through the ladders when the traps are not operating. Lampman asked whether the trap efficiency calculations only include hours of operation. Mayfield said the blue shading represents all fish counts, but the orange shading only represents when the traps were operating.

That is, the zeros for the orange shading mean the traps were not operating, but total fish counts are still shown. So, 35% trap efficiency only represents the days of trapping. Ferguson said the important message is that these data show promise for collecting lamprey at Wells to be used in a future study.

Mayfield also looked at what happened to these fish post-tagging (Slide 4). Fish were collected in the traps, PIT-tagged, sampled for genetics, and then were released downstream of Wells Dam in the tailrace. So far, 12 fish went into the Methow, 3 fish went into the Okanogan, and 10 fish passed through the ladders but have not been detected in a tributary. In total, 25 fish were last detected above Wells Dam. A total of eight fish were last detected at the Wells Hatchery volunteer channel, most of which were detected in the first week. The initial plan was to release fish as close to the dam as possible. There is an old boat launch near the hatchery volunteer channel, and fish were initially released at the point near the boat launch, but the volunteer channel was apparently a draw for the fish. After the first week, the release location was moved farther downstream to Carpenter Island, and at least one of these fish still ended up at the hatchery volunteer channel. Hopefully these fish will migrate naturally back to the mainstem, but the hatchery volunteer channel will be dewatered next week, and a fish salvage will be performed. Hatchery staff know to release any recovered lamprey back to the mainstem. Lastly, for post-tagging re-entry into the ladders, some fish moved right away, but one took 24 days. The median was 8 days, which is longer than she expected. Mayfield guessed this might be related to handling effects. These data will be included in the Pacific Lamprey Management Plan annual report, including last known detection locations.

Mayfield shared on Microsoft Teams an aerial image of the hatchery volunteer channel area.

Lampman asked whether other species have been detected at the volunteer channel and whether fish from the channel entered the hatchery building. Mayfield said she believes salmonids have also been detected at the channel and have entered the hatchery building, but she does not know about lamprey entering the building. There is an upwell area toward the top of the channel, and she believes most fish in the volunteer channel typically stay below this point. Lampman asked for a photograph of the upwell area, and Mayfield said she can do this. Douglas PUD has also been thinking about whether this area might be an issue. Gingerich agreed with Mayfield, and he added that hatchery returns and wild-origin salmonids have been detected at this location, particularly when river temperatures increase later in the summer, because the hatchery uses groundwater which acts as a cold water refuge. Fish will nose into the channel and will sometimes enter the hatchery building. He is also unsure about lamprey entering the building, but he does not believe staff have handled any lamprey inside the building. At the top weir, there is no bottom-oriented orifice to make it easy for lamprey to get into the building, which is why he thinks lamprey do not get into the building. Douglas PUD will continue monitoring this area.

Lampman asked about the 17 fish last detected at the Wells Hatchery volunteer channel in the 2022 Adult Pacific Lamprey Study Report. Mayfield said Douglas PUD believes there is evidence of spawning in the tailrace, possibly near Carpenter Island. If not detected again, she hopes these fish are in the mainstem spawning. Lampman asked about the time of year these fish were last detected at the volunteer channel. Mayfield said she would need to review the report, but most of these fish were PIT-only fish. The fish with acoustic tags likely left the channel when it was dewatered and would have detections somewhere else. Lampman suggested figuring out a way to summarize last detections of these 17 fish included in the 2022 report.

Gingerich clarified that the volunteer channel is only dewatered in the upper section above the upwell area, and he does not believe the lower section is ever completely dewatered. Mayfield suggested that Lampman visit Wells Dam so Douglas PUD can show him the Wells Hatchery volunteer channel area. Lampman suggested adding this to the annual site visit.[1] He also asked to verify whether the lower section of the volunteer channel gets fully dewatered.[2] Ferguson asked about the substrate in the volunteer channel between the tailrace and the false weir. Gingerich said there is a concrete apron with eroded rock. Mayfield added there is cobble, the area is fairly fast and shallow, and there is likely no spawning in this area.

[1] Each year, Douglas PUD extends an invitation to the Aquatic SWG, and other interested parties, to tour the Wells Dam fishway while a ladder is dewatered for annual winter maintenance. This tour is also typically coupled with a tour of the Wells Hatchery and White Sturgeon rearing facility and an in-person Aquatic SWG monthly meeting.

[2] Andrew Gingerich later confirmed, the flows change but the lower section is never dry.

Gingerich said that Douglas PUD will provide additional information about the Wells Hatchery volunteer channel system, including the following: 1) photographs of the system, including the upwell area and PIT tag array locations; and 2) how and when the system operates.

Mayfield said that Douglas PUD will also provide additional information about the 17 fish last detected at the Wells Hatchery volunteer channel in the 2022 Adult Pacific Lamprey Study Report, including the following: 1) the current last detection locations of these fish; and 2) what time of year the last detections were. *(Note: Mayfield provided this additional information, which was distributed to the Aquatic SWG by Geris on September 12, 2024.)*

C. BY 2024 Wells White Sturgeon Rearing Update (Andrew Gingerich)

A brood year (BY) 2024 Wells White Sturgeon Rearing Update (Attachment C) was distributed to the Aquatic SWG by Kristi Geris prior to the Aquatic SWG conference call on September 11, 2024. Andrew Gingerich said 10 of 11 tanks are doing well. There is one tank with small fish (highlighted in yellow) where losses are high, but this is normal, and he does not believe there is anything wrong in terms of fish health. Fish per pound (fpp) represents how many fish are needed to equal 1 pound, so those 500 fpp fish are fairly small. To convert fpp to fish in grams, take 454 divided by fpp. When fish reach 58 fpp, hatchery staff start feeling more comfortable, and when fish reach 60 fpp, which are 8- to 10-gram fish, staff feel pretty confident there will be few losses through the balance of rearing. There are 5,517 fish on station, which is way more than is needed. In 3 to 4 weeks, Douglas PUD will begin discussing with the CTCR about surplusing fish, as was done in previous years, because as these fish grow the hatchery will soon reach capacity. To date, survival of BY 2024 White Sturgeon on station at Wells Hatchery is about 65%.

John Ferguson asked whether 5,517 fish is about double what is needed. Gingerich recalled that Douglas PUD needs 325 fish and Chelan PUD needs about 2,250 fish.

Laura Heironimus asked why Tank 12 has no fish. Gingerich explained that Tanks 1 to 11 have shallow trough inserts. When fish reach a certain size, fish are moved to deep tanks. The one extra tank is to help with this grading process and is currently vacant in preparation for moving fish from shallows into deep tanks.

Heironimus left the call.

D. Draft 2025 Adult Pacific Lamprey Study Plan Update (Mariah Mayfield)

The draft memorandum "2025 Adult Lamprey Study Plan Overview" was distributed to the Aquatic SWG on August 13, was discussed during the meeting on August 13, and was available for review with further edits and comments due to Douglas PUD by September 10. Mariah Mayfield recalled that the Yakama Nation and the CTCR submitted comments, and she asked whether USFWS plans to

submit comments. Stuart Fety said he does not plan to submit comments, and he is unsure whether RD Nelle plans to submit comments.

Mayfield said she reviewed last month's meeting minutes, and everything seems straightforward.[3] She recalled that Ralph Lampman indicated interest in studying fish migrating during the spring. Mayfield said the proposed study tags have a battery life long enough to track spring movements. For a study starting in July 2025, the proposed tags should last until July 2026. Lampman said it would be good if the tag could last longer than July, because sometimes Pacific Lamprey spawn even later in the Upper Columbia River. Mayfield said these tags will cover passage through Wells Dam, and this study is not proposing to track fish into the tributaries. She did look into longer tag life, but this meant bigger tags, which is not ideal. Lampman asked about a sleep mode, and Mayfield said these nano tags do not have a sleep mode, but this also means Douglas PUD can continue tracking fish throughout the winter months. According to the Lotek representative, these tags have two modes: 1) 24 hours on; or 2) 12 hours on and 12 hours off. The latter would not work for this proposed study design.

Lampman recalled that he also suggested early, mid, and late releases, and he asked whether this is doable. Mayfield said yes, Douglas PUD was thinking the same way, especially for collecting study fish at Wells Dam. Capturing the full run is a good approach. Additionally, she understands that Chelan PUD is also hoping to use fish collected at PRD for a passage study at Rock Island Dam next year, so it helps Grant PUD if Douglas PUD asks for fewer fish over a longer period. This approach helps both Chelan PUD and Douglas PUD obtain study fish. She understands that Chelan PUD is also planning to use radio telemetry, which may be an opportunity to boost sample size for the Douglas PUD study.

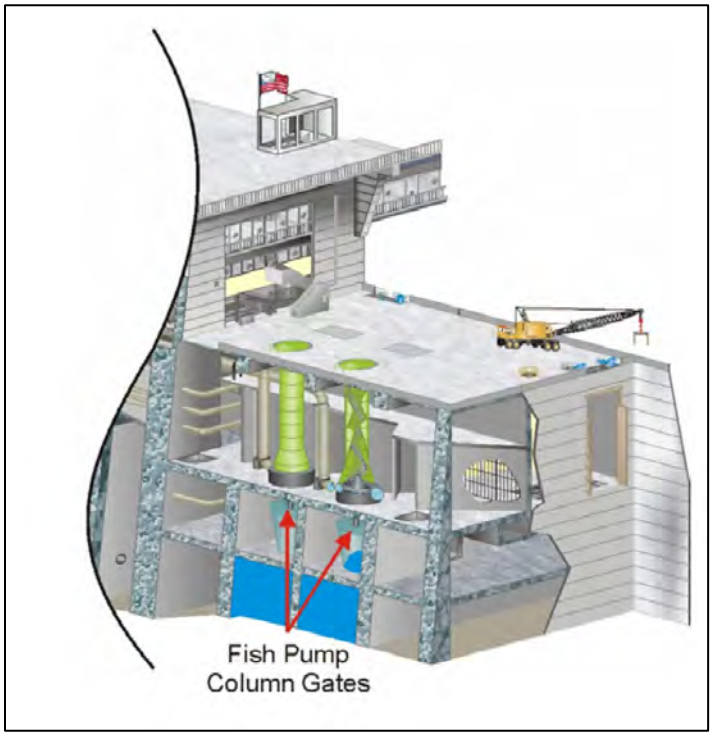
John Ferguson said the comment period is now closed and asked about next steps. Mayfield said the next step is for Douglas PUD to draft a study plan. Currently, Douglas PUD is finishing up the 2024 Resident Fish Assemblage Study[4] and preparing for the 2024 White Sturgeon monitoring and indexing effort this fall, so a draft 2025 Adult Pacific Lamprey Study Plan may not be ready until November or December. Ferguson suggested targeting November to provide more time for discussion, if needed. Mayfield said considering discussions and comments to date, she does not anticipate many questions or changes to the draft plan. Tag orders only require a 2-month lead time, and most equipment is in place. She thinks end-of-year will be okay but can target November.

Douglas PUD will target having a draft 2025 Adult Pacific Lamprey Study Plan for Aquatic SWG review by the Aquatic SWG conference call on November 13, 2024.

[3] Mayfield could not attend the Aquatic SWG conference call on August 13, 2024.
[4] Per the *2024 Resident Fish Assemblage Study Plan*, as approved by the Aquatic SWG during the conference call on March 13, 2024.

E. Wells Dam Fishway Operations (Andrew Gingerich)

Andrew Gingerich shared in the Microsoft Teams chat a figure of a cutaway showing the fish pump gates at Wells Dam.



Gingerich said the east and west fishways at Wells Dam have alarms for monitoring head differentials between the auxiliary water supply (AWS) system and the collection gallery. This figure is a view of the fish pumps from the tailrace. The pumps move water into the lower section of the fishway, starting at Pool 19 down to the collection gallery. Not every weir, but most, have AWS diffuser gratings that are supplied with auxiliary water from the fish pumps. Recall, during the annual site visits, the large area accessed by being lowered in a crane: some of this diffuser grating is in that area, which separates the supply chamber from the collection gallery.

As the AWS pumps operate, this is bringing in aquatic vegetation that is impinging on the diffuser grating. Starting late last week, operators started receiving elevation-differential alarms between the supply chamber and collection gallery. These alarms are triggered when there is a 2-foot or more difference in head differentials. Aquatic vegetation is building up on the backside (supply chamber side) of the diffuser wall panel, reducing AWS flow into the collection gallery. This happened before in 2001. At that time, National Marine Fisheries Service (NMFS) recommended reducing the collection gallery opening to the tailrace (tan doors in the figure) from 8 feet to 4 feet across so not as much water needs to be pumped through the diffuser gratings to maintain head differentials between the collection chamber and the tailrace. Normally, the fishway operates at a 1.5-foot head

differential. By reducing the fish pump output and collection gallery entrance opening, this results in a 1.0-foot head differential. Secondly, with the fish pumps not pushing as much water against the wall diffusers, this puts less pressure on the vertical diffuser panels separating the auxiliary water supply from the collection chamber. This is important because if too much pressure is placed on the AWS screens that are matted with vegetation, this can blow out a vertical wall panel, allowing fish to access the area. In 2001, NMFS instructed Douglas PUD to avoid this at all costs. Last week, Douglas PUD discussed options for cleaning the screens. The best option is a ladder outage to dewater and scrape the screens; however, with salmonids migrating through the ladder right now, Douglas PUD prefers not to do an outage. Therefore, the decision was made to close the entrance slightly and reduce the AWS flow needed to maintain a 1.0-foot head differential, consistent with the 2001 recommendation from NMFS. This is a short-term fix and will be monitored closely. During the upcoming winter maintenance period, in November and December 2024, there will be a full cleaning of the screens. Gingerich felt it was important to update the Aquatic SWG about these modified operations to maintain safe fish passage through the fishway while handling aquatic vegetation. He will keep the Aquatic SWG updated if anything changes or if Douglas PUD receives different guidance from the Wells HCP Coordinating Committee.

Ralph Lampman asked, if the fishway entrance is reduced, does this result in faster velocities at the entrance or in any other parts of the ladder? Gingerich said at the entrance, in theory no; velocities should be lower. The AWS pumps control velocities. To reduce the fish pump output, the openings of the fish pump column gates (shown in the figure) are reduced, which sends less water through, dropping the 1.5-foot head differential to 1.0-foot, so velocities are lower than under normal operations. Gingerich said, regarding Lampman's second question about other sections of the ladder, again, in theory no. However, Pool 54 also receives AWS from the forebay, and he is growing concerned about water velocity through the count window. There are picketed leads above and below the count window crowder that can bypass water, so not all water goes through the count window area. He believes these screens may be loaded with vegetation too. If this is true, water cannot bypass the count window, resulting in increased headwater pressure behind the count window location. There is no water velocity meter there. His guess is based on the seemingly increasing rate he sees vegetation and bubbles move through the area. Tomorrow, the east ladder is scheduled for routine maintenance, just for about 1 hour in the upper section. Crews will check the picketed lead area and can clean off any vegetation buildup. If successful, crews will do the same on the west ladder.

Ferguson asked, when does this aquatic vegetation diminish? Gingerich said as daylight hours decrease, water temperatures should decrease, all of which should be a net positive for vegetation production. However, this also means vegetation dying, and some vegetation is designed to

reproduce through fragmentation. He has heard that other PUDs are battling this issue too, but he has not heard of similar operational issues like Wells Dam has encountered this year.

III. Administration

A. Upcoming Meetings (John Ferguson)

The Aquatic SWG meeting on October 9 will be held by Microsoft Teams conference call.

Other upcoming meetings include November 13 and December 11, 2024 (conference call).

List of Attachments

Attachment A List of Attendees
Attachment B Lamprey Summary Slides
Attachment C BY 2024 Wells White Sturgeon Rearing Update

Attachment A – Attendees

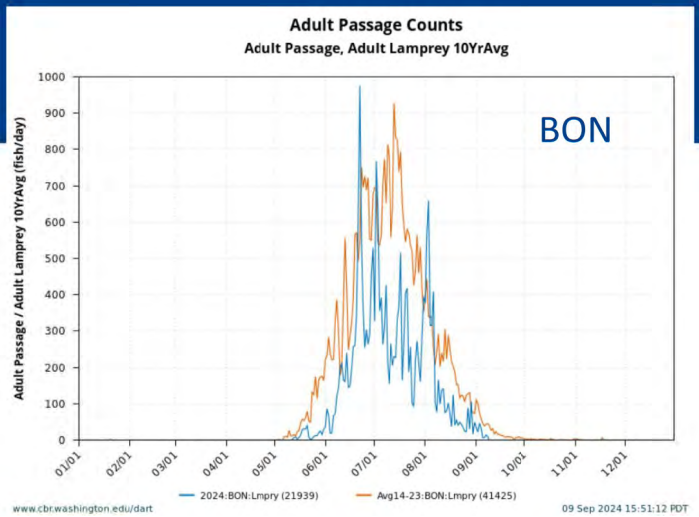
Name	Role	Organization
John Ferguson	Aquatic SWG Chairman	Anchor QEA
Kristi Geris	Administration/Technical Support	Anchor QEA
Andrew Gingerich	Aquatic SWG Technical Representative	Douglas PUD
Mariah Mayfield	Aquatic SWG Technical Support	Douglas PUD
Stuart Fety	Aquatic SWG Technical Alternate	U.S. Fish and Wildlife Service
Laura Heironimus*	Aquatic SWG Technical Alternate	Washington Department of Fish and Wildlife
Ralph Lampman	Aquatic SWG Technical Representative	Yakama Nation

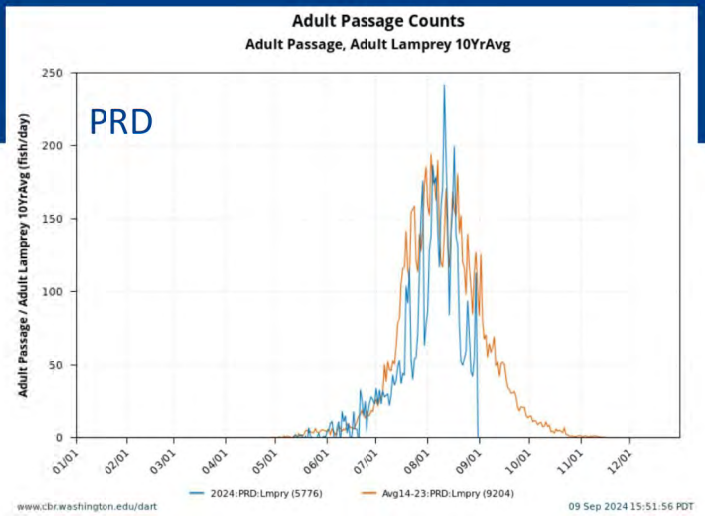
Notes:

* Attended from Item I-A to Item II-C.

2024 Translocation

- 860 total fish
- Most released at Starr
- 129 transferred to Colville Tribes
  - Loup Loup Cr: 36; Salmon Cr: 37; Similkameen: 27; Omak Cr: 29





As of 9/9:

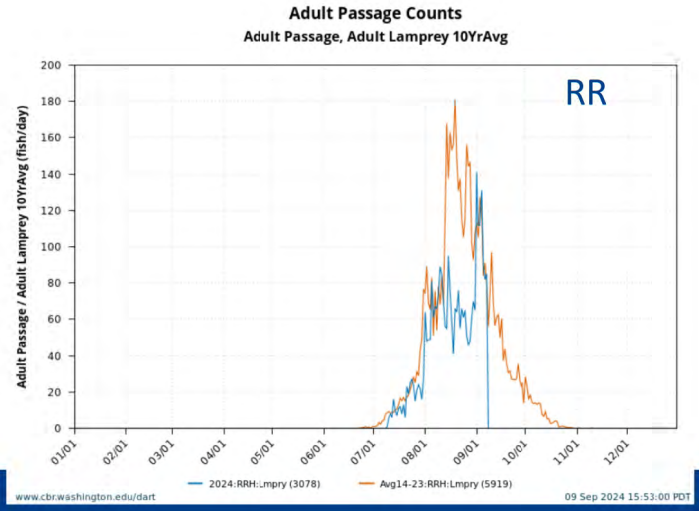
BON: 53% of 10-yr avg

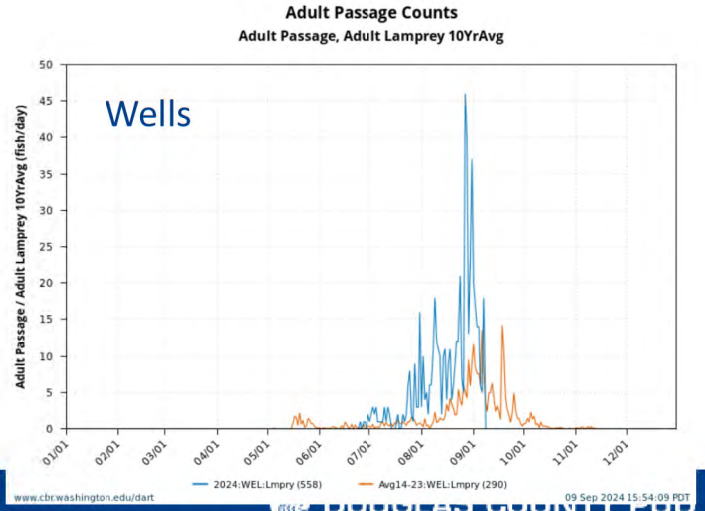
PRD: 63% of 10-yr avg

RR: 52% of 10-yr avg

Wells: 192% of 10-yr avg

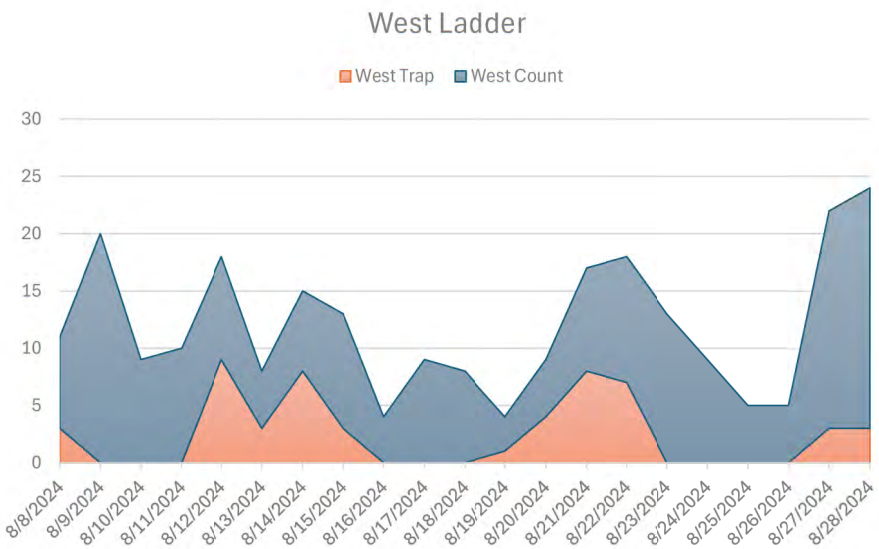
RR to Wells conversion:
18% (highest rate since 2005; 2022 was 15%)



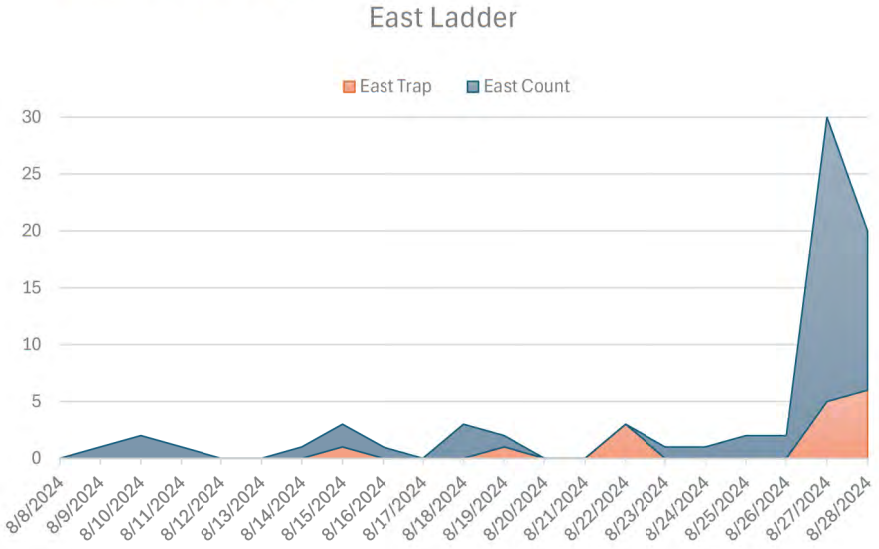


Ladder Trapping Summary

- August 8 – 28
- 21:30 - 8:00, Sun night to Thurs morning
- 63 individual fish; 5 recaps



- West Ladder Efficiency: 0.34 (90% CI: 0.10 – 0.58)
- Both Ladders Combined: 0.35 (90% CI: 0.00 – 0.71)



Post-Tagging Summary (as of 9/9)

- Methow: 12 fish
- Okanogan: 3 fish
- Passed Ladder, no trib detection: 10 fish
- Hatchery Volunteer Channel: 8 fish
- Post-tagging re-entry to ladders:
  - Range: 1 – 24 days
  - Median: 8 days

From: Andrew Gingerich
To: Kristi Geris
Subject: Wells White Sturgeon Rearing Update
Date: Wednesday, September 11, 2024 09:17:09

CAUTION: This Message Is from an External Sender
This email originated from outside of Anchor QEA. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Kristi, with Chas out today I will provide the White Sturgeon BY 2024 update. Here's the summary for distribution. I will refer to it this morning on the call.

Tank	POPULATION	fpp	Daily mort (Sept 1-9)fish/d
1	704	158	1.6
2	954	500	36.0
3	454	81	0.6
4	509	102	0.0
5	453	81	0.7
6	480	82	0.3
7	468	79	0.7
8	344	89	0.3
9	426	81	0.0
10	152	58	0.0
11	573	118	0.4
12	0	NA	NA
Total	5,517		

Andrew

FINAL

Conference Call Minutes

Aquatic Settlement Work Group

To: Aquatic SWG Parties Date: December 11, 2024

From: John Ferguson, Chair, Anchor QEA

Re: Final Minutes of the November 13, 2024, Aquatic SWG Conference Call

The Aquatic Settlement Work Group (SWG) met by conference call on Wednesday, November 13, 2024, from 10:00 a.m. to 11:45 a.m. Attendees are listed in Attachment A of these conference call minutes.

Summary of Action Items

1. Douglas PUD will verify the spacing of the metal grating in the Wells Hatchery volunteer channel groundwater upwell area, as well as investigate the detection efficiency of the passive integrated transponder (PIT) array located downstream of this area (Item II-A).
2. Douglas PUD will determine whether the two Chelan PUD hatchery-reared White Sturgeon captured during the 2024 Wells White Sturgeon monitoring and evaluations (M&E) effort were recaptures (Item II-E). *(Note: one fish had not been captured before, and the other had been captured previously during index monitoring in 2017 and again in 2019.)*
3. Douglas PUD will look into locating White Sturgeon count data at Columbia and Snake River dams to include in Douglas PUD's *Adult White Sturgeon Upstream Passage Evaluation* (Item II-F).
4. The Aquatic SWG meeting on December 11, 2024, will be held by conference call (Item III-B).
5. The Aquatic SWG meeting on February 12, 2025, will be held in person at Wells Hatchery in Azwell, Washington, starting at 9:00 a.m., followed by a tour of the volunteer channel (Item III-B).

Summary of Decisions

1. There were no decisions approved during today's conference call.

Agreements

1. There were no agreements discussed during today's conference call.

Review Items

1. The draft *Adult White Sturgeon Upstream Passage Evaluation* was distributed to the Aquatic SWG by Kristi Geris on November 7, and is available for a 30-day review with edits and comments due to Douglas PUD by December 9, 2024.
2. A draft *Wells Dam 2025 Adult Lamprey Approach and Passage Study Plan* was distributed to the Aquatic SWG by Kristi Geris prior to the Aquatic SWG conference call on November 13. Verbal comments will be discussed during the Aquatic SWG conference call on December 11, and written comments are due to Douglas PUD by December 13, 2024 (Item II-B).

Documents Finalized

1. There are no documents that have been recently finalized.

I. Welcome

A. Review Agenda (John Ferguson)

John Ferguson welcomed the Aquatic SWG members (Attachment A) and reviewed the agenda. Ferguson asked for any additions or changes to the agenda. Ralph Lampman added the draft *Adult White Sturgeon Upstream Passage Evaluation*.

B. Meeting Minutes Approval (John Ferguson)

The revised draft September 11 conference call minutes were reviewed. Kristi Geris said edits and comments received from Aquatic SWG members that were minor clarifications were incorporated into the revised minutes. There are three items remaining to be discussed, as follows:

- Andrew Gingerich noted that the draft *Total Dissolved Gas Water Quality Attainment Plan Year 10 Report* has languished without a Washington State Department of Ecology (Ecology) Aquatic SWG representative and suggested reinitiating this review once Ecology identifies a new representative. Mariah Mayfield said Chad Brown (Ecology Aquatic SWG Policy representative) is trying to identify a new representative by early 2025, and she can place this back on the agenda at that time. Steve Lewis (U.S. Bureau of Indian Affairs) asked what this means in terms of compliance. Mayfield said Douglas PUD met the 10-year compliance schedule by submitting the draft report to Ecology in 2023.
- Geris added the draft *Adult White Sturgeon Upstream Passage Evaluation* under Review Items, which will be discussed during today's conference call.
- Gingerich provided clarification about the lower section of the Wells Hatchery volunteer channel, which will be discussed during today's conference call.

Aquatic SWG representatives present approved the September 11 conference call minutes, as revised. The Confederated Tribes of the Colville Reservation (CTCR) abstained because a representative did not participate in the September 11, 2024, conference call.

C. Review of Action Items (John Ferguson)

Action items from the Aquatic SWG conference call on September 11 are as follows *(Note: The following italicized item numbers correspond to agenda items from the September 11, 2024, conference call)*:

1. *Douglas PUD will provide additional information about the Wells Hatchery volunteer channel system, including the following: 1) photographs of the system, including the upwell area and PIT-tag array locations; and 2) how and when the system operates (Item II-B).*
   This will be discussed during today's conference call.
2. *Douglas PUD will provide additional information about the 17 fish last detected at the Wells Hatchery volunteer channel in the 2022 Adult Pacific Lamprey Study Report, including the following: 1) the current last detection locations of these fish; and 2) what time of year the last detections were (Item II-B).*
   Mariah Mayfield provided this additional information, which was distributed to the Aquatic SWG by Kristi Geris on September 12, 2024.
3. *Douglas PUD will target having a draft 2025 Adult Pacific Lamprey Study Plan for Aquatic SWG review by the Aquatic SWG conference call on November 13, 2024 (Item II-D).*
   This will be discussed during today's conference call.

II. Summary of Discussions

A. Wells Hatchery Volunteer Channel – Review and Explanation (Andrew Gingerich and Mariah Mayfield)

A Wells Hatchery Volunteer Channel document (Attachment B) was distributed to the Aquatic SWG by Kristi Geris prior to the Aquatic SWG conference call on November 13, 2024.

Mariah Mayfield said Page 1 of Attachment B shows an aerial view of the Wells Hatchery volunteer channel area. The Columbia River is on the right, the numbers correspond to photographs in the next slides, and photographs were taken at low water. Photograph 1 is the view from the alcove looking at the volunteer channel entry, which is a series of weirs. After the entrance there is a corner, then more weirs, as shown in Photograph 2. To the left, there are different inputs of water, including an outlet from an earthen rearing pond. For the 2025 Adult Pacific Lamprey Study, radio antennas will be installed at the downstream and upstream weirs to evaluate whether study fish are entering this area and when. Farther up the channel are the PIT arrays, as shown in Photograph 3. These arrays are fairly close together, and PIT-tagged lamprey have been detected moving back and forth between

these arrays. Upstream of the PIT arrays is the groundwater upwell area, as shown in Photograph 4. During processing salmon for hatchery brood, the metal grating is raised so adults can pass through into the next area and then into the adult handling facility. Photograph 5 shows the area behind the metal grating, which is dry in the photograph because there are no fish being processed. These weirs are 90-degree concrete structures. Even during high water, salmon need to jump to get up and over the weirs and into the adult handling facility. Douglas PUD believes lamprey that enter the volunteer channel stay in the channel, and the goal is to verify this with radio tags next year. If lamprey were to enter the adult handling facility, crews would see this and return the fish to the river, but this has not been observed.

Ralph Lampman asked, in Photograph 2, is the middle culvert perched? Mayfield said yes, and there is grating at the top end of the pipe before the dirt pond. Douglas PUD has already identified this as a potential issue for lamprey. Next year, Douglas PUD plans to take a closer look at this area to make sure lamprey cannot access this area. Lampman asked about the size of the grating. Mayfield said she would need to verify this with hatchery staff.

Lampman asked, in Photograph 3, is there 100% detection efficiency at the PIT array? Andrew Gingerich said Douglas PUD might be able to investigate this for salmon, but not for lamprey without a better understanding of their motivation to move upstream. Lampman, asked in Photograph 4, what is the size of the openings in the metal grating? Mayfield said the grating on the right has main and secondary veins, and she guessed the openings are less than 1 inch. The grating on the left also has fine openings (mesh), and Chas Kyger thinks this might be a drain. Lampman said 3/4-inch is the standard opening for lamprey exclusion. Douglas PUD will verify the spacing of the metal grating in the Wells Hatchery volunteer channel groundwater upwell area, as well as investigate the detection efficiency of the PIT array located downstream of this area.

Lampman asked about installing addition detection sites between the existing PIT array and the upper volunteer channel where fish are handled. Mayfield said installing another PIT array is not feasible, but this upcoming radio study will present an opportunity to mobile track in the area to ascertain whether fish enter the volunteer channel and where fish might be holding in the channel. Lampman said it is known that lamprey are reaching the PIT array, but it is unknown how far up the channel beyond the array fish are moving and where these fish are turning around. Mayfield thinks lamprey end up in the upwell area, but then there is nowhere further to go. The bigger question to her is when are these fish are leaving the channel. John Ferguson said the radio study will show what proportion of the population is entering the channel, which will also show the magnitude of the issue. Lampman said the radio tags will show when fish are coming in and out of the channel, and PIT tags will show where the fish are in the channel. Mayfield clarified there will be 400 PIT-tagged adults, and 200 fish will also have radio tags.

Lampman asked, once past the upwell area, how do fish get into the adult handling facility? Kyger said after the weirs in Photograph 5, fish jump into a false weir and are sent to a sorting table inside the adult handling facility, which is equipped with PIT detection. To date, no lamprey have been detected inside the facility. If lamprey were to fit through the openings in the metal grating in the upwell area, crews could look down and see the fish in the chamber in Photograph 5. Mayfield added that hatchery staff are aware of this concern and are paying closer attention to these areas.

Laura Heironimus asked about the frequency of mobile tracking events planned for the 2025 Adult Pacific Lamprey Study. Mayfield said the draft study plan proposes conducting opportunistic mobile tracking events, not scheduled events. For example, if a lot of study fish are entering the volunteer channel, this might be cause for conducting a mobile survey. Douglas PUD is also interested in locating possible spawning areas and may conduct more mobile tracking during the spawning period. If Aquatic SWG members prefer more prescribed events, please provide these suggestions during the comment period. Heironimus suggested a couple planned events, along with opportunistic events. Washington Department of Fish and Wildlife will provide these comments. Steve Lewis asked when comments are due. Mayfield said the draft study plan was distributed today, and she suggested a 30-day review. Verbal comments can be discussed during next month's Aquatic SWG meeting, and she noted that she and Lampman will miss the meeting due to their attending the Pacific Lamprey Conservation Initiative (PLCI) Lamprey Information Exchange.

B. Draft 2025 Adult Pacific Lamprey Study Plan (Mariah Mayfield)

A draft *Wells Dam 2025 Adult Lamprey Approach and Passage Study Plan* was distributed to the Aquatic SWG by Kristi Geris prior to the Aquatic SWG conference call on November 13, 2024.

Mariah Mayfield said this draft plan is consistent with discussions to date. The primary objective (Objective 1a) is to determine the proportion of radio-tagged fish that approach Wells Dam, successfully enter the collection gallery, and ascend the fish ladder. Additionally, while acknowledging aspects of this study cannot be compared to past studies due to the use of acoustic versus radio telemetry hardware and methods, Douglas PUD believes the tag sizes are similar enough to do an analysis of differences within the tag groups (Objective 1b). Using radio telemetry also presents the ability to collect data for secondary objectives. Objective 2a evaluates nightly modification of the typical 1.5-foot head differential to a lower 0.5-foot head differential, which has been shown to be advantageous for lamprey passage at other projects. The last time this was evaluated at Wells Dam, the results were limited by small sample size. Objective 3a compares count window data to known upstream and downstream detections to evaluate count window efficiency. Objective 4a evaluates tag burden by comparing "radio+PIT" fish to PIT-only fish. Lastly, to ensure the radio-tagged fish are a representative sample of the entire population, this study proposes

collecting fish at Priest Rapids Dam (PRD) and Wells Dam. Objective 4b evaluates differences in approach and passage rates between fish collected at PRD compared to fish collected at Wells Dam.

Steve Lewis asked whether the head differential protocols are consistent with past evaluations. Mayfield said last time,[1] the evaluation tested a moderate 1-foot head differential. This plan proposes a low 0.5-foot treatment. This plan also proposes a slightly longer treatment period from 18:00 hours to 02:00 hours.[2] Figure 5 in the draft plan depicts these every-other-night treatments. John Ferguson noted that this lower treatment and longer duration will need to be reviewed and approved by the Wells HCP Coordinating Committee. Andrew Gingerich agreed, and said trapping lamprey at Wells Dam will also need approval, which is another reason behind requesting a 30-day Aquatic SWG review, so there is adequate time for Wells HCP Coordinating Committee approval. Regarding Lewis's question about past evaluations, these 0.5-foot and 1.0-foot treatments have been reviewed and approved by the Wells HCP Coordinating Committee in the past.

Lewis asked about the rationale behind every-other-night treatments. Mayfield said the Aquatic SWG requested a rotating option for when lamprey may encounter high or low head differentials. Dave Robichaud (LGL Limited) suggested every-other-day treatments. Previous studies with more than one treatment used a randomized block design. Ralph Lampman asked whether it might be possible to alternate head differential treatments between the two ladders (e.g., treatment in west and control in east, then next night switch). Lampman acknowledged each day will have varying numbers of lamprey passing the dam, but this may still show a clear preference. Gingerich thinks this is a good idea, so long as ladder preference is 50/50 every day. On average, in the past 10 to 13 years, Pacific Lamprey have shown a preference for the east ladder over the west ladder (60/40 ratio), but not every year. How can this evaluation correct for ladder preference effects when this is inconsistent year-to-year? Lampman thinks this does not matter. He is just interested in whether a fish tries one ladder and then the other ladder during a single treatment, and he is interested in these types of movements when treatments are set up in different ladders. Mayfield will discuss this internally and with Robichaud.

Mayfield said this study proposes collecting and tagging 100 radio+PIT fish at PRD and 100 radio+PIT fish at Wells Dam. An additional 100 PIT-only fish will be collected and tagged at each dam. All fish will be released in the Rocky Reach Dam forebay. If target numbers cannot be collected at Wells Dam, the difference will be collected at PRD. This study plan does not have prescribed releases because the goal is to capture the full run at PRD and Wells Dam. This may mean 4 to 8 release groups, with a minimum release group of 15 fish, or ideally closer to 25 fish to increase statistical significance. Figure 1 in the draft plan shows the 10-year average of adult Pacific Lamprey

[1] 2013 Adult Lamprey Passage and Enumeration Study
[2] The 2013 Adult Lamprey Passage and Enumeration Study used a treatment period from 19:00 hours to 02:00 hours.

returns at PRD and Wells Dam, notably the differences in peak timing for each location. The plan is to start trapping and releasing PRD fish in late July, followed by a period of trapping and releasing both PRD and Wells Dam fish, then later in the season there may be a period of just Wells Dam fish.

Figures 2, 3, and 4 in the draft plan show radio antenna locations. Douglas PUD plans to conduct pre-season testing, which may identify additional antenna locations in the tailrace and fishways.

Mayfield will be at the PLCI Lamprey Information Exchange next month, but she suggested discussing verbal comments during the Aquatic SWG conference call on December 11 and submitting written comments to Douglas PUD by December 13. Douglas PUD may present this topic to the Wells HCP Coordinating Committee during their conference call on December 16, 2024. Mayfield noted Table 5 in the draft plan, which shows the timeline for study development, implementation, and reporting. Radio antenna installation is planned for this winter maintenance outage. Douglas PUD hopes to finalize the study plan by February 2025, which provides time to adjust radio antenna locations and finish purchasing equipment. Mayfield noted that Douglas PUD has received the test tags. The tag size is ideal, and the antenna is narrow and flexible, so Douglas PUD is now less concerned about the antenna interfering with the study fish's ability to swim. Lampman asked about battery life. Mayfield said 357 days. After the first summer, Douglas PUD plans to provide an update in January 2026, continue tracking through spring 2026, and finalize the data at the end of the tag life.

C. Juvenile and Adult Pacific Lamprey Literature Reviews and Document Libraries (Mariah Mayfield)

Mariah Mayfield reviewed eight documents that were recently added to the Pacific Lamprey literature review libraries, as described in the following paragraphs.

In the juvenile library, the publication *Juvenile Pacific Lamprey Passage Behavior and Survival at Lower Granite Dam, 2022*[3] is the Pacific Northwest National Laboratory study report that has been presented to various regional fish forums.

In the juvenile library, the publication "Evaluation of Survival Estimates Generated from Tracking Downstream Migrating Juvenile Sea Lamprey (*Petromyzon marinus*) with a Miniature Acoustic Telemetry Tag"[4] is a study on sea lamprey in Michigan and their migration through coastal-riverine versus wetland-lake habitats.

[3] Deng, Z.D., K.A. Deters, J.J. Martinez, R.A. Harnish, R.P. Mueller, P.S. Titzler, T. Fu, H. Li, and B. Wu, 2023. *Juvenile Pacific Lamprey Passage Behavior and Survival at Lower Granite Dam, 2022*. Prepared for the U.S. Department of Energy. October 2023.

[4] Haas, T.F., T.O. Brenden, Z.D. Deng, and C.M. Wagner, 2023. "Evaluation of Survival Estimates Generated from Tracking Downstream Migrating Juvenile Sea Lamprey (*Petromyzon marinus*) with a Miniature Acoustic Telemetry Tag." *Canadian Journal of Fisheries and Aquatic Sciences* 81:403–416.

In the juvenile library, the publication *First Investigations on Lamprey Responses to Elevated Total Dissolved Gas Exposure and Risk of Gas Bubble Trauma*[5] is a new study that found the effects of gas bubble trauma (GBT) in juvenile lamprey may not be detected using standard Fish Passage Center GBT monitoring protocols; rather, a fish needs to be held up to a light to see bubbles in the digestive system. Mayfield said there are very few time periods when Douglas PUD is concerned with GBT in the Wells Project, because GBT expression is more likely to occur when total dissolved gas levels exceed 130%. If juvenile lamprey are encountered during GBT monitoring, Douglas PUD will perform a more extensive evaluation as described in this paper.

In the adult library, the publication, "Adult Sea Lamprey Approach and Passage at the Milford Dam Fishway, Penobscot River, Maine, United States"[6] is a radio telemetry study.

In the adult library, the publication "Evaluating the Viability of the Use of T-Bar and Radiotelemetry Tags on Prespawn Arctic Lampreys"[7] evaluates survival, tag retention, and swim endurance at short-term and long-term intervals for T-bar-tagged (floy-tagged) and radio-tagged fish. Mayfield and Chas Kyger have discussed whether radio tags cannot sufficiently evaluate count window efficiency; another consideration could be the use of floy tags.

In the adult library, the publication "Speed Kills? Migrating Sea Lamprey Increase Speed when Exposed to an Antipredator Cue but Make Worse Short-Term Decisions"[8] is another sea lamprey study in Michigan that uses dead lamprey alarm cues that resulted in fish migrating faster, which may have led to poorer decisions. For trapping at Wells Dam, this paper might suggest trapping operations may actually be drawing fish in.

In the adult library, the publication "Stream and River Flows Mediate Adult Lamprey Spawning Migrations: Considerations for Management"[9] is a review article of common themes related to spawning migration and management implications.

[5] Liedtke, T., K. Tiffan, L. Weiland, and B. Ekstrom, 2023. *First Investigations on Lamprey Responses to Elevated Total Dissolved Gas Exposure and Risk of Gas Bubble Trauma*. BPA Project No. 2017-005-00. March 2023.

[6] Peterson, E., R. Thors, D. Frechette, and J.D. Zydlewski, 2023. "Adult Sea Lamprey Approach and Passage at the Milford Dam Fishway, Penobscot River, Maine, United States." *North American Journal of Fisheries Management* 43:1052–1065.

[7] Spanos, M.C., C.J. Cunningham, K.A. Drew, and T.M. Sutton, 2023. "Evaluating the Viability of the Use of T-Bar and Radiotelemetry Tags on Prespawn Arctic Lampreys." *North American Journal of Fisheries Management* 43:1631–1647.

[8] Federer, M.E., B.D. Wisenden, T.M. Lurhring, and C.M. Wagner, 2024. "Speed Kills? Migrating Sea Lamprey Increase Speed when Exposed to an Antipredator Cue but Make Worse Short-Term Decisions." *Journal for Great Lakes Research. Research*. https://doi.org/10.1016/j.jglr.2024.102398.

[9] Clemens, B.J., and C.M. Wagner, 2024. "Stream and River Flows Mediate Adult Lamprey Spawning Migrations: Considerations for Management." *River Research and Applications* 1–22.

In the adult library, the publication "Detection Efficiency of Adult Pacific Lamprey Passage Counts at Leaburg Dam and Upstream Distribution in the McKenzie River (Oregon, USA)"[10] evaluates adult Pacific Lamprey passage count efficiency using video counts, PIT tags, and radio tags.

D. BY 2024 Wells White Sturgeon Rearing Update (Chas Kyger)

A brood year (BY) 2024 Wells White Sturgeon Rearing Update (Attachment C) was distributed to the Aquatic SWG by Kristi Geris prior to the Aquatic SWG conference call on November 13, 2024. Chas Kyger said fish are growing well—so well that about 1 month ago, approximately 400 fish were surplused to the CTCR Resident Fish Hatchery. In another month or two, if mortality remains low, there will be more surplus events to get the population down closer to the 2,575-fish target, which is composed of 325 Douglas PUD fish and 2,250 Chelan PUD fish.

Laura Heironimus asked whether these tanks are already designated by population or whether the tanks are graded by size. Kyger said they are designated by size. In the next 2 weeks, hatchery staff will start separating fish into the magnum tanks for the Chelan PUD program.

E. 2024 Wells White Sturgeon M&E Update (Chas Kyger)

A 2024 Wells White Sturgeon M&E Update (Attachment D) was distributed to the Aquatic SWG by Kristi Geris prior to the Aquatic SWG conference call on November 13, 2024. Chas Kyger said these are preliminary data from the M&E effort, and numbers may change slightly after the data are sorted. Kyger reviewed Attachment D. Of note, 191 setline sites were sampled which was a little fewer than the target. Aquatic vegetation tangling lines precluded sampling as many lines as intended. However, the number of fish captured was still similar to past efforts, so fewer lines did not impact overall catch numbers relative to previous years. The four unmarked wild fish captured were of similar size, suggesting these fish were the same age class. The table shows catch from 2014 to 2024. In recent years, there were fewer fish released, but the fish were a larger size at release. Also, in the past few years and per the White Sturgeon Management Plan (WSMP), M&E sampling has been less frequent, but the data are still showing good survival. Lastly, a histogram shows the length distribution of recaptured hatchery-reared fish. To note, this effort used a combination of hook sizes. The smaller hooks were 2- (2/0) and 4-aught (4/0) hooks, and the larger were 14- (14/0), 16- (16/0), 18- (18/0), and 20-aught (20/0) hooks.

Jason McLellan asked whether the two Chelan PUD fish were first encounters or recaptures. Kyger said he will look into this. *(Note: one fish had not been captured before, and the other had been captured previously during index monitoring in 2017 and again in 2019.)*

[10] Romer, J.D., B.J. Clemens, J.S. Ziller, and E. Garner, 2023. "Detection Efficiency of Adult Pacific lamprey Passage Counts at Leaburg Dam and Upstream Distribution in the McKenzie River (Oregon, USA)." *Ecology of Freshwater Fish* 33:e12751.

F. Draft *Adult White Sturgeon Upstream Passage Evaluation* (Chas Kyger)

The draft *Adult White Sturgeon Upstream Passage Evaluation* was distributed to the Aquatic SWG by Kristi Geris on November 7 and is available for a 30-day review with edits and comments due to Douglas PUD by December 9, 2024. Chas Kyger said this document addresses Tasks 2 to 4 under Objective 5 in the WSMP, as outlined in the statement of agreement approved last year.[11] LGL Limited and Blue Leaf Environmental compiled information from other hydroelectric projects in the Mid-Columbia region, as well as around the world, about passage measures and structures that have been tested for adult White Sturgeon upstream passage. Task 5 is to collect tissue samples in the Wells Reservoir, which was done as part of this year's M&E effort, with over 300 tissue samples collected. Next steps include discussing what the Aquatic SWG wants to do with these samples in terms of genetics and when. Once this information is in hand, Task 1 (addressing biological benefits) needs to be revisited. Douglas PUD will add this topic to next month's agenda for further discussion after Aquatic SWG members have more time with the document.

Ralph Lampman asked whether it is possible to include a table showing the number of White Sturgeon counted annually passing each dam, maybe under Task 3. Kyger said he can look into this, but it might be an empty table because it does not seem these data are available. John Ferguson does not recall these data in the Columbia River Data Access in Real Time database (Program RealTime, or DART). Jason McLellan said these data are not available on DART, which is an issue. Some sources say these data are collected, but not published. Some Mid-Columbia and Snake River dams may have passage data, but it would take contacting people to get these data. Kyger clarified that those are PIT detection data, and Lampman is asking about count data. McLellan agreed including count data would be helpful if it can be acquired from Columbia and Snake River dams. Douglas PUD will look into locating White Sturgeon count data at Columbia and Snake River dams to include in Douglas PUD's *Adult White Sturgeon Upstream Passage Evaluation*. Kyger thinks he can get this for Mid-Columbia dams, but U.S. Army Corps of Engineers (USACE) and Snake River dams might be more difficult. Laura Heironimus said Mike Parsley (U.S. Geological Survey) published a paper on White Sturgeon counts at The Dalles.[12] McLellan said some dams, particularly The Dalles, also have count data but these data are not readily available. After Parsley's paper, no count data have been published. Andrew Gingerich said he does not believe White Sturgeon are counted at the Wells Dam count windows. McLellan asked whether there is a requirement to count these fish. Kyger said counters are instructed to count other species. Heironimus said her team is pulling together data to evaluate passage questions, but the Columbia Basin PIT Tag Information System (PTAGIS) is not a reliable source for these data. If Douglas PUD is collecting White Sturgeon PIT-tag data, can these be

[11] Titled *Statement of Agreement Regarding Evaluation and Implementation of White Sturgeon Adult Passage Measures (WSMP Objective 5; Section 4.4)*, approved by the Aquatic SWG on November 8, 2023.

[12] Parsley, M.J., C.D. Wright, B.K. van der Leeuw, E.E. Kofoot, C.A. Peery, and M.L. Moser, 2007. "White Sturgeon (*Acipenser transmontanus*) Passage at the Dalles Dam, Columbia River, USA. *Journal of Applied Ichthyology* 1–9.

made publicly available? Kyger said all stocking information is uploaded to PTAGIS, but not all M&E data are uploaded. Douglas PUD can do this.

Lampman asked regarding Table 1, are all the passage and management plans listed in this column specific to White Sturgeon? Kyger said some address general passage topics for all fish species. Lampman asked whether White Sturgeon-specific plans can be highlighted. Kyger will check which plans are specific to White Sturgeon versus general fishway operation and passage plans.

Lampman said no White Sturgeon have been documented passing Wells Dam through the fish ladders. Is this due to a physical limitation? Kyger said based on some literature, it seems fish size and water velocity may be issues. Most fishways are designed to pass salmon, not White Sturgeon.

Ferguson noted that the USACE 2024 Fish Passage Plan for Bonneville Dam,[13] under Adult Fish Migration Timing and Counting (Section 1.2.2), it says, "Other species (sturgeon, grass carp, Atlantic salmon, etc.) are recorded as comments and reported in the *Annual Fish Passage Report*." So, there should be count data publicly available for Bonneville Dam, and maybe other USACE dams.

G. Resident Fish Assemblage Study Update (Chas Kyger)

Chas Kyger said this study started last spring and has included a variety of sampling methods. The study is now winding down. Seining, fyke netting, electrofishing, and minnow trapping are complete. Fall index walleye gillnetting started and has three more sets planned over the next couple of weeks. There are also a couple more sets of burbot traps left. In the spring, sampling burbot was also attempted but was not productive. A draft report will be available for review in early 2025.

Jason McLellan asked what Douglas PUD is using for bait for the hoop nets. Kyger said mostly pikeminnow, and Mariah Mayfield said also crayfish. Kyger asked what the CTCR use in Lake Roosevelt. McLellan said lake white fish, longnose suckers, walleye, rainbow trout, burbot, and herring. Fresh walleye and herring worked best, walleye and rainbow worked okay, and white fish did not work well. He has not used pikeminnow in Lake Roosevelt.

Ralph Lampman asked whether the walleye gillnetting is working well. Kyger said there has only been one set so far, which produced a variety of fish, some never captured before, and some walleye. So, this method seems effective, especially in deeper water. Mayfield said three walleye were sampled last week. McLellan asked whether the Fall Walleye Index Netting (or FWIN) protocol is being used. Kyger said yes, and McLellan said good.

[13] Available at: https://pweb.crohms.org/tmt/documents/fpp/2024/final/FPP24_02_BON_11-14-2024.pdf

III. Administration

A. Wells Project Tour (Dam and Volunteer Channel), plus Aquatic SWG In-Person Meeting (December 2024 or January 2025) (Andrew Gingerich)

Andrew Gingerich said the west fish ladder is the short inspection this year and will start the week of December 2, beginning with a fish salvage. The weeks of December 9 and December 15 will be the inspection window. The east fish ladder is the full maintenance this year, starting the week of December 30, and will last 4 weeks. Sometimes these dates move based on the holidays and weather. With the current maintenance schedule, possible ladder tour windows are either the Aquatic SWG meeting in December (west ladder) or in January (east ladder). As another option, to avoid traveling during these months, Douglas PUD can host an in-person meeting in February or March, with a tour of the Wells Hatchery volunteer channel. John Ferguson noted that for those not interested in a tour, a virtual option for the meeting portion can be provided.

Stuart Fety toured the east ladder last year and would be interested in touring the west ladder this year or would be interested in at least being informed of the opportunity. He also sees a benefit of touring the volunteer channel. Ferguson asked about differences between the fish ladders. Gingerich said each ladder is essentially the same, with subtle differences in the trapping areas.

Ralph Lampman has seen both ladders but is interested in touring the volunteer channel; the earlier the better, given the upcoming lamprey study.

Ferguson suggested an in-person meeting in February at Wells Hatchery, with a virtual option, and a tour of the volunteer channel. He suggested that Fety coordinate directly with Douglas PUD for a tour of the dewatered west ladder. Gingerich suggested an earlier start time of 9:00 a.m., followed by the tour after the meeting.

B. Upcoming Meetings (John Ferguson)

The Aquatic SWG meetings on December 11, 2024, and January 8, 2025, will be held by Microsoft Teams conference call.

The Aquatic SWG meeting on February 12, 2025, will be held in-person at Wells Hatchery in Azwell, Washington, starting at 9:00 a.m., followed by a tour of the volunteer channel.

List of Attachments

Attachment A List of Attendees
Attachment B Wells Hatchery Volunteer Channel
Attachment C BY 2024 Wells White Sturgeon Rearing Update
Attachment D 2024 Wells White Sturgeon M&E Update

Attachment A – Attendees

Name	Role	Organization
John Ferguson	Aquatic SWG Chairman	Anchor QEA
Kristi Geris	Administration/Technical Support	Anchor QEA
Andrew Gingerich	Aquatic SWG Technical Representative	Douglas PUD
Chas Kyger	Aquatic SWG Technical Alternate	Douglas PUD
Mariah Mayfield	Aquatic SWG Technical Support	Douglas PUD
Stuart Fety	Aquatic SWG Technical Alternate	U.S. Fish and Wildlife Service
Patrick Verhey	Aquatic SWG Technical Representative	Washington Department of Fish and Wildlife
Laura Heironimus	Aquatic SWG Technical Alternate	Washington Department of Fish and Wildlife
Jason McLellan	Aquatic SWG Technical Representative	Confederated Tribes of the Colville Reservation
Ralph Lampman	Aquatic SWG Technical Representative	Yakama Nation
Steve Lewis	Observer	U.S. Bureau of Indian Affairs

Wells Hatchery
Volunteer Channel

All photos taken October 2024 during low water levels

Aerial view of volunteer channel with photo locations indicated

Photo 1: View of volunteer channel entry from Columbia River alcove

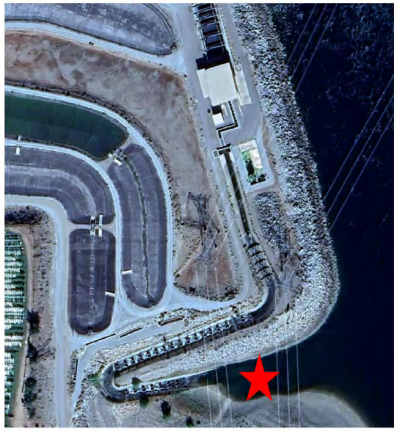


Photo 2: Volunteer channel at dirt pond outflow. This is the location of proposed radio antennas

Photo 3: PIT array

Photo 4: Groundwater upwell. Holding spot for returning adults. Metal grating is opened when fish are being processed.

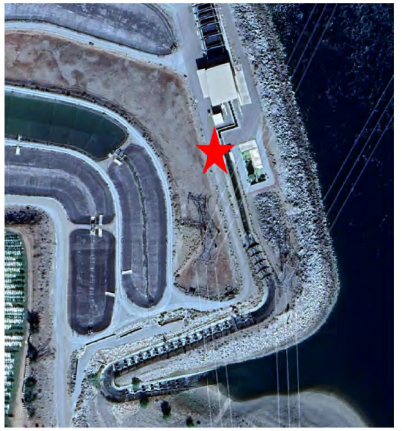
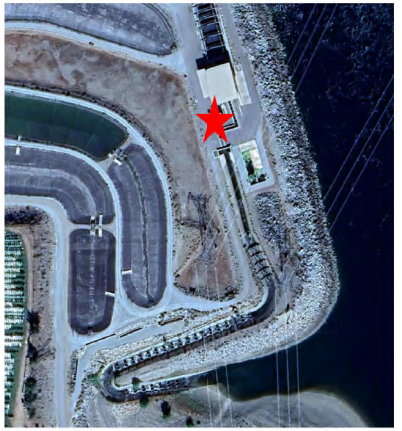


Photo 5: Above the upwell. Adults will pass through these weirs to enter the adult handling facility. Unknown if lamprey can pass these weirs.

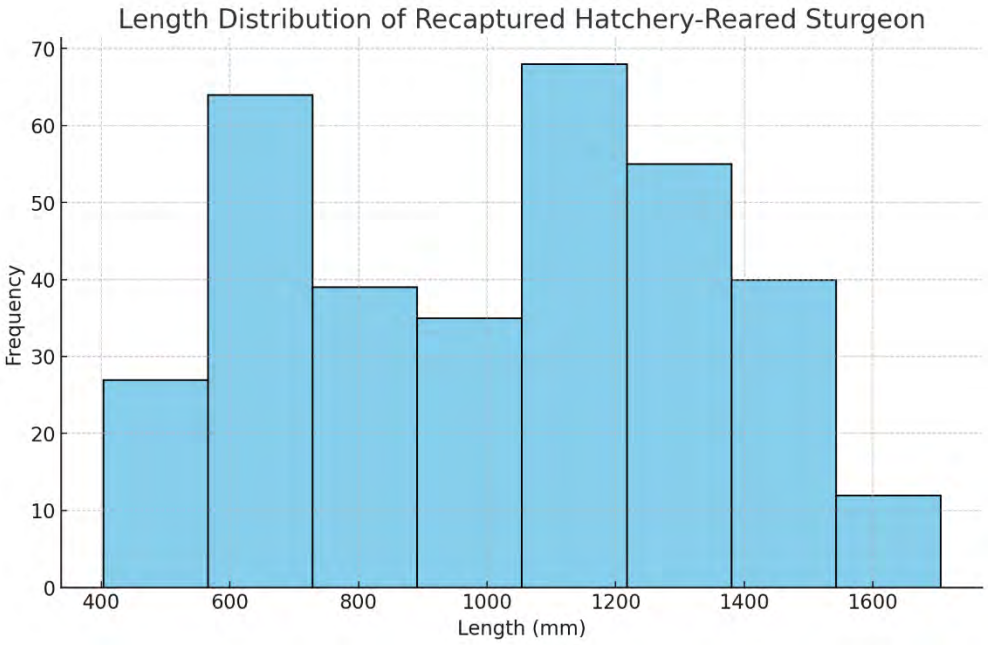


	7-Oct		1-Nov	
Tank	Population	Grams	Population	Grams
1	478	10.0	340	14.3
2	729	3.8	443	9.9
3	288	13.4	283	52.2
4	627	9.1	372	12.5
5	246	13.7	327	28.9
6	499	7.3	401	11.5
7	346	10.5	314	30.7
8	238	15.4	284	54.0
9	381	12.4	278	38.8
10	389	20.4	389	69.8
11	360	10.7	281	20.6
12	235	26.9	235	81.1
Mag 1	--	--	--	--
Mag 2	--	--	--	--
Total	4,816	11.2	3,947	33.1

Sturgeon M&E September 16 – October 18, 2024

- 191 Setline Sites Sampled
- 329 unique fish captured
- 4 Unmarked wild fish – all around 170cm
- 2 Chelan PUD hatchery-reared fish

Release Year	Number Released	Mean Weight (g) at Release (SE)	Number Captured 2024	Percent of Release Total Captured
2014	5,044	166.5 (0.8)	99	1.96%
2015	5,009	97.6 (0.5)	31	0.62%
2016	5,289	147.0 (0.8)	20	0.38%
2017	5,131	118.4 (0.7)	42	0.82%
2018	337	281.0 (2.9)	4	1.19%
2019	99	364.7 (13)	11	11.11%
2020	570	495.7 (4.9)	55	9.65%
2021	338	916.7 (10.8)	28	8.28%
2022	332	488.1 (5.62	14	4.22%
2023	328	541(5.71)	19	5.79%
2024	330	375(3.43)	4	1.21%



FINAL

Conference Call Minutes

Aquatic Settlement Work Group

To: Aquatic SWG Parties Date: January 8, 2025

From: John Ferguson, Chair, Anchor QEA

Re: Final Minutes of the December 11, 2024, Aquatic SWG Conference Call

The Aquatic Settlement Work Group (SWG) met by conference call on Wednesday, December 11, 2024, from 10:00 a.m. to 11:00 a.m. Attendees are listed in Attachment A of these conference call minutes.

Summary of Action Items

1. Douglas PUD will verify the spacing of the metal grating in the Wells Hatchery volunteer channel groundwater upwell area, as well as investigate the detection efficiency of the passive integrated transponder (PIT) array located downstream of this area (Item I-C).
2. The Aquatic SWG meeting on January 8, 2025, will be held by conference call (Item III-B).
3. The Aquatic SWG meeting on February 12, 2025, will be held in person at Wells Hatchery in Azwell, Washington, starting at 9:00 a.m., followed by a tour of the volunteer channel (Item III-B).

Summary of Decisions

1. There were no decisions approved during today's conference call.

Agreements

1. There were no agreements discussed during today's conference call.

Review Items

1. A draft *Wells Dam 2025 Adult Lamprey Approach and Passage Study Plan* was distributed to the Aquatic SWG by Kristi Geris on November 13, with comments due to Douglas PUD by December 13, 2024 (Item II-A). A revised plan (clean and tracked changes versions) was distributed on January 7, 2025.

Documents Finalized

1. There are no documents that have been recently finalized.

I. Welcome

A. Review Agenda (John Ferguson)

John Ferguson welcomed the Aquatic SWG members (Attachment A) and reviewed the agenda. Ferguson asked for any additions or changes to the agenda. Andrew Gingerich added a Wells Dam Fishway Maintenance Update and U.S. Fish and Wildlife Service (USFWS) West Fishway Tour Recap.

RD Nelle announced he will be retiring in January 2025. Stuart Fety announced that Travis Neal (USFWS Ecological Services) will be taking over Fety's role on the Aquatic SWG moving forward. Fety has been working with Neal to get him up to speed on the purpose of the forum and current topics. Neal will participate in the Aquatic SWG conference call on January 8, 2025.

B. Meeting Minutes Approval (John Ferguson)

The revised draft November 13 conference call minutes were reviewed. Kristi Geris said edits and comments received from Aquatic SWG members were minor clarifications, which were incorporated into the revised minutes. Aquatic SWG representatives present approved the November 13 conference call minutes, as revised.

C. Review of Action Items (John Ferguson)

Action items from the Aquatic SWG conference call on November 13 are as follows *(Note: The following italicized item numbers correspond to agenda items from the November 13, 2024, conference call)*:

1. *Douglas PUD will verify the spacing of the metal grating in the Wells Hatchery volunteer channel groundwater upwell area as well as investigate the detection efficiency of the PIT array located downstream of this area (Item II-A).*
   This action item will be carried forward.
2. *Douglas PUD will determine whether the two Chelan PUD hatchery-reared White Sturgeon captured during the 2024 Wells White Sturgeon monitoring and evaluations effort were recaptures (Item II-E).*
   Chas Kyger said one fish had not been captured before, and the other had been captured previously during index monitoring in 2017 and again in 2019.
3. *Douglas PUD will look into locating White Sturgeon count data at Columbia and Snake River dams to include in Douglas PUD's Adult White Sturgeon Upstream Passage Evaluation (Item II-F).*
   Chas Kyger was able to locate U.S. Army Corps of Engineers (USACE) data back to 2006, except for 2014 and 2015, to include in the revised report. John Ferguson asked about numbers and fish size. Kyger said counts were higher for the Lower Columbia River dams

compared to the upper dams, and fish lengths were not included in the data he found but may be available in the USACE databases.

II. Summary of Discussions

A. Draft 2025 Adult Pacific Lamprey Study Plan (Andrew Gingerich)

A draft *Wells Dam 2025 Adult Lamprey Approach and Passage Study Plan* was distributed to the Aquatic SWG by Kristi Geris on November 13. Written comments are due to Douglas PUD by December 13. Comments were received from the Confederated Tribes of the Colville Reservation (CTCR). Ralph Lampman indicated via email that most of the Yakama Nation's (YN's) comments were shared during last month's meeting, and he will provide any written YN comments by December 13.

Andrew Gingerich said Douglas PUD plans to present a draft outline to the Wells Habitat Conservation Plan Coordinating Committee (HCP-CC) during their meeting on December 16, priming the committee for two forthcoming requests. The first request is to operate lamprey traps in the east and west fishways at Wells Dam during the Pacific Lamprey migration in 2025. The Wells HCP-CC approved this pilot effort in 2024. Next year, the proposal includes an extended trapping window. Douglas PUD believes the data presented to the Wells HCP-CC to date provides a good justification that trap operations have no negative impacts to Upper Columbia River steelhead passage at Wells Dam, which seems to be a key concern for the Wells HCP-CC. Gingerich is optimistic the committee will tolerate a request for longer trap operations.

The second request is to operate at modified (reduced) head differentials during evenings. The Aquatic SWG is still discussing the study design including specific hours. Douglas PUD proposed alternating nights where the east and west fishways will both operate at a reduced 0.5-foot head differential one night, then the normal 1.5-foot differential the next night, and then continue to alternate that pattern. Lampman suggested the same, but with the east and west fishway head reductions alternating on opposite schedules. For the Wells HCP-CC, Douglas PUD will propose modified head differentials, which may look like Option A or Option B, to be determined. The Wells HCP-CC has approved similar modified head differentials in the past. Recall, this nexus is the Wells HCP-CC oversees adult salmonid passage at Wells Dam.

Gingerich asked whether there are any verbal comments the Aquatic SWG would like to discuss today. John Ferguson asked about Jason McLellan's comments. McLellan said the CTCR's comments were mostly related to specificity and clarity about how to address comparisons to previous studies when different approaches were used and to be clear that there are differences in the assumptions. Ferguson asked about Lampman's suggestion for opposite head differential schedules. What is the advantage of this, and is there a way to characterize the pros and cons of the two statistically? Gingerich said Dave Robichaud (LGL/Blue Leaf) might be able to help with this. Ferguson asked what

this does in terms of assessing effects. Does adding a ladder location component strengthen or weaken the test? Chas Kyger questioned whether the data from both ladders can be pooled, which helps to address ladder preference. Each ladder may need to be treated independently, as opposed to overall dam passage. Ferguson said this may be what Lampman wants to do—treat each ladder as an independent test.

Ferguson summarized that Douglas PUD will introduce a request to the Wells HCP-CC this month, then the Aquatic SWG needs to agree on a formal study design in early January, so a formal request can be presented to the Wells HCP-CC in late January, and then a statement of agreement will be ready for Aquatic SWG approval in February. Gingerich said, generally, yes. Aquatic SWG approval in early January is key, and then there is some flexibility considering that study fish collection will not start until June.

A revised *Wells Dam 2025 Adult Lamprey Approach and Passage Study Plan* (clean and tracked changes) was distributed to the Aquatic SWG by Geris on January 7, 2025.

B. BY 2024 Wells White Sturgeon Rearing Update (Chas Kyger)

A brood year (BY) 2024 Wells White Sturgeon Rearing Update (Attachment B) was distributed to the Aquatic SWG by Kristi Geris prior to the Aquatic SWG conference call on December 11, 2024.
Chas Kyger said fish are doing well. Mortalities remain low. Fish have not yet been separated into the magnum tanks, but this will happen soon. There will likely be another surplus event in early January, and Douglas PUD will coordinate with the CTCR as needed.

Jason McLellan said based on fish counts in Attachment B, surplus numbers may be beyond what the Resident Fish Hatchery can handle, and the CTCR may need to look into other options. He can start these discussions now within the Lake Roosevelt group, but getting as much notification ahead of time will be helpful to get arrangements in place. Kyger will touch base with hatchery staff after today's call and will share a timeline with McLellan. To note, hatchery staff are envisioning a couple more batches of surplus, as opposed to all at once.

McLellan announced the CTCR broke ground on a sturgeon facility at the CTCR Resident Fish Hatchery, which is on track to be operational in time to rear BY 2026 White Sturgeon for the Chelan PUD program. This aligns with the expiration of the current interlocal agreement between Douglas PUD and Chelan PUD.

C. Draft *Adult White Sturgeon Upstream Passage Evaluation* (Chas Kyger)

The draft *Adult White Sturgeon Upstream Passage Evaluation* was distributed to the Aquatic SWG by Kristi Geris on November 7 and was available for a 30-day review with edits and comments due to Douglas PUD by December 9. Chas Kyger said that aside from verbal comments shared during last

month's meeting, the only written comments received were from the CTCR. Douglas PUD will incorporate these edits and comments and will distribute a revised report for approval during next month's meeting. Next steps will be to address the other components of the statement of agreement,[1] including genetics and biological benefits. *(Note: the revised report, including a response to comments matrix, was distributed on December 31, 2024.)*

D. PRESENTATION: 2024 TDG/GBT Annual Review and Summary (Andrew Gingerich)

Andrew Gingerich shared the presentation *2024 Total Dissolved Gas* (Attachment C), which was distributed to the Aquatic SWG by Kristi Geris prior to the Aquatic SWG conference call on December 11. Discussions were as follows.

Slides 3 to 4

In 2024, there was only one non-compliance event that occurred over a weekend in February, which could have been avoided with better communication within Douglas PUD and training. Operators were trying to accommodate Hanford Reach Fall Chinook Salmon Agreement flows and spilled too quickly, which resulted in a non-spill season 110% tailrace standard exceedance.

Slide 7

A Washington State Department of Ecology (Ecology) letter regarding *Clarification of Total Dissolved Gas Standards During Spring/Summer Juvenile Bypass Operational Period* (Attachment D) was distributed to the Aquatic SWG by Geris prior to the Aquatic SWG conference call on December 11. Gingerich explained that the "new"[2] water quality standard for total dissolved gas (TDG) says the 125% and 126% TDG tailrace standards will apply during the spring bypass season, which is "generally from April to June." Douglas PUD wrote a letter to Ecology explaining that the Wells Dam bypass also runs from July to August to provide non-turbine bypass for late-migrating fish, per an obligation to meet Section 10 criteria for Endangered Species Act-listed fish, which may produce TDG in the tailrace. Ecology agreed that providing downstream passage is consistent with the Biological Opinion; therefore, spring TDG criteria may be applied, where appropriate, into July and August, as necessary to meet each dam's juvenile salmonid biological objectives.

Slides 8 to 10

In 2024, TDG concentrations would have still been in compliance with the "new" summer TDG rules.

[1] Titled *Statement of Agreement Regarding Evaluation and Implementation of White Sturgeon Adult Passage Measures (WSMP Objective 5; Section 4.4)*, approved by the Aquatic SWG on November 8, 2023.

[2] On December 30, 2019, Ecology adopted a TDG rule change, which was approved by the U.S. Environmental Protection Agency (USEPA) on March 5, 2020. This modification that adjusted historical TDG criteria, codified in Washington Administrative Code 173-201A-200(1)(f),

Discussion

In 2024, TDG compliance for the Wells Project was perfect except for the one preventable exceedance in February.

John Ferguson asked whether there may be issues with the new TDG standards in years with higher river flows. Gingerich is optimistic they can meet the requirements under high flows given Ecology's interpretation of the new standards, and he does not believe the higher TDG levels allowed will come at a cost to aquatic resources. Since the rule change, there has been a lot of data collection, and gas bubble trauma (GBT) expression has not been observed in fish during TDG concentrations of 125% or less. He believes fish are depth-compensating. In the field, crews are seeing good tolerance in salmonids. Similarly, resident fish seem to be resilient to TDG less than 125% based on results of electrofishing in the Wells Dam tailrace. He believes the new TDG rule is consistent with the biological data, and data from the Wells Reservoir are showing good survival.

E. Wells Dam Fishway Maintenance Update and USFWS West Fishway Tour Recap (Chas Kyger)

Chas Kyger said mechanics are making good progress on clearing debris and checking plating in the west fishway. Other activities include replacing and installing radio telemetry antennas, where a lot of infrastructure is still intact from previous studies. Over the past few days, LGL Limited has been testing the antennas to make sure everything is working. One antenna broke and will be replaced today. He expects the west fishway will be watered up next week, and the east fishway maintenance will start after the New Year. Tag testing is being conducted later in the spring.

Stuart Fety and Travis Neal were able to tour the dewatered west fishway, which provided good context for ongoing Aquatic SWG discussions and studies. Fety recalled touring the east fishway last year. This year, some diffuser grating was removed for maintenance, so Fety and Neal were able to see behind that and explore new areas Fety had not yet seen before. Fety and Neal also toured the volunteer channel and collection facilities.

Andrew Gingerich said prior to when maintenance was initiated and the USFWS tour, a fish salvage was conducted. The memorandum *Fish Salvage During Winter Maintenance Outage of Wells Dam West Fishway* (Attachment E) was distributed to the Aquatic SWG by Kristi Geris on December 6. Gingerich reviewed these fish salvage numbers. Washington Department of Fish and Wildlife helped with enumeration and collected tissue samples and tagged lamprey.

III. Administration

A. 2024 Aquatic Settlement Agreement Annual Report Schedule (John Ferguson)

John Ferguson said this is a courtesy notification that Anchor QEA and Douglas PUD are now compiling the 2024 Aquatic Settlement Agreement (ASA) Annual Report and the six appended aquatic resource management plan (MP) annual reports. The draft 2024 ASA Annual Report and appended MP annual reports will be distributed for a 45-day Aquatic SWG review on Friday, March 14, with comments due on April 28. The final draft reports will be distributed to the Aquatic SWG on May 7, and Douglas PUD will request approval of the reports during the Aquatic SWG conference call on May 14. The final approved reports are due to the Federal Energy Regulatory Commission on May 30, 2025.

B. Upcoming Meetings (John Ferguson)

The Aquatic SWG meeting on January 8, 2025, will be held by Microsoft Teams conference call.

The Aquatic SWG meeting on February 12, 2025, will be held in person at Wells Hatchery in Azwell, Washington, starting at 9:00 a.m., followed by a tour of the volunteer channel.

The Aquatic SWG meeting on March 12, 2025, will be held by Microsoft Teams conference call.

List of Attachments

Attachment A List of Attendees
Attachment B BY 2024 Wells White Sturgeon Rearing Update
Attachment C 2024 Total Dissolved Gas
Attachment D Clarification of Total Dissolved Gas Standards During Spring/Summer Juvenile Bypass Operational Period
Attachment E Fish Salvage During Winter Maintenance Outage of Wells Dam West Fishway

Attachment A – Attendees

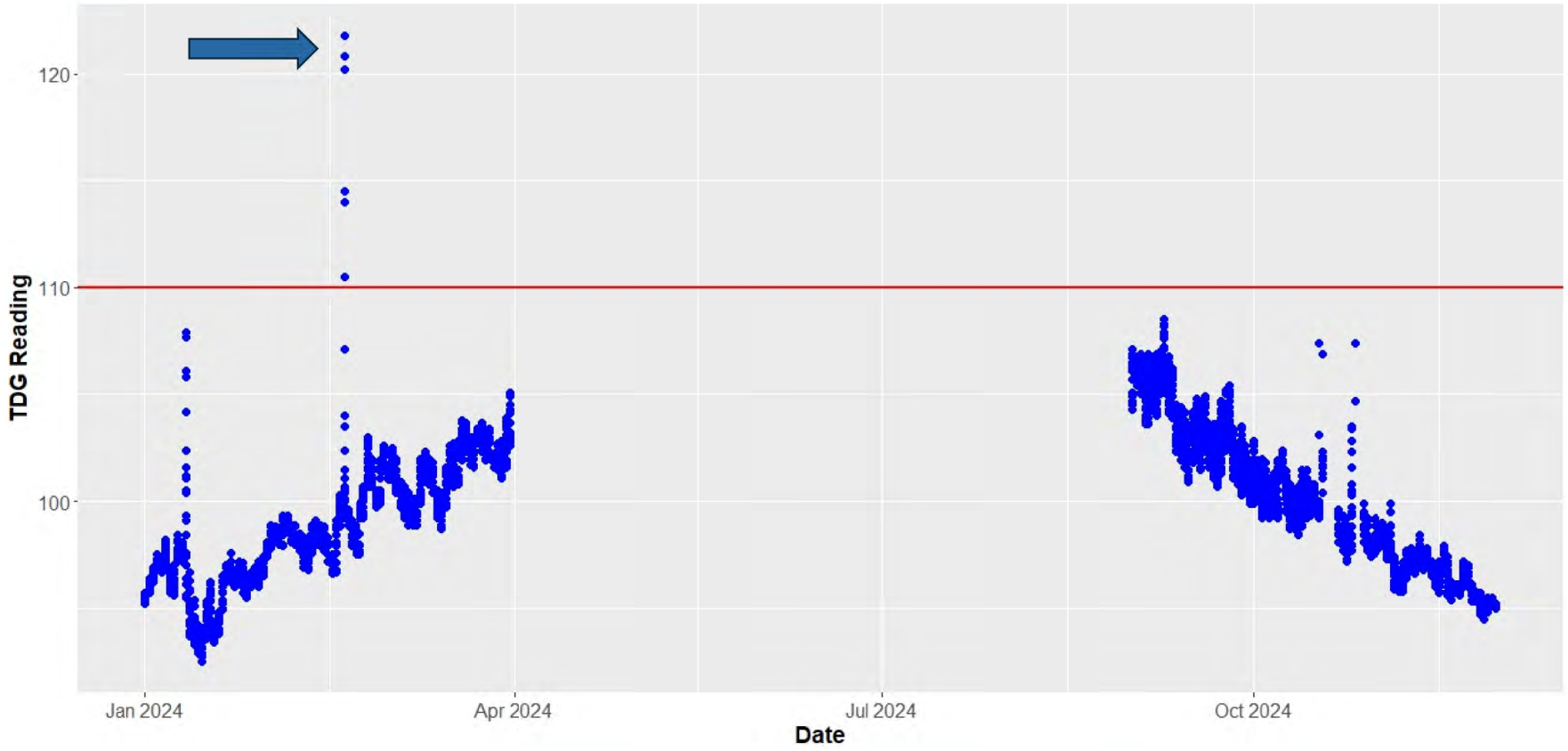
Name	Role	Organization
John Ferguson	Aquatic SWG Chair	Anchor QEA
Kristi Geris	Administration/Technical Support	Anchor QEA
Andrew Gingerich	Aquatic SWG Technical Representative	Douglas PUD
Chas Kyger	Aquatic SWG Technical Alternate	Douglas PUD
RD Nelle	Aquatic SWG Technical Representative	U.S. Fish and Wildlife Service
Stuart Fety	Aquatic SWG Technical Alternate	U.S. Fish and Wildlife Service
Patrick Verhey	Aquatic SWG Technical Representative	Washington Department of Fish and Wildlife
Jason McLellan	Aquatic SWG Technical Representative	Confederated Tribes of the Colville Reservation

	1-Nov		9-Dec	
Tank	Population	Grams	Population	Grams
1	340	14.3	298	42.0
2	443	9.9	426	13.0
3	283	52.2	283	113.5
4	372	12.5	429	28.7
5	327	28.9	327	76.9
6	401	11.5	429	21.6
7	314	30.7	325	81.1
8	284	54.0	277	129.7
9	278	38.8	313	98.7
10	389	69.8	312	120.7
11	281	20.6	251	156.6
12	235	81.1	312	58.2
Mag 1	--	--	--	--
Mag 2	--	--	--	--
Total	3,947	33.1	3,982	71.6

2024 Total Dissolved Gas

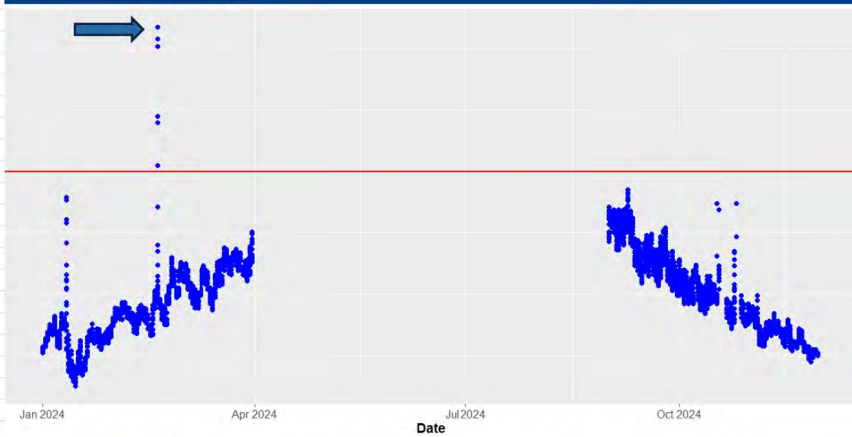
2024 Discharge and Spill

Non-Spill Season 110% Tailrace Standard



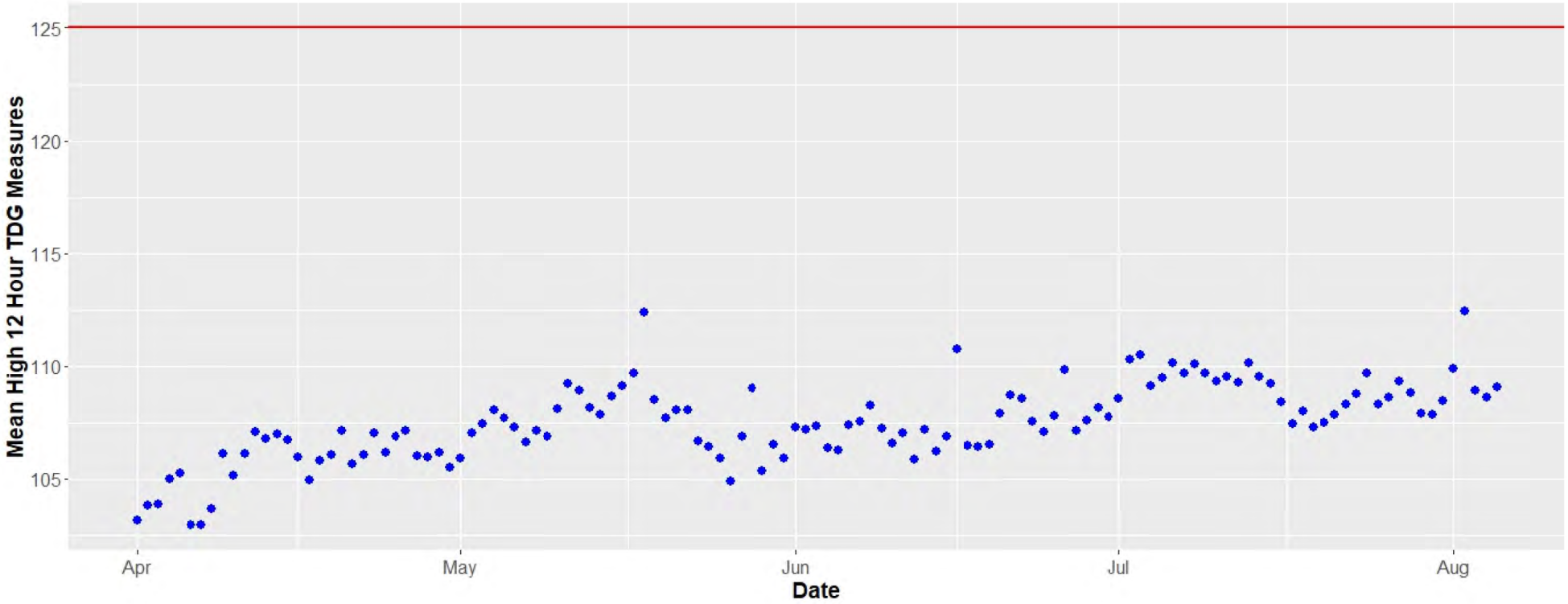
STN	STN#	DATE	HR	SENSOR DEPTH (FT)	TEMP TAILWATE (C)	TEMP FOREBAY (C)	BAROMETI PRESSURE (MMHG)	TOTAL GAS PRESSURE (MMHG)	TDG%	O2 (MMHG)	N2 (MMHG)	SPILL (KCFS)	TOTAL FLOW (KCFS)	FB ELEV (FT)	TW ELEV (FT)
WELW	2400	Saturday, February 17, 2024	19		3.7	3.6	746	738	98.9			0	68.5	777.6	707.6
WELW	2400	Saturday, February 17, 2024	20		3.6	3.6	745	737	98.9			0	72.3	777.5	708.2
WELW	2400	Saturday, February 17, 2024	21		3.6	3.6	745	736	98.8			0	59.7	777.3	707.9
WELW	2400	Saturday, February 17, 2024	22		3.6	3.6	745	736	98.8			0	97.8	777	710.3
WELW	2400	Saturday, February 17, 2024	23		3.6	3.6	744	735	98.8			0	54.1	777.6	706.7
WELW	2400	Saturday, February 17, 2024	24		3.6	3.6	744	735	98.8			0	60.5	776.6	707.2
WELW	2400	Sunday, February 18, 2024	1		3.6	3.6	744	735	98.8			0	78.3	777.3	708.7
WELW	2400	Sunday, February 18, 2024	2		3.6	3.6	744	736	98.9			0	49.8	777.1	706.2
WELW	2400	Sunday, February 18, 2024	3		3.6	3.6	743	736	99.1			0	39.1	777.2	706.3
WELW	2400	Sunday, February 18, 2024	4		3.6	3.6	743	736	99.1			0	34.6	777.4	706.7
WELW	2400	Sunday, February 18, 2024	5		3.6	3.6	743	736	99.1			0	48.1	777.3	707.4
WELW	2400	Sunday, February 18, 2024	6		3.6	3.6	743	736	99.1			0	38.5	777.8	706.2
WELW	2400	Sunday, February 18, 2024	7		3.6	3.6	743	736	99.1			0	39.6	777.5	706.2
WELW	2400	Sunday, February 18, 2024	8		3.6	3.6	743	737	99.2			0	42.5	777.7	706.4
WELW	2400	Sunday, February 18, 2024	9		3.6	3.6	743	737	99.2			0	47.5	777.3	707.7
WELW	2400	Sunday, February 18, 2024	10		3.6	3.6	743	738	99.3			0	52.5	777.5	706.8
WELW	2400	Sunday, February 18, 2024	11		3.6	3.6	743	739	99.5			0	43	777.2	706.3
WELW	2400	Sunday, February 18, 2024	12		3.6	3.6	743	739	99.5			0	46	777.1	706.7
WELW	2400	Sunday, February 18, 2024	13		3.7	3.6	743	740	99.6			0	54.8	777.6	707.1
WELW	2400	Sunday, February 18, 2024	14		3.7	3.7	742	742	100			0	48.8	777.5	706.3
WELW	2400	Sunday, February 18, 2024	15		3.7	3.7	743	743	100			0	34.9	777.7	705.5
WELW	2400	Sunday, February 18, 2024	16		3.7	3.7	742	744	100.3			0	34.3	777.4	705.8
WELW	2400	Sunday, February 18, 2024	17		3.7	3.7	742	744	100.3			0	39.5	777.6	707
WELW	2400	Sunday, February 18, 2024	18		3.7	3.7	743	745	100.3			0	48.1	778	706.5
WELW	2400	Sunday, February 18, 2024	19		3.7	3.6	743	744	100.1			0	51	777.8	706.1
WELW	2400	Sunday, February 18, 2024	20		3.7	3.6	744	743	99.9			0	51.5	777.8	705.9
WELW	2400	Sunday, February 18, 2024	21		3.7	3.7	744	742	99.7			0	36.5	778	705.4
WELW	2400	Sunday, February 18, 2024	22		3.6	3.7	744	742	99.7			0	33	777.8	705.6
WELW	2400	Sunday, February 18, 2024	23		3.6	3.7	744	741	99.6			0	30.7	777.9	706
WELW	2400	Sunday, February 18, 2024	24		3.6	3.7	744	742	99.7			62.8	92.8	776.3	711.5
WELW	2400	Monday, February 19, 2024	1		3.7	3.7	744	770	103.5			44.2	74	778.3	706.1
WELW	2400	Monday, February 19, 2024	2		3.7	3.7	744	852	114.5			0	31.5	776.2	705.6
WELW	2400	Monday, February 19, 2024	3		3.7	3.7	744	870	116.9			0	36.9	777.8	707.3
WELW	2400	Monday, February 19, 2024	4		3.7	3.6	744	899	120.8			0	37	777	707.2
WELW	2400	Monday, February 19, 2024	5		3.7	3.6	743	905	121.8			0	39.2	777.3	707.5
WELW	2400	Monday, February 19, 2024	6		3.7	3.6	743	893	120.2			0	64.5	777.2	708.2
WELW	2400	Monday, February 19, 2024	7		3.7	3.6	742	846	114			0	57.6	777.2	708.3
WELW	2400	Monday, February 19, 2024	8		3.7	3.6	742	820	110.5			0	58.6	777.5	708
WELW	2400	Monday, February 19, 2024	9		3.7	3.7	742	795	107.1			0	62.6	777.4	708.7
WELW	2400	Monday, February 19, 2024	10		3.7	3.7	742	772	104			0	57.3	777.6	707.9
WELW	2400	Monday, February 19, 2024	11		3.7	3.7	742	760	102.4			0	57.5	777	707.7
WELW	2400	Monday, February 19, 2024	12		3.7	3.7	742	753	101.5			0	48.2	777.5	707.3
WELW	2400	Monday, February 19, 2024	13		3.7	3.7	741	749	101.1			0	46.6	777.3	707.1
WELW	2400	Monday, February 19, 2024	14		3.7	3.7	741	746	100.7			0	46.2	777.8	707
WELW	2400	Monday, February 19, 2024	15		3.7	3.7	741	745	100.5			0	46.1	777.6	706.5
WELW	2400	Monday, February 19, 2024	16		3.7	3.7	741	744	100.4			0	46.5	777.5	706.5
WELW	2400	Monday, February 19, 2024	17		3.7	3.7	742	743	100.1			0	74.6	777	709
WELW	2400	Monday, February 19, 2024	18		3.7	3.7	742	742	100			0	82.7	777	709.9
WELW	2400	Monday, February 19, 2024	19		3.7	3.7	742	740	99.7			0	94.3	777.1	710
WELW	2400	Monday, February 19, 2024	20		3.7	3.7	742	739	99.6			0	89.2	777.1	709.6
WELW	2400	Monday, February 19, 2024	21		3.7	3.7	742	739	99.6			0	87.8	777.2	709.5

110% Noncompliance Sunday Feb. 18, 2024

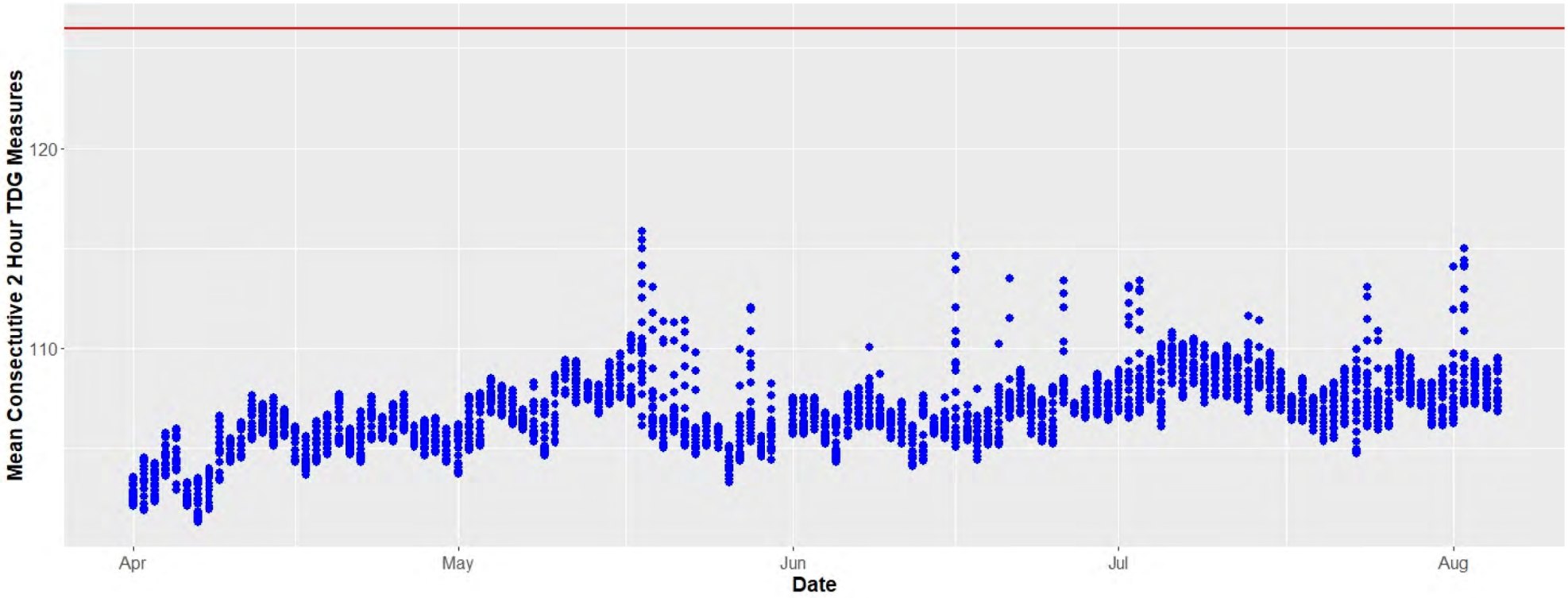


- Weekend delivery of water to Grant PUD and Hanford Reach Fall Chinook Agreement was short
- Instead of generate “it down” operators hit the easy button

Fish Spill Season: 125% High-12 Standard



Fish Spill Season: 126% 2-hour Standard



Slides that follow are "old" approach to math

Letter received from DOE Nov. 21, 2024 confirms applying spring TDG rules to summer to protect summer migrating downstream fish and "late" spring migrating fish.

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
PO Box 47600, Olympia, WA 98504-7600 • 360-407-6000

November 21, 2024

Andrew Gingerich
Natural Resources Supervisor
1151 Valley Mall Parkway
East Wenatchee, WA 98802

Re: Clarification of Total Dissolved Gas Standards During Spring/Summer Juvenile Bypass Operational Period

Dear Andrew:

Thank you for your letter of 5 June 2024 requesting clarification of the total dissolved gas (TDG) standard in relation to operation of the juvenile salmonid bypass system (JBS) at Wells dam. Ecology has reviewed the basis of your request regarding the application of the modified TDG criteria designed to aid fish passage. We appreciate the detailed description of the Wells Project juvenile fish passage program and the Public Utility District No. 1 of Douglas County (Douglas PUD) responsibilities to meet Section 10 Endangered Species Act (ESA) consultation, and the Anadromous Fish Agreement and Habitat Conservation Plan (HCP).

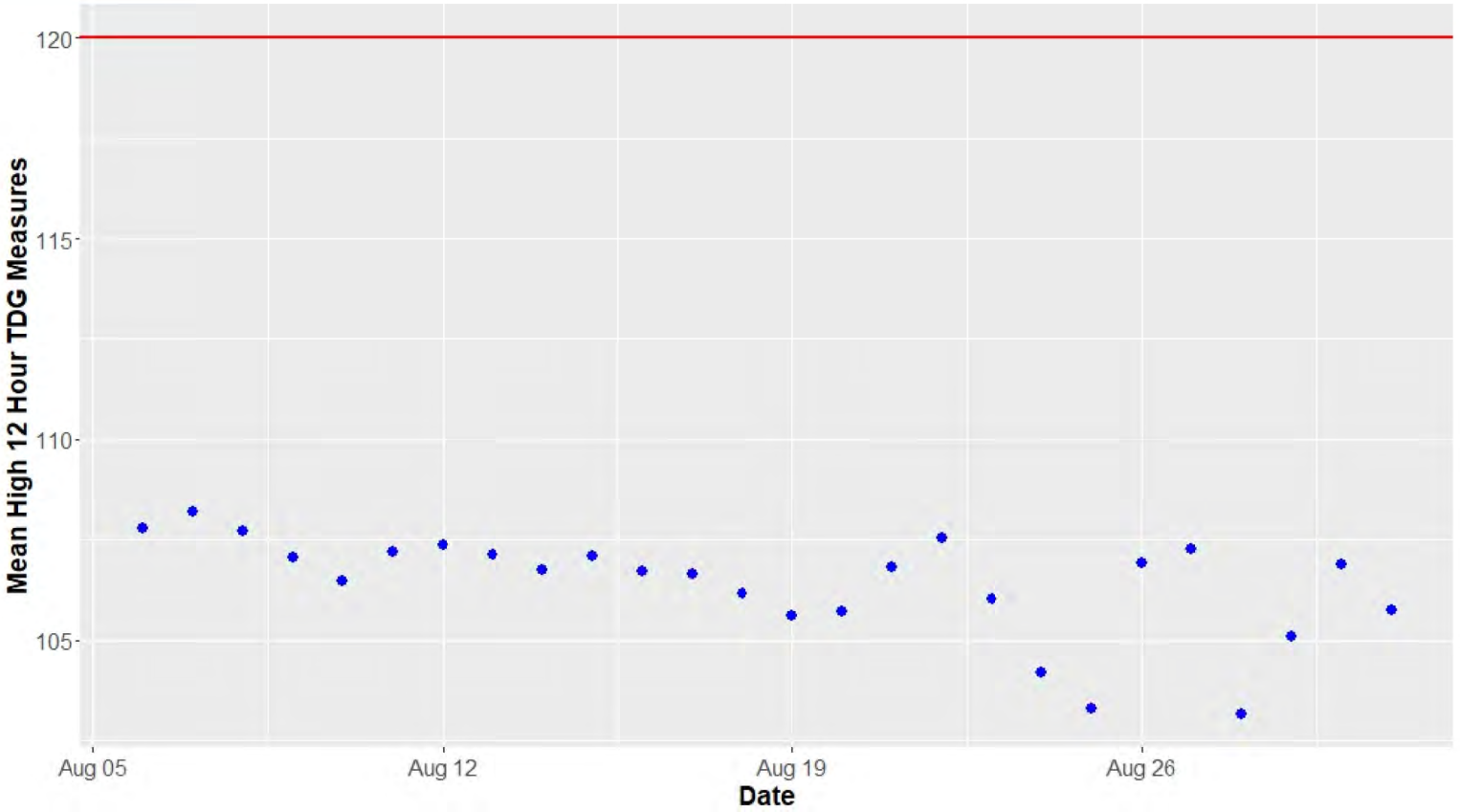
As you described, Douglas PUD is required to provide bypass operation for ≥95% of juvenile downstream smolt migration using the JBS. This requires the operation of the JBS in both spring and summer to meet the ≥95% downstream juvenile passage.

The current water quality standard for TDG, WAC 173-201A-200(f), includes the following provision:

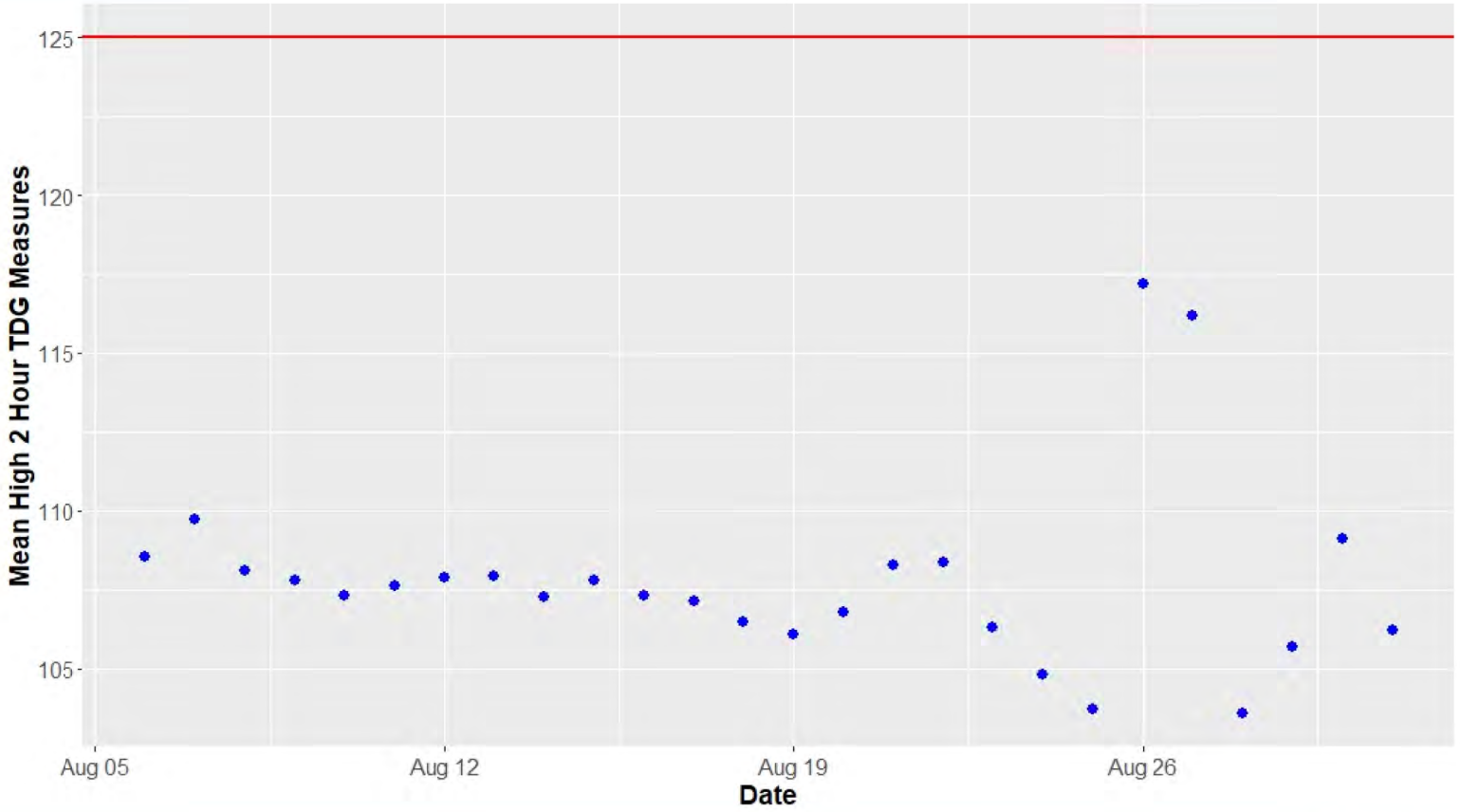
> *WAC 173-201A-200(ii)(B), To further aid fish passage during the spring spill season (generally from April through June), spill may be increased up to the following levels as measured at the tailrace fixed site monitoring location:*
>
> - *A maximum TDG saturation level of 125 percent calculated as an average of the 12 highest hourly TDG measures in a calendar day; and*
> - *A maximum TDG saturation level of 126 percent calculated as an average of any two consecutive hourly TDG measures.*

It is evident that the operation of the JBS is intended to aid fish passage and that the Wells project, at times, increases TDG levels above forebay measurements during the operation of this system. Therefore, the application of the criteria under part B of the TDG standards is appropriate during JBS operations. Furthermore, conditions to utilize the modified criteria under part B of the TDG standard state that "*TDG criteria at hydropower dams shall be applied in*

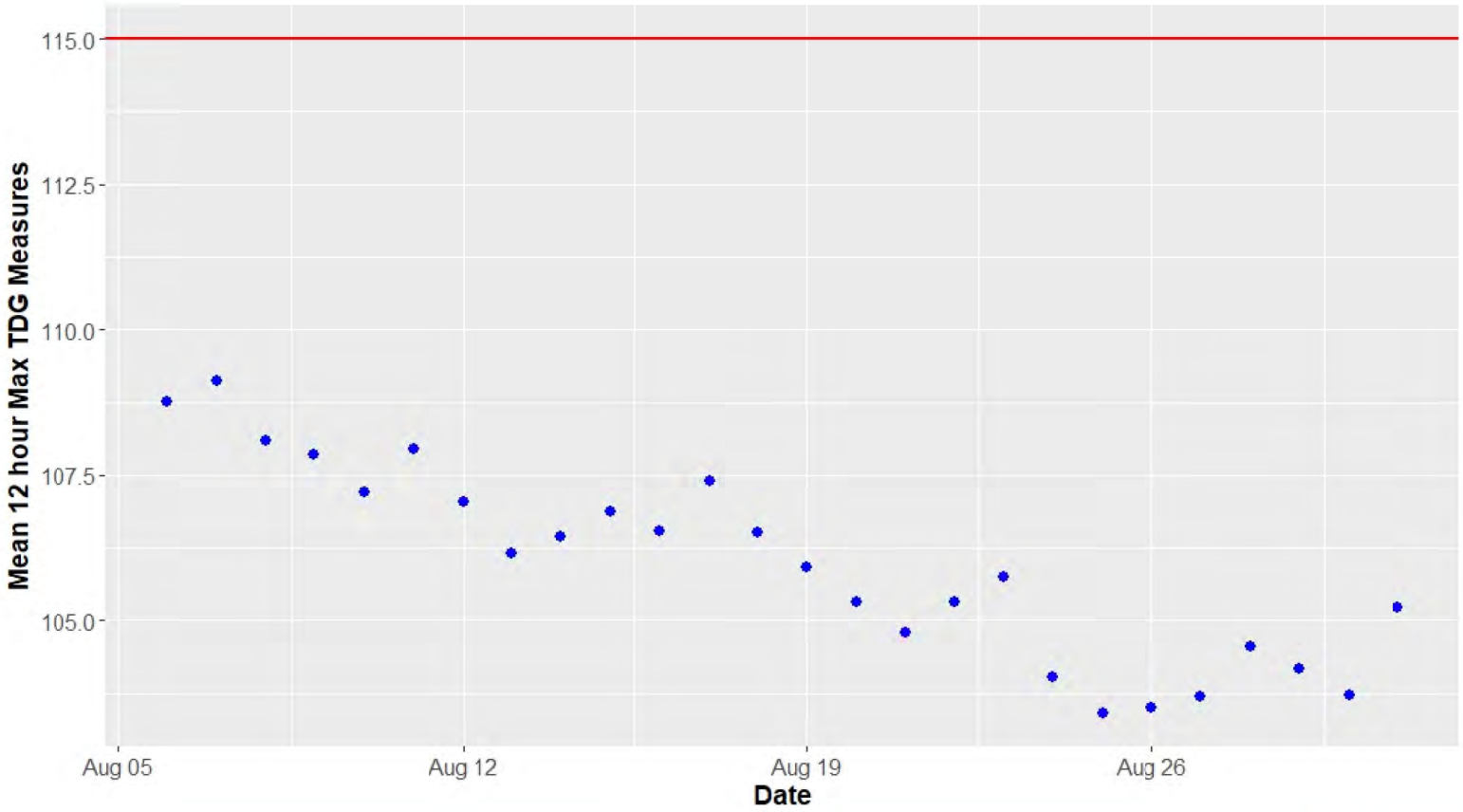
Summer Spill: 120% Mean 12-hour high



Summer Spill: 125% Mean 2-hour high



Summer Spill: 115% at Rocky Reach



STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
PO Box 47600, Olympia, WA 98504-7600 • 360-407-6000

November 21, 2024

Andrew Gingerich
Natural Resources Supervisor
1151 Valley Mall Parkway
East Wenatchee, WA 98802

Re: Clarification of Total Dissolved Gas Standards During Spring/Summer Juvenile Bypass Operational Period

Dear Andrew:

Thank you for your letter of 5 June 2024 requesting clarification of the total dissolved gas (TDG) standard in relation to operation of the juvenile salmonid bypass system (JBS) at Wells dam. Ecology has reviewed the basis of your request regarding the application of the modified TDG criteria designed to aid fish passage. We appreciate the detailed description of the Wells Project juvenile fish passage program and the Public Utility District No. 1 of Douglas County (Douglas PUD) responsibilities to meet Section 10 Endangered Species Act (ESA) consultation, and the Anadromous Fish Agreement and Habitat Conservation Plan (HCP).

As you described, Douglas PUD is required to provide bypass operation for ≥95% of juvenile downstream smolt migration using the JBS. This requires the operation of the JBS in both spring and summer to meet the ≥95% downstream juvenile passage.

The current water quality standard for TDG, WAC 173-201A-200(f), includes the following provision:

> *WAC 173-201A-200(ii)(B), To further aid fish passage during the spring spill season (generally from April through June), spill may be increased up to the following levels as measured at the tailrace fixed site monitoring location:*
>
> • *A maximum TDG saturation level of 125 percent calculated as an average of the 12 highest hourly TDG measures in a calendar day; and*
> • *A maximum TDG saturation level of 126 percent calculated as an average of any two consecutive hourly TDG measures.*

It is evident that the operation of the JBS is intended to aid fish passage and that the Wells project, at times, increases TDG levels above forebay measurements during the operation of this system. Therefore, the application of the criteria under part B of the TDG standards is appropriate during JBS operations. Furthermore, conditions to utilize the modified criteria under part B of the TDG standard state that "*TDG criteria at hydropower dams shall be applied in*

accordance with Endangered Species Act consultation documents associated with spill operations on the Snake and Columbia rivers, including operations for fish passage."

As you have explained, Douglas PUD is required to operate the JBS system into summer months to meet HCP requirements of ≥95% spring and summer juvenile smolt downstream migration. The time-period stated in the TDG standards is *"generally from April through June"*. Ecology includes this general time-period to acknowledge when the majority of juvenile migration occurs in the Columbia basin. As stated in the rule, this is generally the period which requires adjustment to dam operations that result in higher TDG levels. As each dam on the Columbia and Snake Rivers experience juvenile downstream passage at different times, and each dams' operations are set to meet specific ESA requirements, this time-period was written with flexibility. Ecology understands that there are different beginning and ending juvenile fish passage operations between facilities. This period may also vary between years at a given dam. Therefore, part B of the TDG criteria may be applied, where appropriate, earlier then April and later than June as necessary to meet each dams' juvenile salmonid biological objectives.

Ecology concurs with Douglas PUD that when operating the JBS or other juvenile salmonid migration actions at the dam, part B of the criteria is applicable. Furthermore, Douglas PUD may only apply these modified criteria if operating in accordance with ESA consultation requirements. Given the migration period to meet Douglas PUD's ESA obligations of ≥95% juvenile passage requires operation of the JBS system outside the general season noted in the TDG standards, it is evident that the use of TDG, part B is necessary and appropriate.

If you have any questions regarding this clarification, please contact me at (360) 522-6441 or chad.brown@ecy.wa.gov.

Chad Brown
Water Quality Hydropower Unit Supervisor
Washington Department of Ecology

cc: Mariah Mayfield – Douglas PUD
Shane Bickford – Douglas PUD

Memorandum

TO: Scott Carlon, NOAA National Marine Fisheries Service
FROM: Tom Kahler, Douglas PUD
SUBJECT: Fish Salvage During Winter Maintenance Outage of Wells Dam West Fishway
DATE: December 5, 2024

Douglas PUD dewatered the Wells Dam west fishway for annual maintenance beginning on December 2, 2024, and concluding December 5, 2023. At approximately 10:45 AM on the 2nd, a crew consisting of Douglas PUD Natural Resources Department staff and WDFW personnel from the Twisp M&E office proceeded to salvage fish from the upper ladder. Following salvage in the upper ladder, Douglas PUD operators turned off flow to the ladder portion of the fishway. Douglas PUD mechanical crews and operators had the collection gallery ready for dewatering by mid-morning on the 5th, and fish salvage operations began around 10:40, concluding around 12:10. Fish salvaged on each day were released downstream from Wells Dam at Carpenter Island boat launch. The following table lists fishes and invertebrates salvaged.

Numbers of fishes and invertebrates salvaged from the west-fishway ladder and collection gallery at Wells Dam on December 2 and 5, 2024.

Species	December 2 Ladder	December 5 Collection Gallery	Total
Wild steelhead juvenile	2	0	2
Wild steelhead adult	1	0	1
Hatchery steelhead juvenile CWTO	2	0	2
Hatchery steelhead juvenile ad-clip only	0	2	2
Hatchery steelhead adult ad-clip only	7	0	7
Hatchery steelhead adult CWTO	2	0	2
Hatchery steelhead adult	0	1	1
Adult Coho Salmon	2	0	2
Cutthroat Trout	1	0	1
Rainbow Trout	0	1	1
Wild subyearling Chinook Salmon	1	0	1
Mountain Whitefish	457	394	851
Burbot	0	2	2
Three-spine Stickleback	0	29	29
Sculpin spp.	0	10	10
Smallmouth Bass juvenile	0	1	1
Largemouth Bass juvenile	0	1	1
Redside Shiner	0	6	6
Lamprey, larval	0	1	1
Lamprey, juvenile	0	2	2
Non-native northern crayfish	0	37	37
Total	**475**	**487**	**962**

Seven ad-clip-only and two CWTO adult steelhead, and two ad-clip-only and two CWTO juvenile steelhead were euthanized by WDFW personnel per ESA Section 10(a)(1)(A) permit number 23163. Additionally, all non-native crayfish were euthanized. Fish mortalities resulting from fishway dewatering include one hatchery steelhead residual and several whitefish that were in a location from which they could not be retrieved and two whitefish that were accidentally stepped on while in the seine net.

c: Wells HCP Coordinating Committee,
Ritchie Graves, NOAA NMFS

Appendix B
Aquatic Settlement Work Group Members

2024 Aquatic Settlement Work Group Members

Organization	Policy Representative	Technical Representative
Anchor QEA	John Ferguson (Chair)	John Ferguson (Chair)
Douglas PUD	Shane Bickford	Andrew Gingerich Chas Kyger* Mariah Mayfield†
Confederated Tribes of the Colville Reservation	Cody Desautel	Jason McLellan
Yakama Nation	David Blodgett, III Shannon Adams*	Ralph Lampman Keely Murdoch*
U.S. Bureau of Land Management	Chris Sheridan	Chris Sheridan
U.S. Fish and Wildlife Service	Michael Lucid Bill Gale*	RD Nelle Stuart Fety*
Washington Department of Fish and Wildlife	Brock Hoenes Chad Jackson*	Patrick Verhey Laura Heironimus*
Washington State Department of Ecology	Chad Brown	Breean Zimmerman (Jan to Feb) Vacant (Mar to Dec)

* Alternate Representative

† Technical Support who regularly participates on the Work Group

Appendix C
2024 Annual Report White Sturgeon Management Plan

2024 ANNUAL REPORT

WHITE STURGEON MANAGEMENT PLAN

WELLS HYDROELECTRIC PROJECT

FERC PROJECT NO. 2149

March 2025

Prepared by:
Public Utility District No. 1 of Douglas County
East Wenatchee, Washington

EXECUTIVE SUMMARY

The annual White Sturgeon Management Plan (WSMP) Report includes a summary of the progress made towards meeting measures required by the Federal Energy Regulatory Commission (FERC) operating license for Wells Dam and the requirements found within Appendix A (Clean Water Act section 401 Water Quality Certification). The 2012 FERC Order requires Public Utility District No. 1 of Douglas County (Douglas PUD) to submit an annual WSMP report to the FERC on or before May 31st during each year of the license.

The goal of the WSMP is to increase the White Sturgeon (*Acipenser transmontanus*) population in the Wells Reservoir to a level that can be supported by the available habitat and characterized by a diverse age structure consisting of multiple cohorts (juvenile and adult). In addition, the WSMP is intended to support spawning, rearing and migration as identified by the aquatic life designated use under WAC 173-201A in the Washington state water quality standards. Based upon the information available as of December 2006, the Aquatic Settlement Work Group (Aquatic SWG) determined that an assessment of the Wells Hydroelectric Project (Project or Wells Project) effects on White Sturgeon was not practical given sturgeon life history characteristics and the limited number of fish estimated to exist in the Project. Therefore, the Aquatic SWG concluded that resource measures related to White Sturgeon should focus on population protection and enhancement by means of supplementation as an initial step in order to increase the number of fish within the Wells Reservoir. In addition to the initial supplementation activities, implementation of a monitoring and evaluation program shall be conducted to accurately assess natural recruitment, juvenile habitat use, emigration rates, carrying capacity, and the potential for natural reproduction to inform the scope of a future, longer-term supplementation strategy. All objectives were developed to meet the WSMP goal. The Protection, Mitigation and Enhancement measures presented within the WSMP are designed to meet the following objectives:

Objective 1: Supplement the White Sturgeon population to address Project effects, including impediments to migration and associated bottlenecks in spawning and recruitment.

Objective 2: Determine the effectiveness of the supplementation activities through a monitoring and evaluation program (M&E).

Objective 3: Determine the potential for natural reproduction in the Wells Reservoir in order to appropriately inform the scope of future supplementation activities.

Objective 4: Adaptively manage the supplementation program as warranted by the monitoring results.

Objective 5: Evaluate whether there is biological merit to providing safe and efficient adult upstream passage.

Objective 6: Identify White Sturgeon educational opportunities that coincide with WSMP activities.

This WSMP is intended to be compatible with other White Sturgeon management plans in the Columbia River mainstem. Furthermore, this management plan is intended to be not inconsistent with other management strategies and recovery goals of federal, state and tribal natural resource management agencies. The WSMP is not intended to be a harvest management plan and does not create or supersede jurisdiction over fisheries management decisions made by the responsible fishery agencies and tribes. However, the WSMP activities are expected to ultimately support appropriate and reasonable harvest opportunities consistent with the goals of the responsible fishery agencies and tribes and designated use for harvest under WAC 173-201A identified in the Washington State water quality standards. Should the responsible fishery agencies and tribes determine that there is an ongoing harvestable surplus of sturgeon in the Wells Reservoir, then this indicates significant progress toward achievement of the goals and objectives of this plan.

1.0 INTRODUCTION

The White Sturgeon Management Plan (WSMP) is one of six Aquatic Resource Management Plans contained within the Aquatic Settlement Agreement (Agreement). Collectively, these six Aquatic Resource Management Plans are critical to direct implementation of Protection, Mitigation, and Enhancement measures (PMEs) during the term of the new license (Issued November 9, 2012).

To ensure active stakeholder participation and support, the Public Utility District No. 1 of Douglas County (Douglas PUD) developed all of the resource management plans in close coordination with agency and tribal natural resource managers (Aquatic Settlement Work Group or Aquatic SWG). During the development of the WSMP, the Aquatic SWG focused on developing management priorities for resources potentially impacted by the Wells Hydroelectric Project (Project or Wells Project) operations. Entities invited to participate in the Aquatic SWG include the U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), Bureau of Land Management (BLM), Bureau of Indian Affairs (BIA), Washington Department of Ecology (Ecology), Washington State Department of Fish and Wildlife (WDFW), the Confederated Tribes of the Colville Reservation (Colville), the Confederated Tribes and Bands of the Yakama Nation (Yakama Nation), and Douglas PUD.

The WSMP directs the implementation of measures to protect against and mitigate for potential Project impacts on White Sturgeon (*Acipenser transmontanus*).

The Aquatic SWG agrees on the need to develop a plan for the long-term management of White Sturgeon in the Project. This management plan report summarizes the relevant resource issues and background (Section 2), identifies the goal and objectives of the plan (Section 3), and describes the relevant PMEs (Section 4) for White Sturgeon during the term of the new license. In addition, the progress toward meeting each of these sections is provided.

In addition to the requirements found within the WSMP, the new Federal Energy Regulatory Commission (FERC) license added several additional sturgeon related requirements associated with the continued operation of the Wells Project. Implementation of all of the WSMP related measures will be reported to the various agencies and tribes within this report.

2.0 BACKGROUND

2.1 White Sturgeon Biology

White Sturgeon are the largest of all North American freshwater fish. They are found in marine waters and freshwaters of rivers along the Pacific coast from Monterey, California to Cook Inlet in northwestern Alaska (Wydoski and Whitney 2003). Significant populations of the Pacific coast appear to be restricted to three locations: the Sacramento, Fraser, and Columbia rivers (Lane 1991). White Sturgeon are distributed throughout the U.S. portion of the Columbia River and in many of its larger tributaries. Historically, White Sturgeon migrated throughout the

mainstem Columbia River from the estuary to the headwaters, although passage was probably limited at times by large rapids and falls (Brannon and Setter 1992).

White Sturgeon are long-lived fish, with fin ray analysis documenting fish over 100 years in age (Beamesderfer et al. 1995). This anadromous species has been reported to reach a length of 20 feet and a weight of 1,800 pounds (Wydoski and Whitney 2003). In the Columbia River, White Sturgeon spawn in the spring between April and July. Only a small percentage of adult White Sturgeon in the Columbia River spawn in a given year. Intervals between spawning have been estimated to be between 3 and 11 years. White Sturgeon deposit eggs through broadcast spawning at water temperatures between 10 and 18°C. Mature White Sturgeon commonly produce between 100,000 and 300,000 eggs, but larger fish may produce up to 3 million eggs (Wydoski and Whitney 2003). Spawning and egg incubation in the Columbia River occur in the swiftest water available (2.6-9.2 feet per second) at depths between 13.1 and 65.6 feet over cobble, boulder, and bedrock substrates (Wydoski and Whitney 2003). In mainstem Columbia River reservoirs, spawning occurred within 5 miles downstream of the mainstem dams. Eggs hatch in approximately 7 days at 15°C.

Columbia River White Sturgeon have declined in number due to numerous factors, including obstruction of migration by mainstem hydroelectric dams, altered stream flows, altered hydrologic regimes, altered temperature regimes, reduced spawning habitat, and over harvest (van der Leeuw et al. 2006; Wydoski and Whitney 2003). Variations in population characteristics also have been attributed to differences in exploitation rates and recruitment success, access to marine food resources, and suitability of hydrologic conditions and available habitats (Devore et al. 1995). During the 1800s, prior to construction of mainstem hydroelectric dams on the Columbia River, White Sturgeon were in great demand for their caviar and smoked flesh. In 1892, during the peak of commercial harvest activities, approximately 2.5 million kilograms of White Sturgeon were harvested (Wydoski and Whitney 2003). Regulations of the White Sturgeon fishery began with a 4-foot minimum size limit established in 1899. Several regulations were established from 1899 to 2000 to manage the fishery in the lower Columbia River, although, effective recovery efforts did not begin until spawners were protected in the 1950s (Wydoski and Whitney 2003).

Beginning in the 1930s, with the construction of Rock Island, Grand Coulee, and Bonneville dams, migration was disrupted because White Sturgeon generally do not pass upstream through fishways that were built for salmon, although they do pass downstream through dams (Lepla et al. 2001). Construction of hydroelectric projects in the mid-Columbia River Basin, such as Priest Rapids, Wanapum, Rock Island, Rocky Reach, and Wells dams also affected the upstream movement of White Sturgeon. Current populations in the Columbia River basin can be divided into three groups: fish below the Bonneville Dam, with access to the ocean; fish isolated functionally, but not genetically, between dams; and fish in several large tributaries. However, the population dynamics and factors regulating production of White Sturgeon within isolated populations in the mid-Columbia River reservoirs such as the Rocky Reach and Wells reservoirs are not well understood.

2.2 White Sturgeon Management and Recovery Efforts

Management programs to protect and restore White Sturgeon in the Kootenai River and the upper Columbia River are on-going and have provided a relevant framework for the development of a White Sturgeon management plan in the Wells Reservoir. The Kootenai and upper Columbia sturgeon recovery efforts have also provided a good technical framework for implementing a sturgeon management plan. The strategies and activities outlined in these aforementioned management programs have provided important information, which has been used to develop an effective WSMP.

2.2.1 Kootenai River White Sturgeon Recovery

In the early 1990s following concerns that White Sturgeon populations were decreasing due to near total recruitment failure, a detailed monitoring program was instituted by the Idaho Department of Fish and Game (IDFG) to provide more information on White Sturgeon species status in the Kootenai River system. In 1994, the USFWS listed the Kootenai stock of White Sturgeon as an endangered species, which introduced a higher level of management and control by various authorities in the drainage and region. A Recovery Team was established to provide technical direction regarding hatchery supplementation efforts. A final Kootenai White Sturgeon Recovery Plan was signed by the USFWS in 1999.

Kootenai White Sturgeon recovery efforts consist of a multi-faceted approach aimed at improving survival at various life history stages. Coordinated flow releases during spring are a major habitat restoration focus designed to increase natural recruitment, although currently it is difficult to assess the relationship between flows and recruitment success (USFWS 1999). Directed stocking programs, which address genetic concerns, stocking rates, and fish size at release, have also been implemented to boost juvenile sturgeon in the Kootenai system. The Kootenai Tribe of Idaho in collaboration with the Kootenay Trout Hatchery (KTH) in Canada are primarily responsible for producing juvenile White Sturgeon for the directed stocking program. Information collected from annual monitoring activities, which assess survival, growth rates, and natural spawning success, allow for an adaptive management approach with regards to the stocking program.

2.2.2 Upper Columbia River White Sturgeon Recovery

In 2002, a bi-national Recovery Team, termed the Upper Columbia White Sturgeon Recovery Initiative (UCWSRI) finalized the Upper Columbia White Sturgeon Recovery Plan in response to concerns that the transboundary White Sturgeon population residing between Hugh L. Keenleyside Dam and Grand Coulee Dam consists of an aging and declining population with extremely limited recruitment. The Recovery Team, consisting of technical representatives from Federal, Provincial, and State resource management agencies and from Canadian and U.S. tribes, directs the recovery program.

Due to near total recruitment failure over the past two decades, a decision was made early in the recovery planning process to move immediately to development of a hatchery program to

produce juvenile sturgeon for stocking (UCWSRI 2002). The breeding plan (Kincaid 1993) developed for the Kootenai sturgeon program was used as a model for the upper Columbia sturgeon, although this was modified in 2007 to a factorial breeding design using wild adult broodstock (Hildebrand and Parsley 2013). The UCWSRI program shifted to the use of wild caught eggs and first-feeding larvae for the conservation aquaculture program in Washington in 2011 and British Columbia in 2014. Rearing of fish for the stocking program currently occurs at WDFW Sherman Creek and Colville Tribal Resident Fish hatcheries in Washington and the Kootenay Trout Hatchery in British Columbia. Similar to the Kootenai recovery program, a coordinated monitoring program is employed in Washington and British Columbia to assess growth, survival, health, distribution, and relative abundance of released juveniles, which provides information essential to managing the upper Columbia sturgeon population and evaluating the success of the aquaculture program.

2.2.3 Rocky Reach White Sturgeon Management Plan

The relicensing process for the Rocky Reach Hydroelectric Project brought fisheries agencies, tribes, and interested parties together in a Natural Resources Working Group (Rocky Reach Fish Forum or RRFF) that provided an opportunity for comprehensive review of current and future management priorities for fish resources potentially impacted by ongoing Project operations (Chelan PUD 2005). In 2004 and 2005, RRFF members collaborated on the development of goals and objectives to manage the White Sturgeon population within the Rocky Reach Project boundary under the new license. Based upon the information collected from White Sturgeon field studies implemented by Chelan PUD in 2001 and 2002, a White Sturgeon management plan was developed to promote population growth of sturgeon to a level commensurate with the available habitat. The Rocky Reach management plan measures include the implementation of a White Sturgeon supplementation program, a monitoring program to determine population characteristics, and tracking surveys to determine movements and to assess potential spawning locations.

Following the issuance of Rocky Reach Dam's operating license from the FERC Chelan PUD implemented the first year of broodstock collection in 2010. Few viable adults were obtained despite many adults being captured. Offspring from 1x2 cross and captive brood fish were released into the Rocky Reach Reservoir, for an approximate 2011 release of 6,500 fish. In 2011, viable broodstock capture increased, however offspring produced showed signs of White Sturgeon Iridovirus which prevented the release of very many fish in 2012. Approximately 130 fish were released into the Rocky Reach Project in 2012. In 2012, broodstock collection resulted in two spawning groups that contained multiple males. From 2013 to 2020, Chelan PUD had successful releases of direct gamete origin fish into the Rocky Reach Reservoir, but transitioned to the use of wild-caught larvae from Lake Roosevelt for their program beginning with BY2021.

2.2.4 Priest Rapids Project White Sturgeon Management Plan

As part of the Priest Rapids Project relicensing, White Sturgeon populations were investigated in the Priest Rapids and Wanapum reservoirs from 1999 to 2003. Results of the study have assisted in identifying a framework for the future development and implementation of a Priest Rapids Project White Sturgeon Management Plan. Biological objectives associated with this

management plan consist of increasing White Sturgeon populations to a level commensurate with available habitat through a supplementation program and the implementation of a monitoring program to determine population characteristics such as natural recruitment, spawning, rearing, growth, survival, and rates of emigration.

Following the issuance of the Priest Rapids Dam License Order and the issuance of a Clean Water Act Section 401 Water Quality Certification (401 Certification) via Ecology, Grant PUD has begun implementing White Sturgeon stocking objectives. Similar to Chelan PUD, Grant PUD has released juvenile sturgeon above Priest Rapids and Wanapum Dams. Release numbers and broodstock collection for this effort is coordinated through the Priest Rapids Fish Forum (PRFF). In the early years of Grant PUD's license implementation the release target was 6,500 fish per year , but the target was reduced in later years.

2.3 Project White Sturgeon Study

Since little information existed on the status of White Sturgeon populations in the mid-Columbia, Chelan, Grant, and Douglas PUDs each initiated studies of White Sturgeon to support their current or upcoming relicensing processes. The information gathered from these studies was intended to provide basic White Sturgeon life history information, distribution, and current population sizes in the mid-Columbia River Basin. Additionally, study results provided the foundation for the development of appropriate management goals and objectives.

From 2001-2003, Douglas PUD implemented a study to examine the White Sturgeon population within the Project. Prior to the implementation of this study, little information on White Sturgeon was available for the Wells Reservoir. WDFW catch record card returns for 1993 and 1994 indicate that legal size White Sturgeon were present in the Wells Reservoir (Brad James, WDFW, pers. comm.). Additionally, information from previous studies in reservoirs upstream and downstream supported the existence of a population. The primary objectives of the study were to provide basic information on the population abundance, age structure, size, and growth of Project White Sturgeon; analyze movements of White Sturgeon within the Reservoir; and compare the data collected during this study with data collected during assessments at other projects (Jerald 2007).

During the summers of 2001 and 2002, setlines were deployed in the Wells Reservoir. Sturgeon captured on setlines were measured, marked with passive integrated transponder (PIT) tags and with scute markings. Additionally, a select number of captured fish were fitted with radio-transmitters to track movements and had pectoral fin rays removed for age analysis using standard methodologies (Beamesderfer et al. 1989).

Setline sampling took place over a two-year timeframe with a total of 129 setlines deployed and retrieved from throughout the reservoir. In total, 13 White Sturgeon were captured during the 2-year study with the majority of the fish being captured in the Columbia River within five miles of the mouth of the Okanogan River. Twelve of the captured fish were PIT tagged. Subsequently, five recapture events were recorded for a total of 18 capture events during the mark-recapture period (one fish was recaptured twice). Population abundance was estimated to

be 31±18. The 95% confidence interval for sturgeon abundance was calculated to be CI (13<N<218). The results of the mark-recapture portion of the study indicated that the sturgeon population in the Wells Reservoir is small with a point estimate of 31 fish over 50 cm in length (Skalski and Townsend 2005).

The length of the 13 fish captured during the study ranged from 60-202 cm. Two of the fish were classified as juveniles (65 and 73 cm) while 11 were classified as sub-adults or adults (>90 cm; range 90-202 cm). It is important to note that the capture methodology was not designed to provide accurate sampling of fish under 50 cm. Captured sturgeon ranged in age from 6 to 30 years old (based on 11 fish) demonstrating that all of these fish recruited to the Wells Reservoir after Wells Dam was completed in 1967 with strong year class recruitment between the years 1972 and 1978 and again between 1988 and 1996. The presence of fish within these age classes suggests that successful recruitment within or to the Wells Reservoir is occurring either through (1) spawning within the Wells Reservoir and/or (2) immigration into the Wells Reservoir from populations upstream. Two White Sturgeon captured in 2001 and subsequently recaptured in 2002 provided limited growth rate information. One juvenile fish was measured at 65 cm (fork length) on July 11, 2001. The fish was again captured on September 26, 2002 and measured 87 cm. This represented a growth rate of 22 cm in 14 months, or 18.9 cm/year. One adult fish was captured on August 9, 2001 measuring 197 cm (fork length). The fish was subsequently captured on September 6, 2002 and measured 199 cm representing a 2 cm growth rate over approximately 13 months, or 1.85 cm/year (Jerald 2007). In October 2006, this fish was found dead along the shoreline of the Columbia River adjacent to the mouth of the Okanogan River. At that time, biologists measured the fish at 228.5 cm representing a 29.5 cm increase in length over a four year period or an average of 7.4 cm of growth per year.

A total of six White Sturgeon were fitted with radio-tags and monitored throughout the study period using mobile and fixed telemetry. Telemetry data along with setline capture data verify that White Sturgeon congregate in the Columbia River near the Okanogan River confluence during the summer, fall, and winter months with none of the six fish being detected downstream from Brewster (river mile [RM] 530) or upstream of Park Island (RM 538). Very little movement of tagged sturgeon was observed during winter months. In the spring of 2002, one of the five mature radio-tagged fish made an upstream migration into the Okanogan River and two different radio-tagged mature sized sturgeon made movements into the Okanogan River during 2003.

In general, the results of the White Sturgeon study in the Wells Reservoir were similar to the results of a study conducted in the neighboring Rocky Reach Reservoir in 2001-2002 (Chelan PUD 2005). Results indicate that the Wells Reservoir adult sturgeon population is estimated from 13-217 fish. These results are similar to the Rocky Reach assessment which estimated numbers of sturgeon from 50-115 fish. Both studies captured similar numbers of sturgeon using similar amounts of effort and similar capture techniques (Rocky Reach=18 sturgeon, Wells=13 sturgeon). Radio-telemetry data from both studies suggest that very little activity occurs during the overwintering period. Wells Reservoir sturgeon ranged in age from 6 to 30 years old while Rocky Reach sturgeon ranged in age from 7 to 50 years old. Both studies suggest that some

recruitment into each population is occurring given the presence of juvenile fish in their respective reservoirs (Chelan PUD 2005; Jerald 2007).

3.0 GOAL AND OBJECTIVES

The goal of the WSMP is to increase the White Sturgeon population in the Wells Reservoir to a level that can be supported by the available habitat and characterized by a diverse age structure consisting of multiple cohorts (juvenile and adult). In addition, the WSMP is intended to support spawning, rearing and migration as identified by the aquatic life designated use under WAC 173-201A in the Washington state water quality standards. Based upon the available information, the Aquatic SWG agreed that a rigorous and reliable assessment of ongoing Project effects on White Sturgeon was not practical given sturgeon life history characteristics and the limited number of fish estimated to exist in the Wells Reservoir. Therefore, the Aquatic SWG concluded that efforts should focus, initially, on supplementation efforts to increase the population within the Wells Reservoir to address Project effects. Once the population numbers have been increased to a level that can be studied, as determined by the Aquatic SWG, Douglas PUD shall implement a monitoring and evaluation (M&E) program to accurately assess natural recruitment, juvenile habitat use, emigration rates, carrying capacity, and the potential for natural reproduction to inform the scope of a future, long-term supplementation strategy. The PMEs of the WSMP are designed to meet the following objectives:

Objective 1: Supplement the White Sturgeon population in order to address Project effects, including impediments to migration and associated bottlenecks in spawning and recruitment;

Objective 2: Determine the effectiveness of the supplementation activities through a monitoring and evaluation program;

Objective 3: Determine the potential for natural reproduction in the Wells Reservoir in order to appropriately inform the scope of future supplementation activities;

Objective 4: Adaptively manage the supplementation program as warranted by the monitoring results and in consultation with the Aquatic SWG;

Objective 5: Evaluate whether there is biological merit to providing safe and efficient adult upstream passage;

Objective 6: Identify White Sturgeon educational opportunities that coincide with WSMP activities.

This WSMP is intended to be compatible with other White Sturgeon management plans in the Columbia River mainstem. Furthermore, this management plan is intended to be not inconsistent with other management strategies and recovery goals of federal, state and tribal natural resource management agencies. The WSMP is not intended to be a harvest management plan and does not create or supersede jurisdiction over fisheries management decisions made by the responsible fishery agencies and tribes. However, the WSMP activities are expected to ultimately support

appropriate and reasonable harvest opportunities consistent with the goals of the responsible fishery agencies and tribes and designated use for harvest under WAC 173-201A identified in the Washington state water quality standards. Should the responsible fishery agencies and tribes determine that there is an ongoing harvestable surplus of sturgeon in the Wells Reservoir, then this indicates significant progress toward achievement of the goals and objectives of this plan.

The schedule for implementation of specific measures within the WSMP is based on the best information available at the time the Plan was developed. As new information becomes available, implementation of each activity may be adjusted through consultation with the Aquatic SWG.

4.0 PROTECTION, MITIGATION AND ENHANCEMENT MEASURES

To fulfill the goal and objectives described in Section 3.0 of the WSMP, Douglas PUD, in consultation with the Aquatic SWG, has initiated the implementation of the following measures. The program shall be implemented in two phases. Phase I of the PMEs shall be implemented during the first ten years of the new license and consist of supplementation, monitoring and evaluation activities. Results of Phase I PMEs will be used to inform the scope of continued PMEs during Phase II, which shall be implemented for the remainder of the new license.

Douglas PUD, in consultation with the Aquatic SWG, shall initiate implementation of the following PMEs during the 50-year license term:

Phase I (Years 1-10)

- Development of a Broodstock Collection and Breeding Plan (Year 1 and updated as determined by the Aquatic SWG, See Section 4.1.1);
- Broodstock Collection (Years 1-4 and other years TBD by the Aquatic SWG, see Section 4.1.1);
- Juvenile Stocking (Years 2-5 and other years TBD by the Aquatic SWG, see Section 4.1.2);
- Index Monitoring Program (Years 3-5 and 2 more years prior to Year 10 TBD by the Aquatic SWG, see Section 4.2.1);
- Marked Fish Tracking (Years 3-5 and 2 more years prior to Year 10 TBD by the Aquatic SWG, see Section 4.2.2);
- Natural Reproduction Assessments (5 annual assessments over the license term, see Section 4.2.3)*;

* Natural reproduction assessments can be implemented over the term of the license (Phase I and Phase II) as determined by the Aquatic SWG.

Phase II (Years 11-50)

- Long-term juvenile stocking (stocking rate and frequency TBD by Aquatic SWG in Years 11-50, see Section 4.3.1);

- Supplementation Program Review (Years 11-50 TBD by the Aquatic SWG, see Section 4.3.2);
- Long-term Index Monitoring Program (Year 12 and once every 3-5 years thereafter TBD by the Aquatic SWG, see Section 4.3.3);
- Adult Passage Evaluation (Year 11 and once every 10 years thereafter, see Section 4.4)

As determined by the Aquatic SWG, appropriate educational opportunities coinciding with implementation of WSMP activities (Section 4.5) will be made available during the entire license term.

The following sections describe, in detail, the components, timing of implementation, and decision-making process of the PMEs to be conducted during Phase I and II of the White Sturgeon management program.

4.1 Phase I Supplementation Program (Objective 1)

4.1.1 Broodstock Collection and Breeding Plan

Due to the low numbers of sturgeon indicated by the 2001-2003 White Sturgeon study and the need to increase genetic variation, there is a low probability that broodstock from only the Wells Reservoir can be utilized as the basis for supplementation activities. Consequently, other sources of fish must be considered in addition to capturing fish from Wells Reservoir to increase the White Sturgeon population. Within one year of issuance of the new license Douglas PUD shall prepare and implement a Broodstock Collection and Breeding Plan, in consultation with the Aquatic SWG, which considers such factors as genetics and questions of imprinting, and are consistent with the goal and objectives of the WSMP and includes the level of detail provided in other existing White Sturgeon breeding plans.

Following is a prioritized list[1] of juvenile fish source options that shall be incorporated into a Broodstock Collection and Breeding Plan:

- Broodstock collected from the Wells Reservoir;
- Broodstock collected from nearby reservoirs (Priest Rapids, Wanapum, Rocky Reach, Rock Island);
- Broodstock collected from McNary Reservoir;
- Juvenile production from the Lake Roosevelt White Sturgeon recovery effort;
- Broodstock collected from below Bonneville Dam in the lower Columbia River;
- Juveniles purchased from a commercial facility.

[1] Although the original WSMP included a prioritized list, since the development of the WSMP the Aquatic SWG has approved the White Sturgeon Broodstock Collection and Breeding Plan (filed with the FERC on February 14, 2012) and a sturgeon collection location Statement of Agreement developed and approved in the Aquatic SWG on March 20, 2012. Collectively, these two documents approve all capture locations found in the WSMP and remove the prioritization found in the WSMP.

A White Sturgeon supplementation program may include, but may not be limited to, the following implementation options (Not listed in a priority order):

- Build new or retrofit existing Douglas PUD funded hatchery facilities to accommodate White Sturgeon broodstock, egg incubation, and juvenile rearing;
- Development of a mid-Columbia hatchery facility funded by the three PUDs (Douglas, Chelan, and Grant) to accommodate various phases of White Sturgeon supplementation; broodstock, egg incubation, and juvenile rearing;
- Direct release into the Wells Reservoir of juveniles produced via appropriate Breeding Plan criteria and reared at a commercial facility;
- Direct release into the Wells Reservoir juveniles or adults trapped and hauled from the lower Columbia River.

The initial source of broodstock shall be determined within the first year of issuance of the new license. Collection of broodstock shall occur consistent with the broodstock collection plan in years 1-4 of the new license. Any additional years during the Phase I program (first ten years of the new license) in which broodstock collection shall occur in order to facilitate additional juvenile stocking into the Wells Reservoir (Section 4.1.2) will be determined by the Aquatic SWG. The intent of broodstock collection is to use their progeny, if feasible, for future White Sturgeon stocking activities in the Wells Reservoir. The broodstock collection plan shall be updated annually, or as otherwise recommended by Douglas PUD in consultation with the Aquatic SWG, to incorporate new and appropriate information.

4.1.1.1 Progress Towards Objective 1 in 2024 – Broodstock Collection and Breeding Plan

Since the approval of the 2011 Broodstock and Breeding Plan a number of statements of agreements (SOAs) have been reviewed and approved within the Aquatic SWG. In 2012, the parties approved two White Sturgeon collection techniques consistent with the Broodstock and Breeding Plan. Since 2014, however, only wild caught larvae repatriates have been planted in the Wells Project.

On January 11, 2017, the Aquatic SWG approved the Wells Reservoir White Sturgeon Supplementation SOA that required Douglas PUD to stock wild origin larvae in the years 2018 through -2022. Consistent with this SOA, June 2018 - 2022 White Sturgeon released into the Wells Reservoir were wild caught larvae that were repatriated into the Columbia River between Wells Dam and Chief Joseph Dam. Prior to releasing them, these fish were captured within Lake Roosevelt as ~10-14 day old larvae and reared for eleven months at the Wells Fish Hatchery. In 2018 the White Sturgeon Broodstock and Breeding Plan was revised, reviewed, and approved by the Aquatic SWG. This document was renamed to the White Sturgeon Supplementation Plan and was filed with the FERC on May 14, 2018.

In early 2022, Douglas PUD and the Aquatic SWG further reviewed Wells Project White Sturgeon M&E data, which aligned with the abundance estimate derived from example modelling discussed with the Aquatic SWG (See 4.1.2.1 below). Additionally, Blue Leaf

Environmental/LGL Limited considered possible model designs to improve abundance estimates and concluded that more data are needed to improve the precision of the estimates or make more meaningful estimates in survival. Based on this, on February 7, 2022, Douglas PUD distributed a draft 4-year SOA proposing the same stocking number of 325 fish because there are no strong data to suggest a change. The range of ±5% in release numbers was increased to ±10%, as requested by hatchery staff, to incorporate production flexibility into the SOA. Lastly, the target size at release was increased from 200 g to a minimum of 350 g, based on the belief that raising fish to a larger size will improve first year survival in the wild. On March 9, 2022, the SOA, Wells Reservoir White Sturgeon Supplementation 2023–2026 was approved by the Aquatic SWG. This SOA stipulates that Douglas PUD will release 325 (±10%) White Sturgeon greater than or equal to 350 g per fish into the Wells Reservoir annually between 2023 and 2026. These fish will be composed of juveniles originating as wild caught larvae sourced from Lake Roosevelt. This SOA addresses the supplementation goals for the first 4 years of Phase II of the WSMP.

Throughout 2022, Douglas PUD and the Aquatic SWG discussed spontaneous autopolyploidy (SAP) screening of all White Sturgeon being reared at Wells Fish Hatchery. On May 11, 2022, the Aquatic SWG proposed incorporating guidelines for SAP screening into the current White Sturgeon Supplementation 2023-2026 SOA. As requested, on June 3, 2022, Douglas PUD distributed an updated SOA, using the current SOA as a framework, that stipulates SAP screening of White Sturgeon at Wells Fish Hatchery and euthanizing fish identified as displaying SAP. The Aquatic SWG thoroughly discussed and edited the draft SOA, considering impacts to meeting stocking targets, off-ramp language (notably, the lack of off-ramps), and co-manager commitments to continued evaluations of ploidy rates in nature. After several iterations, on August 10, 2022, the Statement of Agreement Regarding Wells Reservoir White Sturgeon Supplementation 2023-2026 was approved by the Aquatic SWG. This SOA stipulates that, in addition to the version approved on March 9, 2022, fish will also be blood sampled and tested for SAP, and fish identified having anything other than 8N[2] chromosome types will be euthanized.

In 2024, Douglas PUD released 330 larval-origin White Sturgeon into the Wells Project (Table 1). Blood samples from these fish were analyzed for SAP prior to their release into the Wells Reservoir. All of the fish tested were 8N chromosome types.

4.1.2 Juvenile White Sturgeon Stocking

Within two years following issuance of the new license, Douglas PUD shall release up to 5,000 yearling White Sturgeon into the Wells Reservoir annually for four consecutive years (20,000 fish total). Additional years and numbers of juvenile sturgeon to be stocked during Phase I will be determined by the Aquatic SWG and will not exceed 15,000 juvenile sturgeon (total of 35,000 juvenile sturgeon during Phase I). In consultation with the Aquatic SWG, yearling fish for release shall be acquired through one or more of the sources listed in priority order in Section 4.1.1 above, or through other measures identified by the Aquatic SWG. If juvenile sturgeon stocking deadlines cannot be achieved, the Aquatic SWG will determine alternative implementation measures that will be undertaken by Douglas PUD (see Table 4.7-1, footnote 2).

[2] White Sturgeon are normally evolutionary octoploids having 8 copies of each chromosome (8N).

Douglas PUD shall ensure that all hatchery-reared juvenile White Sturgeon released into the Wells Reservoir are marked with PIT tags and year-specific scute marks for monitoring purposes described in Section 4.2 of this plan. In order to allow for tracking of juvenile White Sturgeon emigration described under Section 4.2.2, Douglas PUD shall ensure that up to one percent (or a maximum of 50) of the juvenile White Sturgeon released into the Wells Reservoir are large enough to allow implantation of an active tag prior to release. In addition, following the third year of supplementation (unless the Aquatic SWG determines more analysis is required), the Aquatic SWG may elect to release juveniles at an earlier or later life stage for the fourth year in order to compare success of fish released at varying life stages. For example, the Aquatic SWG may elect to have a proportion of the hatchery-reared juveniles released at differing size intervals (with the minimum size being that which permits PIT tagging), in order to monitor potential differences in survival and growth during future indexing periods.

4.1.2.1 Progress Towards Objective 1 in 2024 – Juvenile White Sturgeon Stocking

<u>Brood Year 2013</u>

In March 2013, the Aquatic SWG approved a White Sturgeon Collection Plan SOA for implementation in the first year (2013) of Douglas PUD's White Sturgeon collection efforts, which included the following efforts: 1) larval collection in the mid-Columbia River from the Vernita Bridge upstream to the Rock Island Dam tailrace, and in Lake Roosevelt, with collection from mid-Columbia locations as the highest priority and 2) broodstock collection in the pools of the Columbia River between Bonneville Dam upstream to Rock Island Dam. The Aquatic SWG also agreed that the proportion of fish from each program (larvae and brood-collected offspring) released into the Wells Project would be agreed on prior to planting in spring 2014 following the completion of the larvae and brood-collection season and following the results from initial incubation and rearing efforts.

In March 2014, following several months of discussions regarding genetics, fish health, and the merits of stocking larval-origin versus direct gamete-origin fish, the Aquatic SWG approved the following plan for stocking Wells White Sturgeon for implementation in 2014: 1) all stocked fish will be asymptomatic of disease (i.e., no clinical signs of disease); 2) all larvae-source fish available at the Wells Fish Hatchery (approximately 2,200) will be stocked at a target size of at least 146 to 272 grams (280 to 352 millimeters [mm]); and 3) the balance of the 5,000-fish target will be stocked using direct gamete-source fish from 12 families (half sibling) and be stocked at a target mean size of 111 to 146 grams (256 to 280 mm).

In April 2014, approximately 2,900 direct gamete-origin fish were released into Wells Reservoir. Larval-origin fish were held an additional 2 months for additional growth. In June 2014, more than 2,100 larval-origin fish were released into the Wells Reservoir.

Brood Years 2014 to 2016

In 2014, based on 2013 collection efforts, the Aquatic SWG agreed to focus larval-collection efforts in Lake Roosevelt, and to not collect below Rock Island Dam in subsequent years because few larvae were collected in 2013, which suggested low production in the area. The Aquatic SWG also agreed that 2014 brood-collection efforts would continue in the same manner as in 2013, including brood collection in The Dalles and Bonneville pools, and coordination with Grant PUD and Chelan PUD for brood collection at their respective facilities.

In May 2014, Douglas PUD distributed a draft Wells White Sturgeon Collection and Stocking SOA for brood years 2014 to 2016. During the next several months, the Aquatic SWG discussed fish source, collection capabilities, cultural boundaries, fish health, genetics, and stocking goals. Several revisions and iterations of the draft SOA were provided by Douglas PUD, the Colville Tribes, the Yakama Nation, and WDFW. The following common objectives were expressed by Aquatic SWG members: 1) moving genes from the lower river upstream; 2) achieving a genetically based split through parental representation; and 3) meeting the stocking target of 5,000 fish.

In early 2015 the Aquatic SWG approved the prioritization of stocking larvae origin fish when available through 2017 stocking (brood year 2016). In each of the years between 2015 -2017 just over 5,000 wild origin larvae captured from Lake Roosevelt and reared at Wells Hatchery for almost one year were released into the Wells Project. No direct gamete fish were released into the Project during 2015 -2017. Detailed information of fish size and releases is provided in (Robichaud and Gingerich, 2018), however all release data in association with the Wells Project license implementation are summarized in Table 1 below.

Brood Years 2017 to 2021

In 2016, the Aquatic SWG began discussing collection and stocking plans for releasing up to 15,000 fish in Years five to ten of the FERC license. The Aquatic SWG convened a White Sturgeon subgroup that discussed the technical merits of different collection and stocking strategies, how to approach stocking rates in the Wells Project, and how to attain a diverse age and size structure that could be supported with the available habitat. The subgroup developed an adult abundance target and parameterized a productivity simulation model that was used to estimate the stocking rate needed to achieve the target. Model inputs included size of the starting population, natural recruitment, expected survival, and potential exploitation rates. Based on model results, an agreement was reached to target a population within the Wells Reservoir of approximately 1,000 to 1,100 adult White Sturgeon and that stocking approximately 325 juvenile fish annually at a weight of 200 grams each would be needed to reach the abundance target. The subgroup also agreed these releases would be comprised of larval-origin fish sourced from the Columbia River between Bonneville Dam and the United States/Canadian border. The entire Aquatic SWG discussed these findings and agreed that raising fish to the size of 300 grams each may be possible.

In January 2017, the SOA, Wells Reservoir White Sturgeon Supplementation 2018-2022 (as appended to the 2017 Aquatic Settlement Agreement Annual Report) was approved by the

Aquatic SWG. This SOA stipulates that Douglas PUD will release 325 (±5%) White Sturgeon greater than or equal to 200 grams per fish into the Wells Reservoir annually between 2018 and 2022 to complete the supplementation requirement in Phase I of the WSMP.

In June 2018, a total of 337 brood year 2017 larval-origin (Lake Roosevelt) White Sturgeon were released into the Wells Project, per the January 2017 SOA guidelines. The 337-fish release included 319 fish (±5%) at or above the 200-gram size criteria and 19 fish below the 200-gram threshold, resulting in a median fish size of 280 grams (mean = 281 g) per fish (included in Table 1).

Poor hatchery survival in 2018 and 2019 led to the release of 99 White Sturgeon juveniles in 2019. To account for the BY 2018 and planting year 2019 shortfall, 570 11-month old White Sturgeon were released in 2020 (BY 2019). In so doing, Douglas PUD accounted for the 325 yearly stocking target and the shortfall target release in 2019.

In 2021, 338 11-month old White Sturgeon were released into the Wells Project near Bridgeport, WA. All fish released exceeded the target weight threshold of 200 grams.

In 2022, 332 11-month old White Sturgeon were released into the Wells Project near Bridgeport, WA. All fish released exceeded the target weight threshold of 200 grams.

Brood Years 2022 to 2025

Based on the most recent SOA regarding White Sturgeon stocking rates and target size for brood years 2022 to 2025 (Statement of Agreement Regarding Wells Reservoir White Sturgeon Supplementation 2023-2026), the stocking rate remained 325 fish per year with an increase in target size at stocking from 200 to 350 grams (see Section 4.1.1.1).

In 2023, 328 11-month old White Sturgeon were released into the Wells Project near Bridgeport, WA. Of the 328 fish, 324 exceeded the target weight threshold of 350 grams. The remaining four fish weighed between 282 grams and 347 grams.

In 2024, 330 11-month old White Sturgeon, with an average size of 375 grams, were released into the Wells Project near Bridgeport, WA.

Table 1. White Sturgeon released into the Wells Reservoir 2014-2024.

Year	Direct Gamete	Wild Larvae	Annual Total	Grand Total
2014	2,911	2,132	5,044	5,004
2015	--	5,009	5,009	10,013
2016	--	5,289	5,289	15,302
2017	--	5,131	5,131	20,433
2018	--	337	337	20,770
2019	--	99	99	20,869
2020	--	570	570	21,439

2021	--	338	338	21,777
2022	--	332	332	22,109
2023	--	328	328	22,437
2024		330	330	22,767

4.2 Phase I Monitoring and Evaluation Program (Objective 2)

Douglas PUD shall conduct a monitoring and evaluation program within the Wells Reservoir for the purpose of assessing the effectiveness of the supplementation activities described in Section 4.1 and outlined in Table 4.7-1. Monitoring shall include both an Index Monitoring Program (Section 4.2.1) and a Marked Fish Tracking Program (Section 4.2.2). Both studies will be used to collect life history and population dynamics information including rates of fish movements into and out of the Wells Reservoir and habitat use. Douglas PUD shall also obtain updated information, when available, on other White Sturgeon recovery programs (e.g., Upper Columbia River, Kootenai River, mid-Columbia PUDs), to improve the monitoring and evaluation program and refine its implementation. The results of this information will also inform supplementation, monitoring and evaluation activities during implementation of Phase II of the WSMP.

4.2.1 Index Monitoring Program

Within three years following issuance of the New License, Douglas PUD shall initiate a three-year index monitoring program (Years 3-5) for juvenile and adult sturgeon in the Wells Reservoir to determine age-class structure, survival rates, abundance, density, condition factor, growth rates, and to identify distribution and habitat selection of juvenile sturgeon. The indexing methods shall include using gillnets, set lines or other appropriate recapture methods for juveniles and adults.

As a component of the Phase I indexing program, Douglas PUD shall capture and implant active tags in a portion of the juvenile and sexually mature adult sturgeon population found in the Wells Reservoir. This tagging effort shall be used to augment broodstock collection (Section 4.1.1), population level information and juvenile habitat use (Section 4.2.2) and natural reproduction potential (Section 4.2.3).

After the initial three-year indexing period (Years 3-5), Douglas PUD shall conduct an additional two years of index monitoring in Phase I as determined by the Aquatic SWG. After year 9, an additional year of index monitoring would take place in year 12 and then every three to five years over the term of the new license (Phase II) to assess age-class structure, survival rates, abundance, condition factor, growth rates; identify distribution and habitat selection of juvenile sturgeon; and to inform the supplementation program strategy (see Table 4.7-1).

Frequency (every 3, 4 or 5 years) of implementation of a long-term index monitoring activities (after year 12) will be determined by the Aquatic SWG. Phase II index monitoring activities will not consist of implantation of active tags in captured individuals.

4.2.1.1 Progress Towards Objective 2 in 2024 – Index Monitoring Program

On January 8, 2014, the Aquatic SWG approved the Phase I White Sturgeon Management Plan Monitoring and Evaluation Study Plan (See Anchor QEA., 2015). (Note: Ecology and USFWS approved the study plan via email on December 20, 2013.)

Phase I components of the WSMP include supplementation releases, an Index Monitoring Program, an Acoustic-Tracking Program, and research towards Determining Natural Reproduction Potential.

To date, supplementation has comprised a total of 22,767 PIT tagged juvenile sturgeon that were released into the Wells Reservoir. One percent, or 178 fish have been acoustic tagged, with the majority being hatchery fish that were acoustic tagged prior to release or in situ during field work. A tagging summary is provided in Table 2.

Table 1. Douglas PUD's releases of acoustic tagged White Sturgeon, by year and tag type. Tags with longer battery life are larger, and more powerful. Tag sets shown in red expired prior to late 2017 (during periods covered by previous reports). Tag sets in blue expired in late 2017 or in 2018. Only the ten-year (3650 day; yellow) tags were active in 2023.

							Tag's Estimated Battery Life (days)			
Brood Year	**Year of Hatchery Release**	**Number Tagged in 2015**	**Number Tagged in 2016**	**Number Tagged in 2017**	**Number Tagged in 2018**	**Number Tagged in 2022**	**487** [a]	**904** [b]	**1070** [c]	**3650** [d]
Natural	na	7 †	1 †	8 †	2 †					18 †
2012	2013	1 †							1 †	
2013	2014	50 †						25 †	24 †	1 †
2014	2015	49 *				9	49 *			9 †
2015	2016		50 *			1	50 *			1 †
2016	2017									
2017	2018									
TOTAL		**107**	**51**	**8**	**2**	**10**	**99**	**25**	**25**	**29**

* tagged at the hatchery prior to release

† tagged *in situ* upon recapture during indexing setlining efforts

[a] Vemco Model V9-2H-069k-1 (length 29 mm, diameter 9 mm, weight in air 4.7 g); pings every 150-210 s.

[b] Vemco Model V13-1H-069k-1 (length 36 mm, diameter 13 mm, weight in air 11 g); pings every 150-210 s.

[c] Vemco Model V13-1H-069k-1 (length 36 mm, diameter 13 mm, weight in air 11 g); pings every 150-300 s.

[d] Vemco Model V16-4L-069k-1 (length 36 mm, diameter 16 mm, weight in air 25 g); pings every 150-210 s.

For Index Monitoring, strictly-implemented stratified-random setline sampling was conducted in the summer (July/August) and fall (September/October) of 2015 – 2017, and 2019. Index monitoring was conducted in 2018, but targeted adult fish with larger gear. Index monitoring for juvenile fish planted after rearing at the Wells Fish Hatchery resumed in 2019. For each set, the total number of White Sturgeon (by brood-year-class) was recorded. All captured sturgeon were scanned for PIT tags, measured (fork length, weight), and any fish without a PIT tag or scute mark had one applied.

Indexing monitoring was not completed in 2020 pursuant to requirements found in the WSMP. However, indexing resumed in 2021 and continued in 2022. These efforts utilized a mixture of large (14/0, 16/0, 18/0, 20/0) and small (2/0 and 4/0) hook sizes to target both juvenile and larger White Sturgeon (Table 3). No index monitoring activities occurred in the Wells Reservoir in 2023.

After a hiatus in 2023 indexing monitoring occurred in September and October 2024. Setlines were fish at 191 locations and utilized the same methodology as in 2021 and 2022 (Table 3).

Table 3. Timing and sample sizes for index monitoring sessions from 2015 to 2024.

Sampling Session	Start Date	End Date	# of Setlines
Juvenile Sampling Gear			
Summer 2015	July 6	August 5	207
Fall 2015	September 8	October 9	212
Summer 2016	July 11	August 8	336
Fall 2016	September 6	October 2	312
Summer 2017	July 10	August 9	312
Fall 2017	September 4	October 3	300
Summer 2019	July 7	August 2	240
Fall 2019	September 8	October 4	240
Adult Sampling Gear			
Adult 2016	August 21	September 3	112
Adult 2017 - 1	August 13	August 21	112
Adult 2017 - 2	October 10	October 20	85
Adult 2018	July 29	August 31	239
Adult 2019	August 4	August 30	240
Juvenile and Adult Gear			
2021	July 25	September 30	588
2022	September 18	October 20	300
2024	September 16	October 18	191

Table 4. Number of hatchery–reared White Sturgeon released into the Wells Reservoir and the number of unique individuals caught during indexing monitoring in 2024.

Release Year	Number Released	Mean Weight (g) at Release (SE)	Number Captured 2024	Percent of Release Total Captured
2014	5,044	166.5 (0.8)	99	1.96%
2015	5,009	97.6 (0.5)	29	0.62%
2016	5,289	147.0 (0.8)	19	0.38%
2017	5,131	118.4 (0.7)	40	0.82%
2018	337	281.0 (2.9)	4	1.19%
2019	99	364.7 (13)	11	11.11%
2020	570	495.7 (4.9)	55	9.65%
2021	338	916.7 (10.8)	27	8.28%
2022	332	488.1 (5.62	14	4.22%
2023	328	541(5.71)	11	3.38%
2024	330	375(3.43)	4	1.21%

4.2.2 Marked Fish Tracking Program

Beginning in year three of the new license and continuing for three years (Years 3-5), Douglas PUD shall conduct tracking surveys of the juvenile White Sturgeon that were released with active tags as part of supplementation activities. This will require one percent of each of the annual classes of juvenile sturgeon (up to a maximum of 50 fish each year) released in years 2, 3, 4, and 5 to be reared large enough to implant an active tag for tracking purposes (See Table 4.7-1). The purpose of tracking active-tagged fish is to determine juvenile White Sturgeon emigration rates out of the Wells Reservoir and habitat use within the Wells Reservoir.

Douglas PUD shall repeat the tracking survey for two additional years during Phase I (see Table 4.7-1). The additional two years of surveys shall track: 1) active tags implanted in a percentage of juvenile fish from previous years of supplementation activities (dependent upon tag life) and 2) any juvenile and adult fish implanted with active tags during the last indexing period preceding the survey. Subsequent Phase I surveys are likely to coincide with the additional Phase I index monitoring and juvenile stocking activities.

4.2.2.1 Progress Towards Objective 2 in 2024 – Monitoring and Evaluation Program

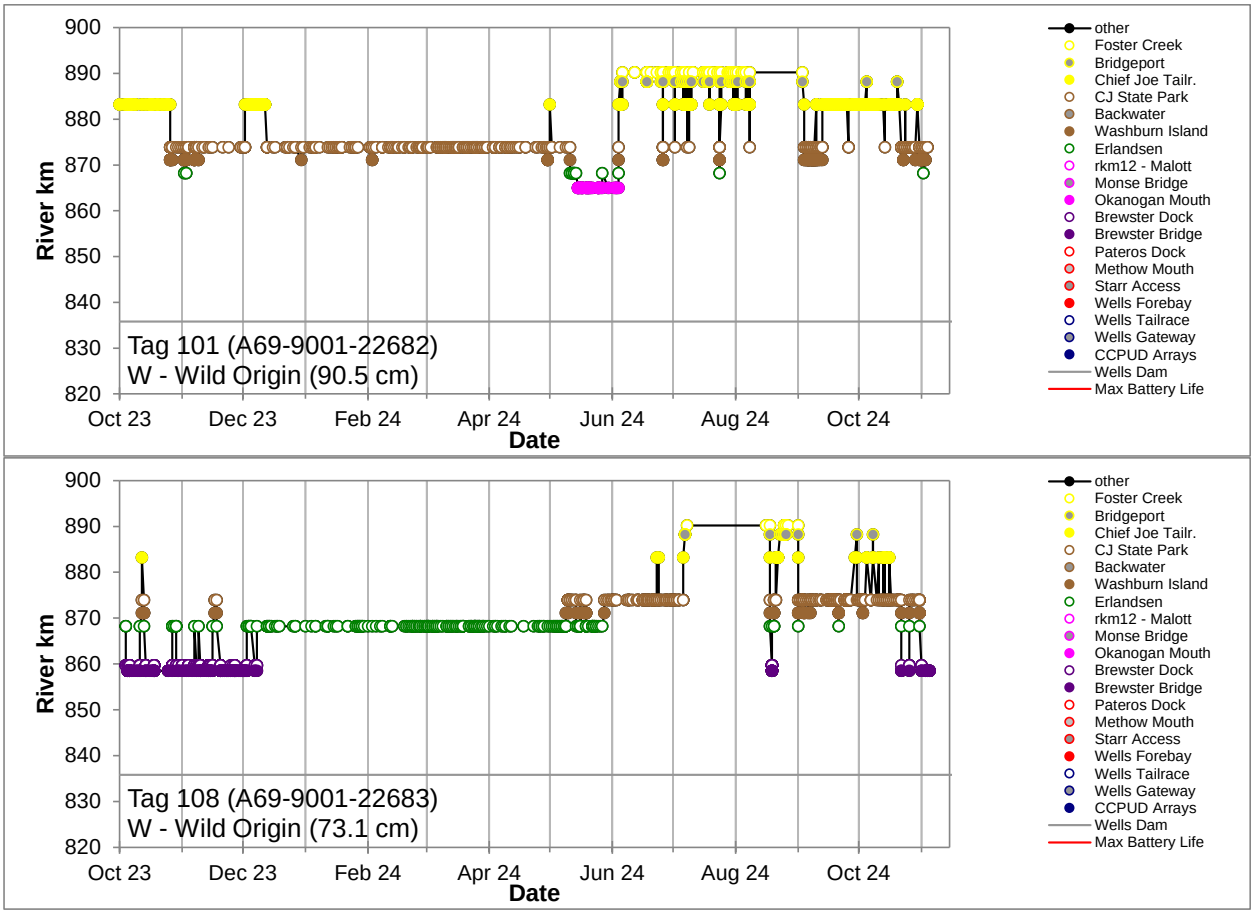
On January 8, 2014, the Aquatic SWG approved the Phase I White Sturgeon Management Plan Monitoring and Evaluation Study Plan (See Anchor QEA., 2015). (Note: Ecology and USFWS approved the study plan via email on December 20, 2013.) Consistent with the WSMP, Monitoring and Evaluation with specific emphasis on applying active tags and monitoring White Sturgeon movement within the Wells Project began in 2015 and continued each year through 2018. No new tags were applied in since 2018, acoustic tracking of 18 fish carrying V-16s (10 year acoustic tags) continued through 2022. In 2022, an additional 10 hatchery-origin White

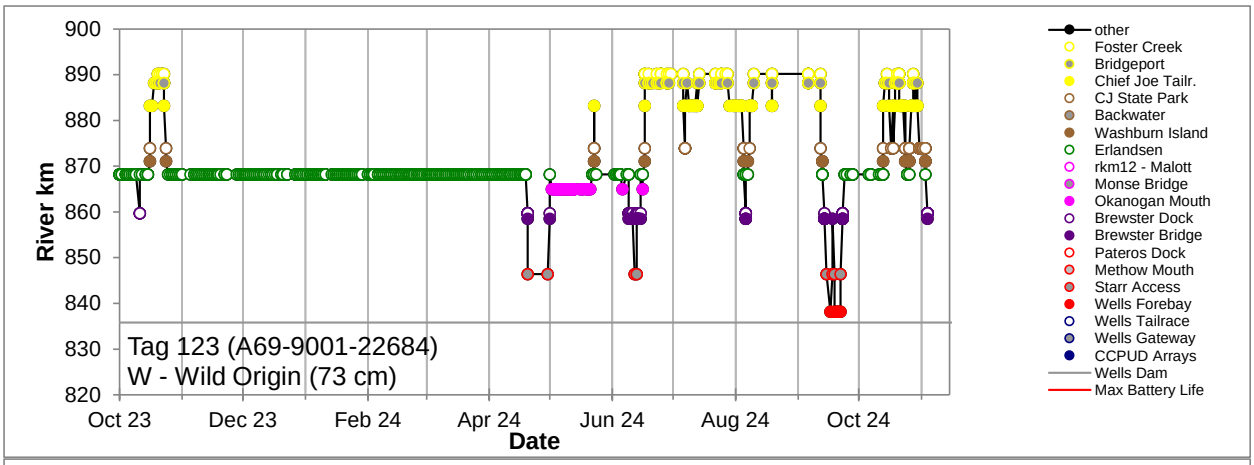
Sturgeon one meter or greater in length were given V-16 acoustic tags during monitoring and evaluation activities. No additional Sturgeon were given acoustic tags in 2023; however, monitoring of existing acoustic tagged fish continued.

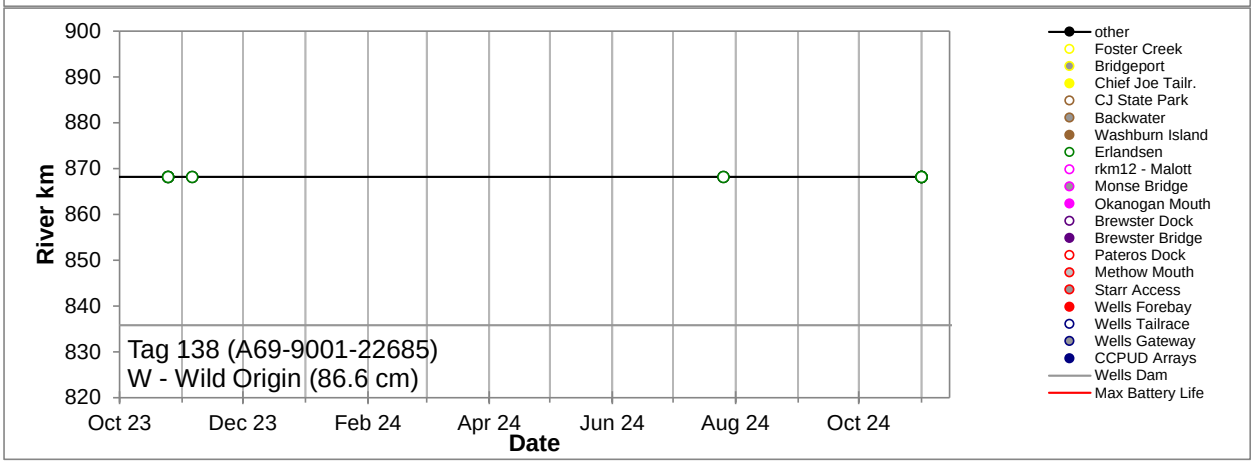
Acoustic tracking was done using an array of 16-22 receivers deployed throughout the study area from the Chief Joseph Dam tailrace to the Wells Dam tailrace. Sturgeon were detected in all of the reservoir sampling zones, although some areas had more sturgeon detections than others. The distribution of sturgeon did not vary markedly between the summer and fall sampling sessions.

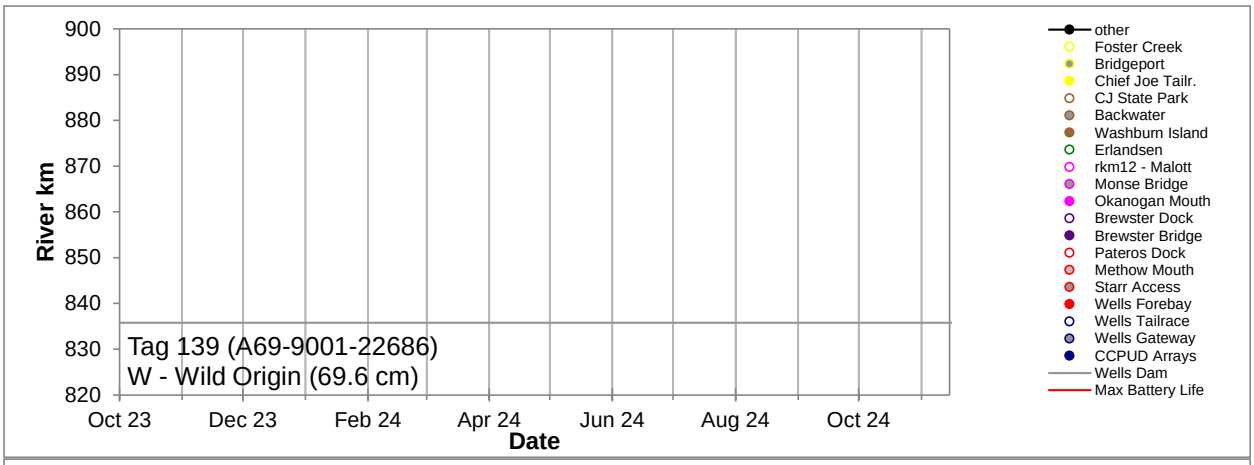
Acoustic tracking data to date shows that most wild and larger White Sturgeon in the Wells Project move a great deal throughout the reservoir. The Okanogan River seems to be an area that is often used by acoustic tagged sturgeon, particularly when water temperatures are higher than in the mainstem Columbia River in the spring (e.g. April/May). When examining adult sized fish, it appears that they spend significant time in the upper portions of the reservoir closer to the Chief Joseph Dam tailrace from mid-June to late summer and many use the entire Wells Reservoir in what appear to be seasonal movement patterns (Figure 1).

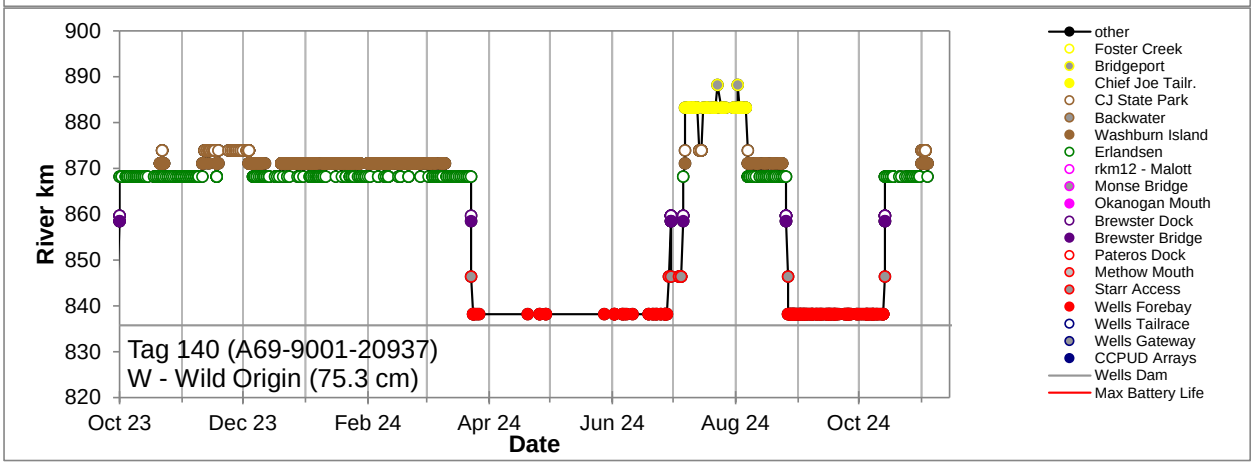
Detection history plots for smaller-sized wild-origin fish, tagged *in situ*.

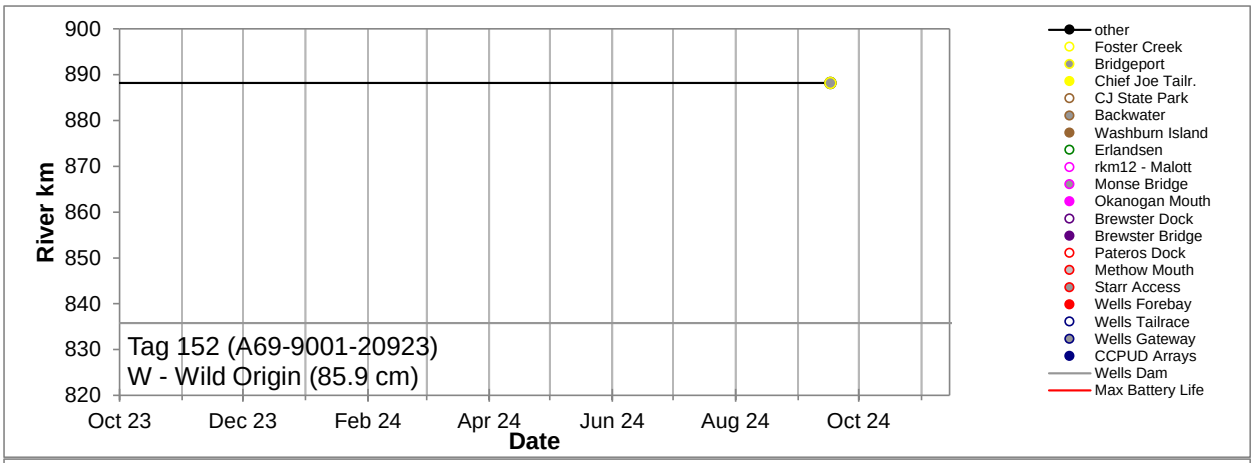


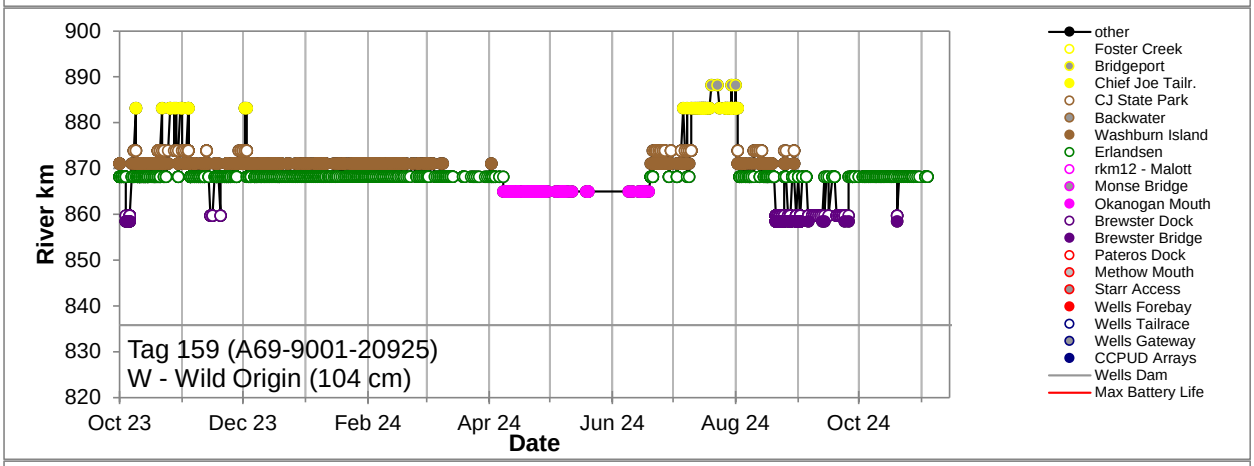

900
890
880
870
860
850
840
830
820
River km
Tag 123 (A69-9001-22684)
W - Wild Origin (73 cm)
Oct 23
Dec 23
Feb 24
Apr 24
Jun 24
Aug 24
Oct 24
Date
other
Foster Creek
Bridgeport
Chief Joe Tailr.
CJ State Park
Backwater
Washburn Island
Erlandsen
rkm12 - Malott
Monse Bridge
Okanogan Mouth
Brewster Dock
Brewster Bridge
Pateros Dock
Methow Mouth
Starr Access
Wells Forebay
Wells Tailrace
Wells Gateway
CCPUD Arrays
Wells Dam
Max Battery Life

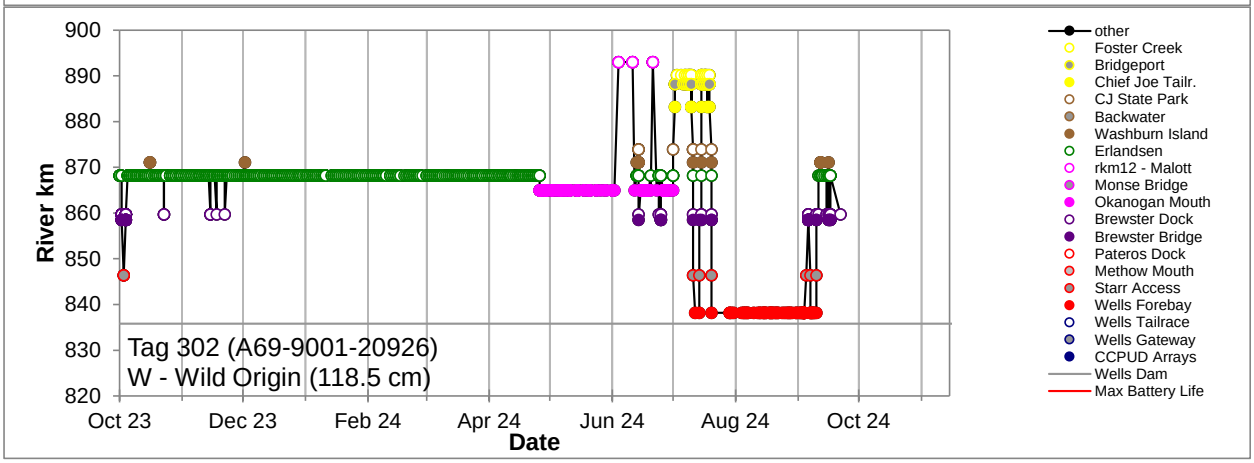

900
890
880
870
860
850
840
830
820
River km
Tag 138 (A69-9001-22685)
W - Wild Origin (86.6 cm)
Oct 23
Dec 23
Feb 24
Apr 24
Jun 24
Aug 24
Oct 24
Date
other
Foster Creek
Bridgeport
Chief Joe Tailr.
CJ State Park
Backwater
Washburn Island
Erlandsen
rkm12 - Malott
Monse Bridge
Okanogan Mouth
Brewster Dock
Brewster Bridge
Pateros Dock
Methow Mouth
Starr Access
Wells Forebay
Wells Tailrace
Wells Gateway
CCPUD Arrays
Wells Dam
Max Battery Life

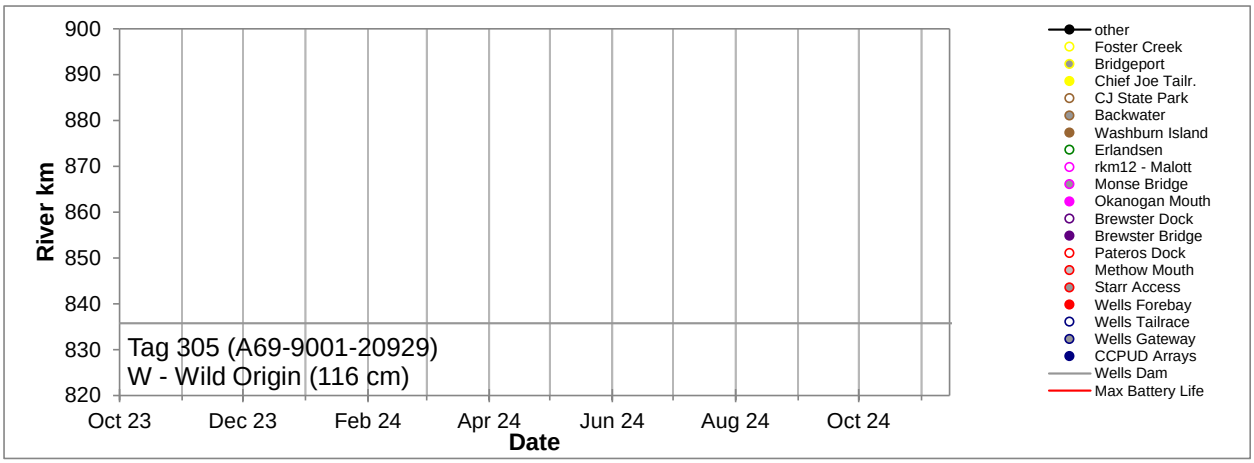

River km
900
890
880
870
860
850
840
830
820
Oct 23
Dec 23
Feb 24
Apr 24
Jun 24
Aug 24
Oct 24
Date
Tag 139 (A69-9001-22686)
W - Wild Origin (69.6 cm)
other
Foster Creek
Bridgeport
Chief Joe Tailr.
CJ State Park
Backwater
Washburn Island
Erlandsen
rkm12 - Malott
Monse Bridge
Okanogan Mouth
Brewster Dock
Brewster Bridge
Pateros Dock
Methow Mouth
Starr Access
Wells Forebay
Wells Tailrace
Wells Gateway
CCPUD Arrays
Wells Dam
Max Battery Life


River km
900
890
880
870
860
850
840
830
820
Oct 23
Dec 23
Feb 24
Apr 24
Jun 24
Aug 24
Oct 24
Date
Tag 140 (A69-9001-20937)
W - Wild Origin (75.3 cm)
other
Foster Creek
Bridgeport
Chief Joe Tailr.
CJ State Park
Backwater
Washburn Island
Erlandsen
rkm12 - Malott
Monse Bridge
Okanogan Mouth
Brewster Dock
Brewster Bridge
Pateros Dock
Methow Mouth
Starr Access
Wells Forebay
Wells Tailrace
Wells Gateway
CCPUD Arrays
Wells Dam
Max Battery Life

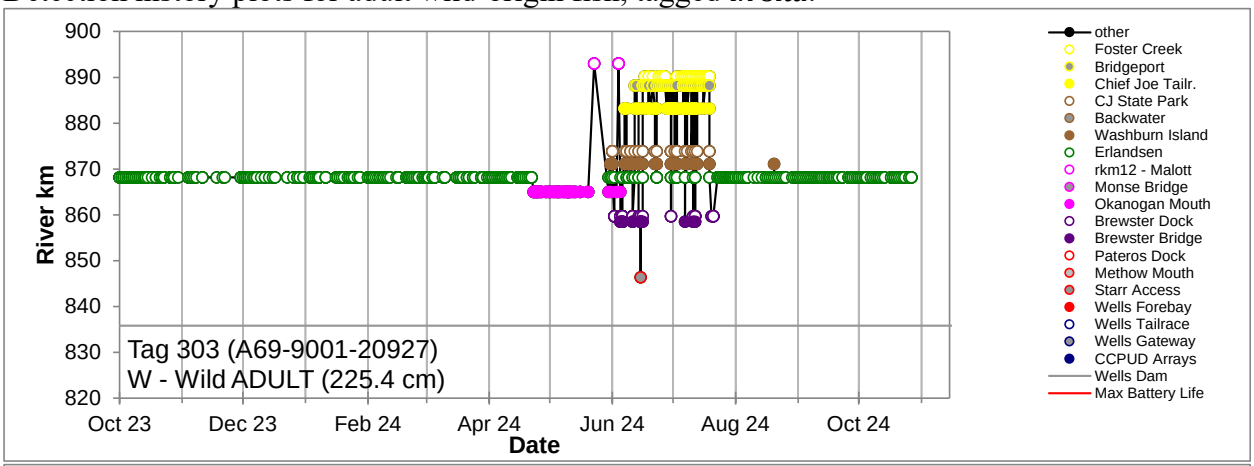

River km
900
890
880
870
860
850
840
830
820
Oct 23
Dec 23
Feb 24
Apr 24
Jun 24
Aug 24
Oct 24
Date
Tag 152 (A69-9001-20923)
W - Wild Origin (85.9 cm)
other
Foster Creek
Bridgeport
Chief Joe Tailr.
CJ State Park
Backwater
Washburn Island
Erlandsen
rkm12 - Malott
Monse Bridge
Okanogan Mouth
Brewster Dock
Brewster Bridge
Pateros Dock
Methow Mouth
Starr Access
Wells Forebay
Wells Tailrace
Wells Gateway
CCPUD Arrays
Wells Dam
Max Battery Life

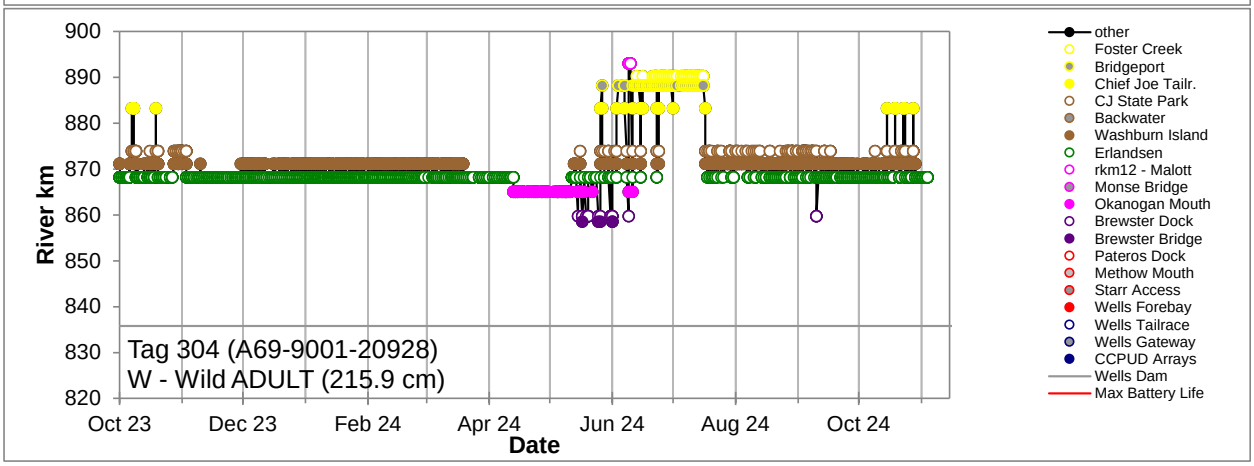

River km
900
890
880
870
860
850
840
830
820
Oct 23
Dec 23
Feb 24
Apr 24
Jun 24
Aug 24
Oct 24
Date
Tag 159 (A69-9001-20925)
W - Wild Origin (104 cm)
other
Foster Creek
Bridgeport
Chief Joe Tailr.
CJ State Park
Backwater
Washburn Island
Erlandsen
rkm12 - Malott
Monse Bridge
Okanogan Mouth
Brewster Dock
Brewster Bridge
Pateros Dock
Methow Mouth
Starr Access
Wells Forebay
Wells Tailrace
Wells Gateway
CCPUD Arrays
Wells Dam
Max Battery Life

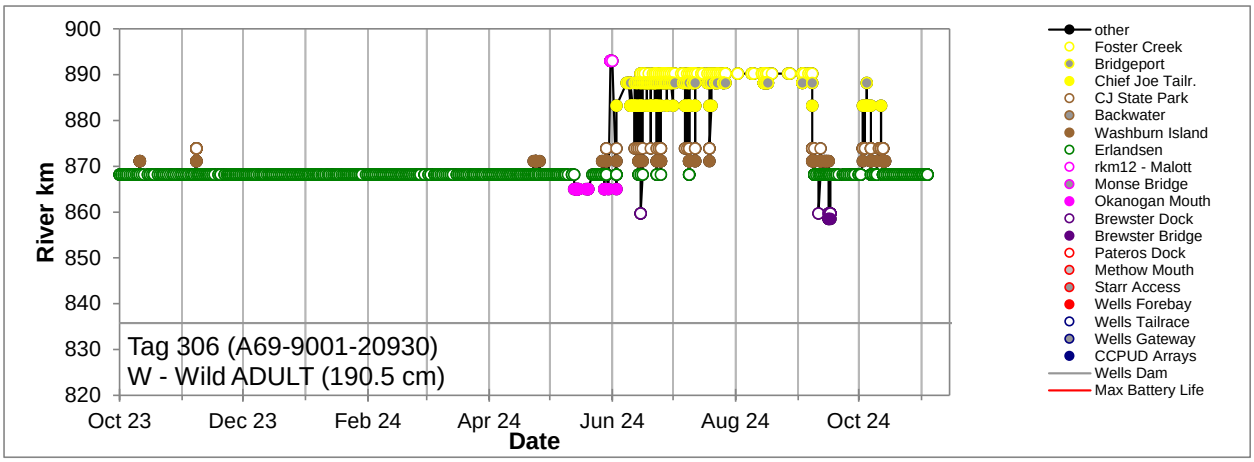

River km
900
890
880
870
860
850
840
830
820
Oct 23
Dec 23
Feb 24
Apr 24
Jun 24
Aug 24
Oct 24
Date
Tag 302 (A69-9001-20926)
W - Wild Origin (118.5 cm)
other
Foster Creek
Bridgeport
Chief Joe Tailr.
CJ State Park
Backwater
Washburn Island
Erlandsen
rkm12 - Malott
Monse Bridge
Okanogan Mouth
Brewster Dock
Brewster Bridge
Pateros Dock
Methow Mouth
Starr Access
Wells Forebay
Wells Tailrace
Wells Gateway
CCPUD Arrays
Wells Dam
Max Battery Life

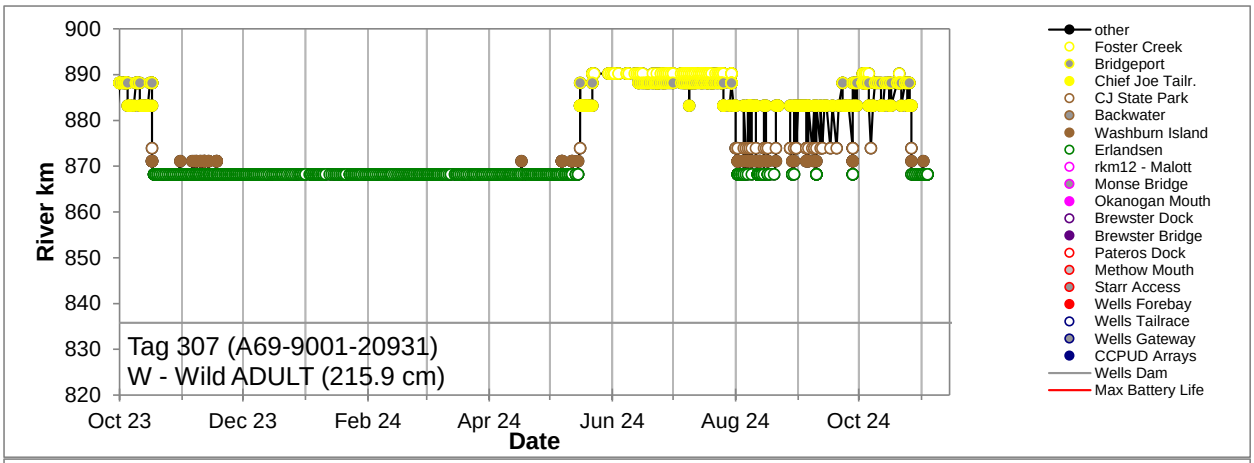


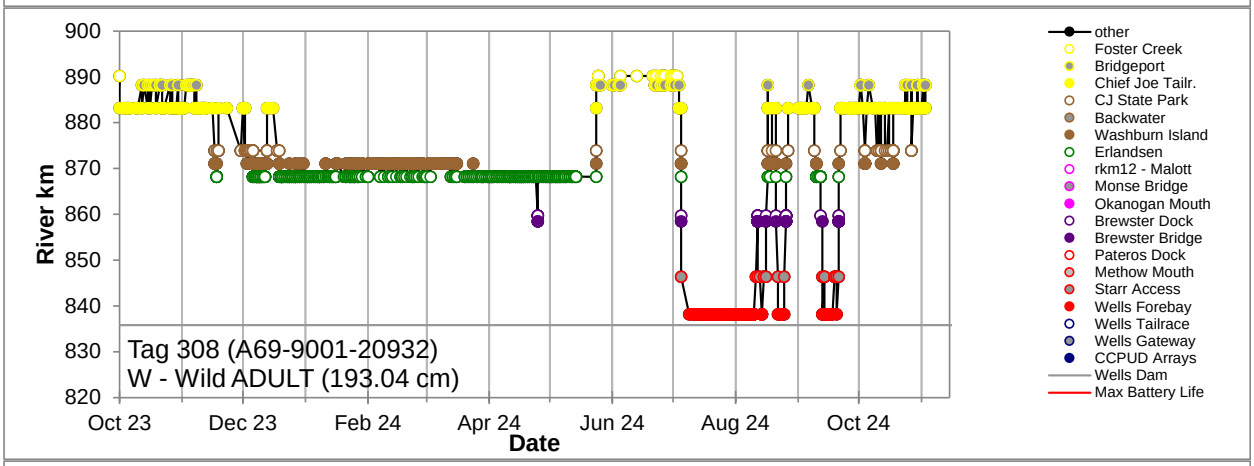
Detection history plots for adult wild-origin fish, tagged *in situ*.

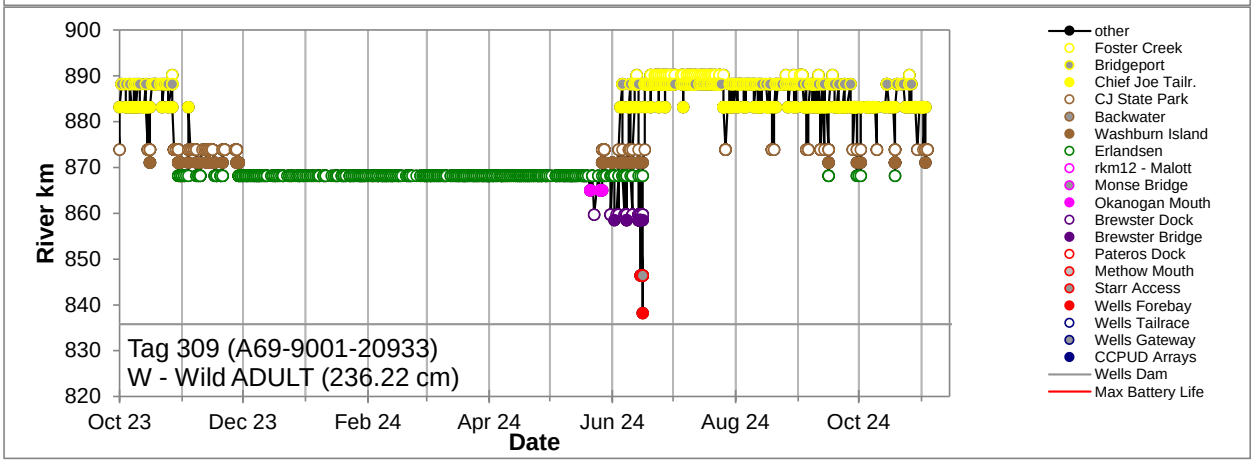


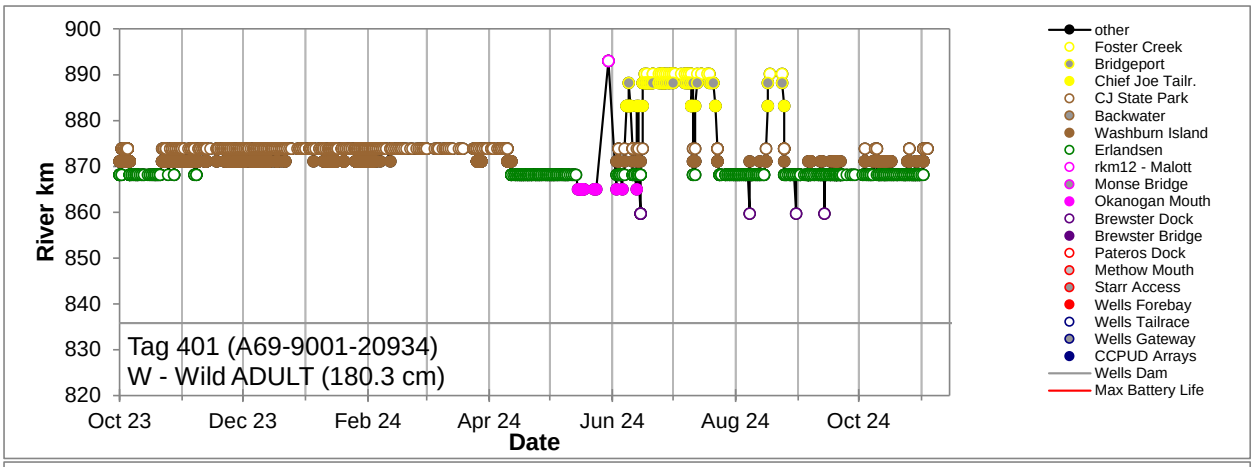


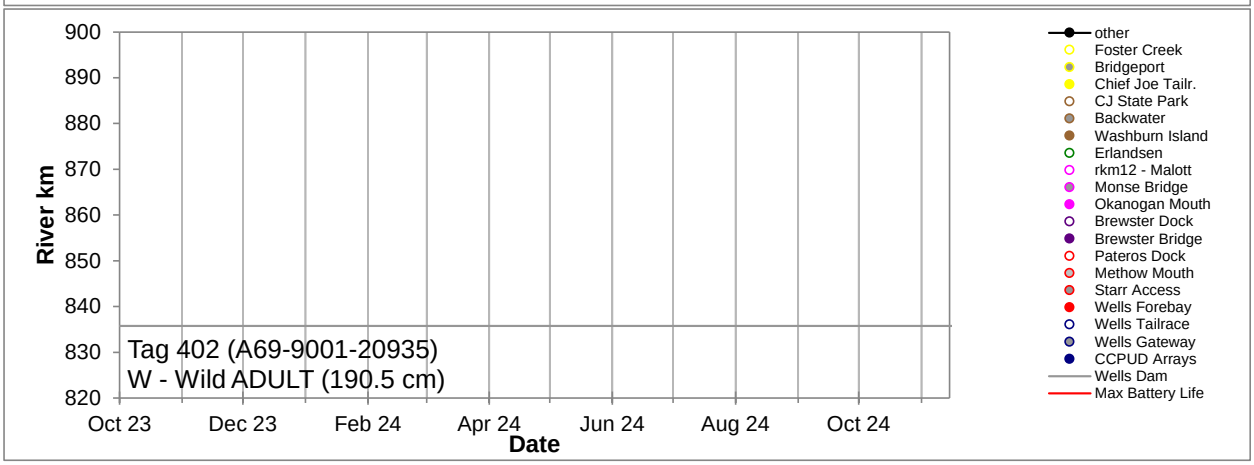

900
890
880
870
860
850
840
830
820
River km
Tag 306 (A69-9001-20930)
W - Wild ADULT (190.5 cm)
Oct 23
Dec 23
Feb 24
Apr 24
Jun 24
Aug 24
Oct 24
Date
other
Foster Creek
Bridgeport
Chief Joe Tailr.
CJ State Park
Backwater
Washburn Island
Erlandsen
rkm12 - Malott
Monse Bridge
Okanogan Mouth
Brewster Dock
Brewster Bridge
Pateros Dock
Methow Mouth
Starr Access
Wells Forebay
Wells Tailrace
Wells Gateway
CCPUD Arrays
Wells Dam
Max Battery Life


River km
900
890
880
870
860
850
840
830
820
Oct 23
Dec 23
Feb 24
Apr 24
Jun 24
Aug 24
Oct 24
Date
Tag 307 (A69-9001-20931)
W - Wild ADULT (215.9 cm)
other
Foster Creek
Bridgeport
Chief Joe Tailr.
CJ State Park
Backwater
Washburn Island
Erlandsen
rkm12 - Malott
Monse Bridge
Okanogan Mouth
Brewster Dock
Brewster Bridge
Pateros Dock
Methow Mouth
Starr Access
Wells Forebay
Wells Tailrace
Wells Gateway
CCPUD Arrays
Wells Dam
Max Battery Life

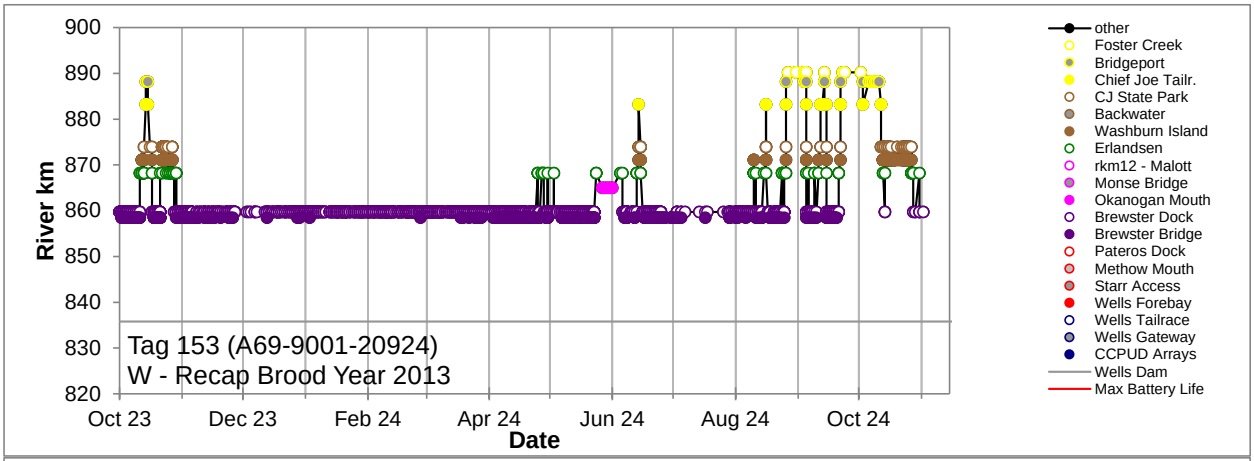

River km
900
890
880
870
860
850
840
830
820
Oct 23
Dec 23
Feb 24
Apr 24
Jun 24
Aug 24
Oct 24
Date
Tag 308 (A69-9001-20932)
W - Wild ADULT (193.04 cm)
other
Foster Creek
Bridgeport
Chief Joe Tailr.
CJ State Park
Backwater
Washburn Island
Erlandsen
rkm12 - Malott
Monse Bridge
Okanogan Mouth
Brewster Dock
Brewster Bridge
Pateros Dock
Methow Mouth
Starr Access
Wells Forebay
Wells Tailrace
Wells Gateway
CCPUD Arrays
Wells Dam
Max Battery Life

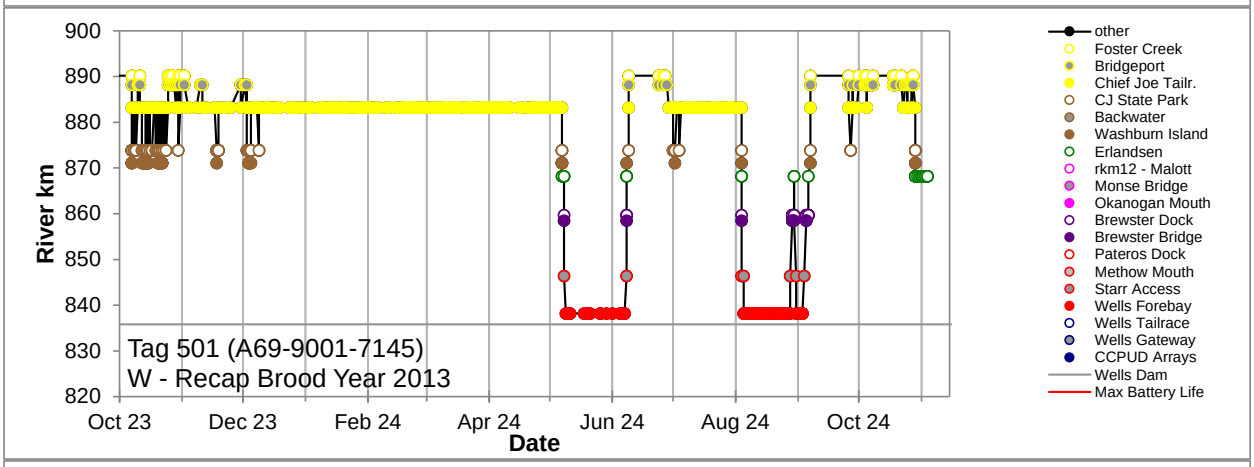

River km
900
890
880
870
860
850
840
830
820
Oct 23
Dec 23
Feb 24
Apr 24
Jun 24
Aug 24
Oct 24
Date
Tag 309 (A69-9001-20933)
W - Wild ADULT (236.22 cm)
other
Foster Creek
Bridgeport
Chief Joe Tailr.
CJ State Park
Backwater
Washburn Island
Erlandsen
rkm12 - Malott
Monse Bridge
Okanogan Mouth
Brewster Dock
Brewster Bridge
Pateros Dock
Methow Mouth
Starr Access
Wells Forebay
Wells Tailrace
Wells Gateway
CCPUD Arrays
Wells Dam
Max Battery Life

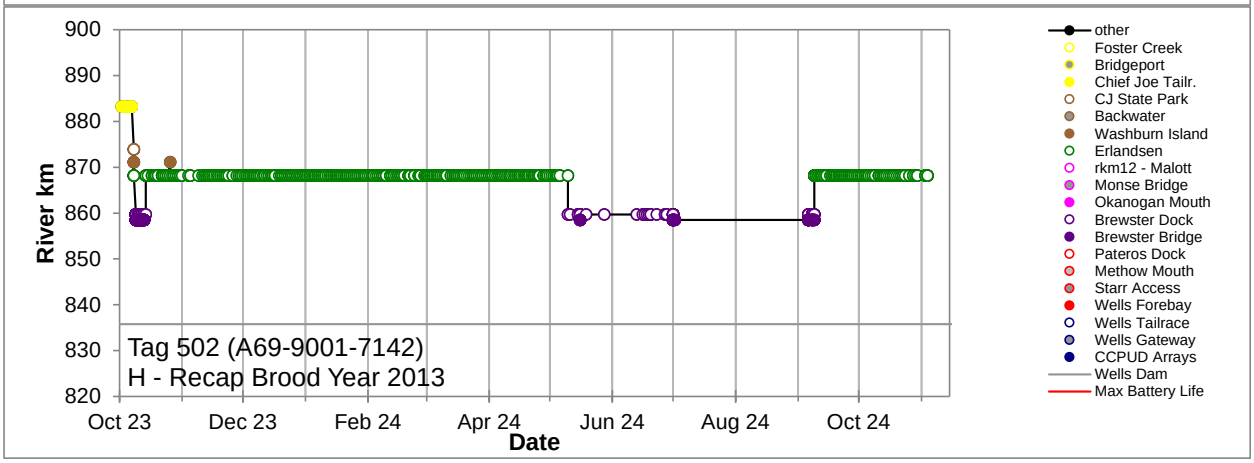

900
890
880
870
860
850
840
830
820
River km
Tag 401 (A69-9001-20934)
W - Wild ADULT (180.3 cm)
Oct 23
Dec 23
Feb 24
Apr 24
Jun 24
Aug 24
Oct 24
Date
other
Foster Creek
Bridgeport
Chief Joe Tailr.
CJ State Park
Backwater
Washburn Island
Erlandsen
rkm12 - Malott
Monse Bridge
Okanogan Mouth
Brewster Dock
Brewster Bridge
Pateros Dock
Methow Mouth
Starr Access
Wells Forebay
Wells Tailrace
Wells Gateway
CCPUD Arrays
Wells Dam
Max Battery Life

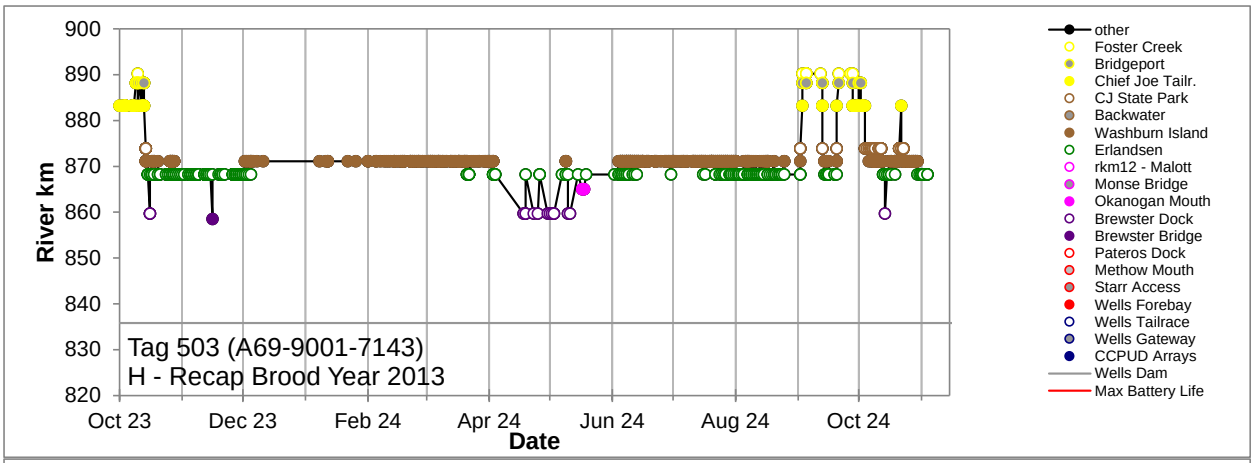

900
890
880
870
860
850
840
830
820
River km
Tag 402 (A69-9001-20935)
W - Wild ADULT (190.5 cm)
Oct 23
Dec 23
Feb 24
Apr 24
Jun 24
Aug 24
Oct 24
Date
other
Foster Creek
Bridgeport
Chief Joe Tailr.
CJ State Park
Backwater
Washburn Island
Erlandsen
rkm12 - Malott
Monse Bridge
Okanogan Mouth
Brewster Dock
Brewster Bridge
Pateros Dock
Methow Mouth
Starr Access
Wells Forebay
Wells Tailrace
Wells Gateway
CCPUD Arrays
Wells Dam
Max Battery Life

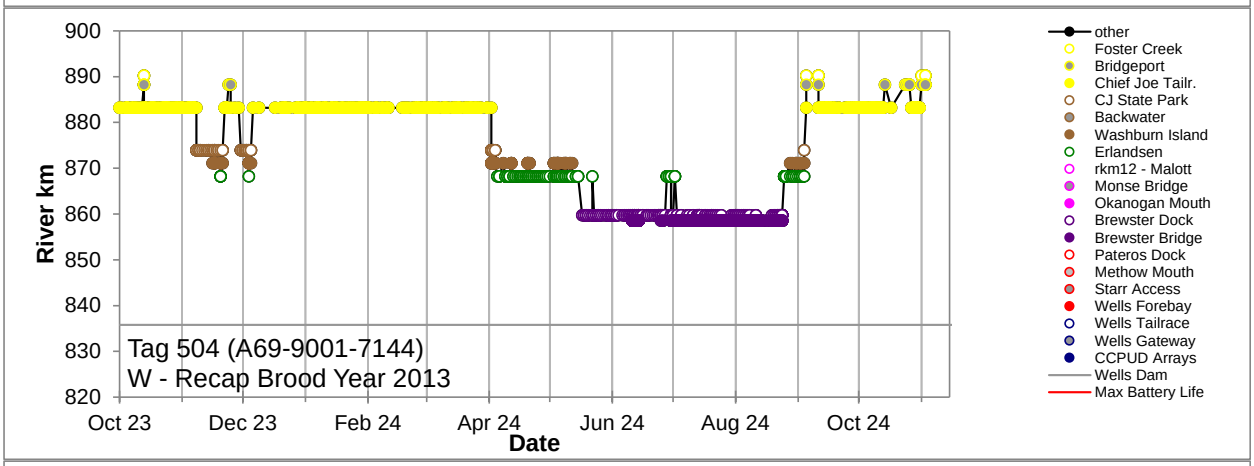
Detection history plots for hatchery-origin fish, tagged *in situ*.

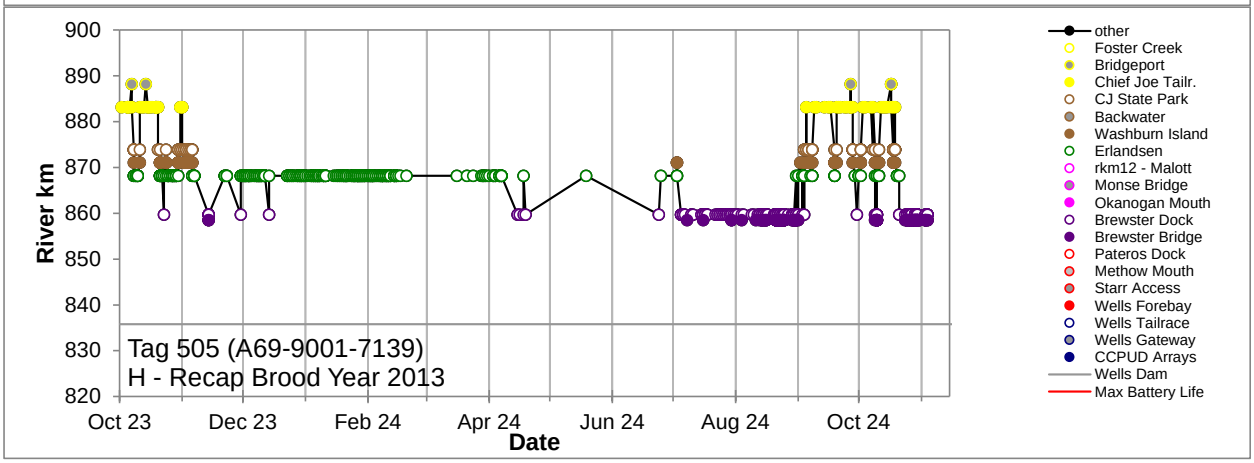


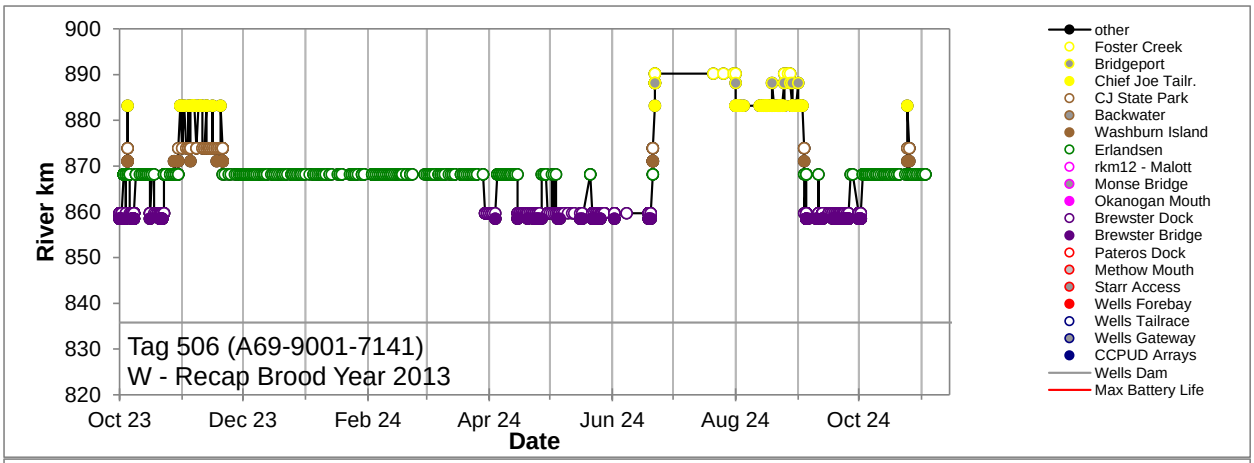


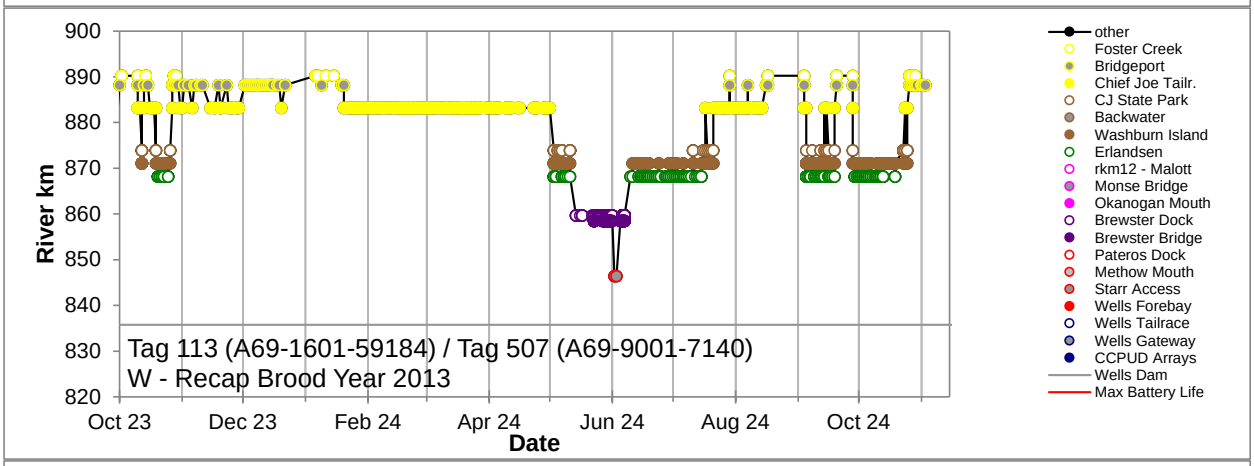


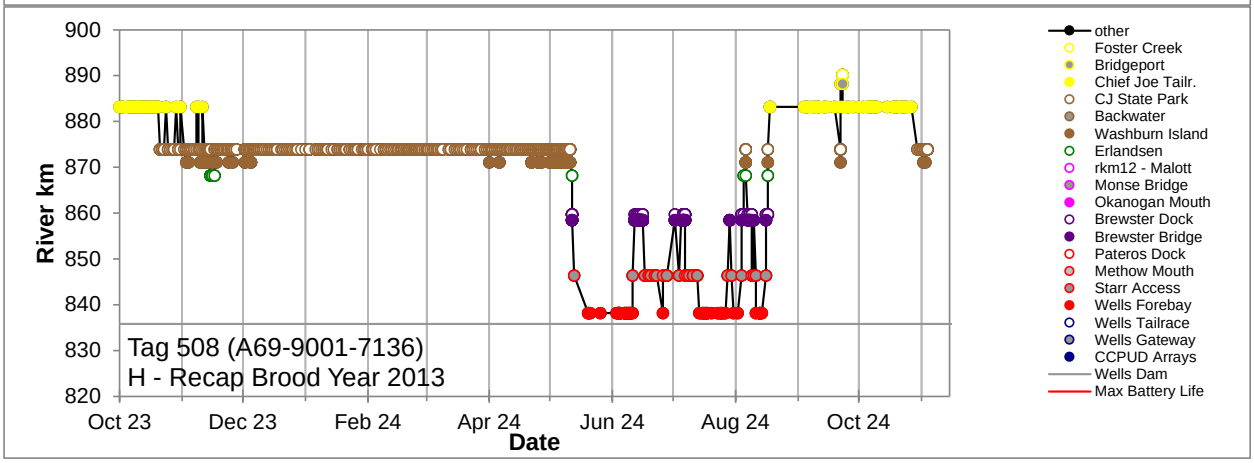

River km
900
890
880
870
860
850
840
830
820
Oct 23
Dec 23
Feb 24
Apr 24
Jun 24
Aug 24
Oct 24
Date
Tag 503 (A69-9001-7143)
H - Recap Brood Year 2013
other
Foster Creek
Bridgeport
Chief Joe Tailr.
CJ State Park
Backwater
Washburn Island
Erlandsen
rkm12 - Malott
Monse Bridge
Okanogan Mouth
Brewster Dock
Brewster Bridge
Pateros Dock
Methow Mouth
Starr Access
Wells Forebay
Wells Tailrace
Wells Gateway
CCPUD Arrays
Wells Dam
Max Battery Life


River km
900
890
880
870
860
850
840
830
820
Oct 23
Dec 23
Feb 24
Apr 24
Jun 24
Aug 24
Oct 24
Date
Tag 504 (A69-9001-7144)
W - Recap Brood Year 2013
other
Foster Creek
Bridgeport
Chief Joe Tailr.
CJ State Park
Backwater
Washburn Island
Erlandsen
rkm12 - Malott
Monse Bridge
Okanogan Mouth
Brewster Dock
Brewster Bridge
Pateros Dock
Methow Mouth
Starr Access
Wells Forebay
Wells Tailrace
Wells Gateway
CCPUD Arrays
Wells Dam
Max Battery Life


River km
900
890
880
870
860
850
840
830
820
Oct 23
Dec 23
Feb 24
Apr 24
Jun 24
Aug 24
Oct 24
Date
Tag 505 (A69-9001-7139)
H - Recap Brood Year 2013
other
Foster Creek
Bridgeport
Chief Joe Tailr.
CJ State Park
Backwater
Washburn Island
Erlandsen
rkm12 - Malott
Monse Bridge
Okanogan Mouth
Brewster Dock
Brewster Bridge
Pateros Dock
Methow Mouth
Starr Access
Wells Forebay
Wells Tailrace
Wells Gateway
CCPUD Arrays
Wells Dam
Max Battery Life


River km
900
890
880
870
860
850
840
830
820
Oct 23
Dec 23
Feb 24
Apr 24
Jun 24
Aug 24
Oct 24
Date
Tag 506 (A69-9001-7141)
W - Recap Brood Year 2013
other
Foster Creek
Bridgeport
Chief Joe Tailr.
CJ State Park
Backwater
Washburn Island
Erlandsen
rkm12 - Malott
Monse Bridge
Okanogan Mouth
Brewster Dock
Brewster Bridge
Pateros Dock
Methow Mouth
Starr Access
Wells Forebay
Wells Tailrace
Wells Gateway
CCPUD Arrays
Wells Dam
Max Battery Life


River km
900
890
880
870
860
850
840
830
820
Oct 23
Dec 23
Feb 24
Apr 24
Jun 24
Aug 24
Oct 24
Date
Tag 113 (A69-1601-59184) / Tag 507 (A69-9001-7140)
W - Recap Brood Year 2013
other
Foster Creek
Bridgeport
Chief Joe Tailr.
CJ State Park
Backwater
Washburn Island
Erlandsen
rkm12 - Malott
Monse Bridge
Okanogan Mouth
Brewster Dock
Brewster Bridge
Pateros Dock
Methow Mouth
Starr Access
Wells Forebay
Wells Tailrace
Wells Gateway
CCPUD Arrays
Wells Dam
Max Battery Life


River km
900
890
880
870
860
850
840
830
820
Oct 23
Dec 23
Feb 24
Apr 24
Jun 24
Aug 24
Oct 24
Date
Tag 508 (A69-9001-7136)
H - Recap Brood Year 2013
other
Foster Creek
Bridgeport
Chief Joe Tailr.
CJ State Park
Backwater
Washburn Island
Erlandsen
rkm12 - Malott
Monse Bridge
Okanogan Mouth
Brewster Dock
Brewster Bridge
Pateros Dock
Methow Mouth
Starr Access
Wells Forebay
Wells Tailrace
Wells Gateway
CCPUD Arrays
Wells Dam
Max Battery Life

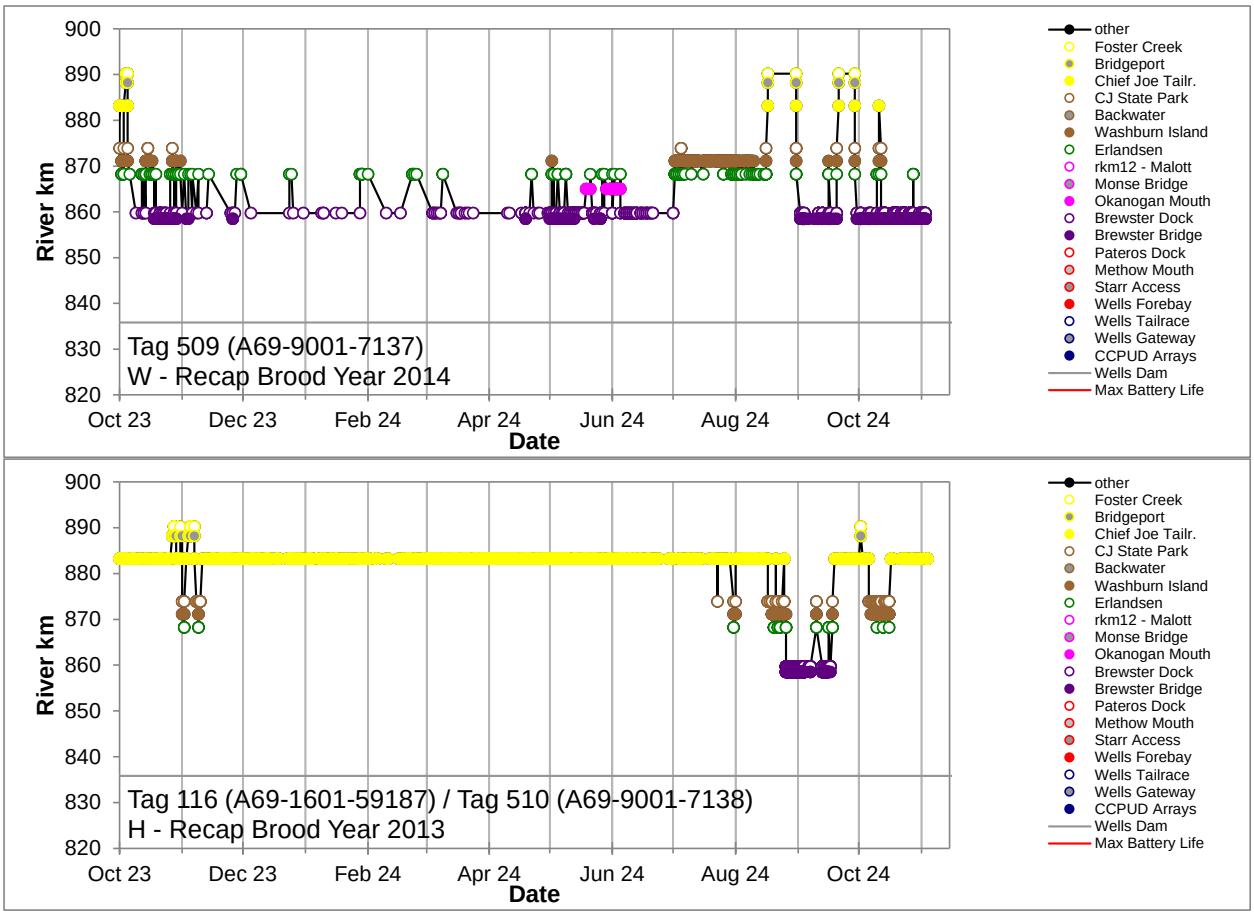


Figure 1. Movement histories of acoustic tagged adult and juvenile White Sturgeon from October 2023 to October 2024. Movement histories suggest that both adults and juveniles the entire length of the reservoir and often make seasonal movements into the Okanogan and Chief Joseph Tailrace.

4.2.3 Determining Natural Reproduction Potential (Objective 3)

In years where environmental conditions are appropriate, Douglas PUD shall track sexually mature adult sturgeon that were captured and implanted with active tags under Section 4.2.1 for the purpose of identifying potential spawning locations and determining natural reproduction potential. Appropriate environmental conditions may be determined by examining the following factors: water quality and quantity (i.e., flow, temperature, and turbidity), the presence of reproductively viable adults during index monitoring activities, and the status of maturity for supplemented fish. In years in which sexually mature adult sturgeon are tagged under Section 4.2.1, Douglas PUD may also utilize egg collection mats in combination with tracking in areas of the Wells Reservoir for the purpose of identifying potential spawning locations and activity. Five surveys of natural reproduction using adult tracking and/or egg mat placement shall occur over the term of the new license. Several of these surveys are intended to be implemented during

the latter part of the license in order to examine the natural reproductive potential of supplemented fish recruiting to sexual maturity. These activities will support the aquatic life designated use for spawning under WAC 173-201A in the Washington state water quality standards.

4.2.3.1 Progress Towards Objective 3 in 2024 – Determining Natural Reproduction Potential

On January 8, 2014, the Aquatic SWG approved the Phase I White Sturgeon Management Plan Monitoring and Evaluation Study Plan (See Anchor QEA, 2015). (Note: Ecology and USFWS approved the study plan via email on December 20, 2013.) Consistent with the WSMP, monitoring and evaluation with specific emphasis on determining White Sturgeon natural reproduction potential within the Wells Project is scheduled to occur during the first ten years and in years when environmental conditions are appropriate (as determined by the Aquatic SWG).

The presence of wild fish within the Wells Project that are much younger than the hydro system and have been aged to 2011 and/or 2012 recruit suggest that some successful spawning and recruitment is occurring in the Wells Reservoir, or these juvenile fish were born upstream of the Wells Reservoir and came down past Chief Joseph Dam. Data from two years of acoustic tracking suggested that adult fish occupy the Okanogan area in the early part of the summer and shift to the upper portion of the reservoir from June through September. Side-scan sonar work (Robichaud and Gingerich 2018), corroborated the presence of large sturgeon in the lower Okanogan area in the early summer. Tracking data from fish tagged between 2017 and 2018 shows that larger fish occupy the upper most portions of the reservoir during suspected (based on water temperatures and observations in other Columbia River reservoirs) spawning periods in almost every year since tagging.

In 2022, the Aquatic SWG developed, and approved the Wells Reservoir White Sturgeon Reproduction Assessment Study Plan dated April 13, 2022. The study, which utilized egg mat substrate monitoring and larval drift net monitoring, was conducted in July and August. No White Sturgeon eggs or larvae were detected during monitoring. However, extreme high river flows in July 2022 hindered District staff's ability to monitor for eggs and larvae in desired areas. A more detailed description of the monitoring efforts are available in the 2022 White Sturgeon Reproduction Assessment Study Report.

No Sturgeon reproduction assessment activities took place in 2024.

4.3 Phase II Supplementation and Monitoring Program (Objectives 2 and 4)

The information collected through activities described in Section 4.1-4.3 will provide insight into the population dynamics, habitat availability, and limiting factors that affect the natural population structure of White Sturgeon within the Wells Reservoir. This information will inform supplementation, monitoring and evaluation activities during implementation of Phase II

supplementation and monitoring activities in the WSMP for the duration of the new license term after year 10.

4.3.1 Long-Term Juvenile White Sturgeon Stocking

The number and frequency of yearlings released in Phase II of the White Sturgeon supplementation program will range from 0 to 5,000 fish. Stocking rates shall be based on the results of the Phase I Monitoring and Evaluation Program (Section 4.2) and determination of carrying capacity (Section 4.3) and shall be consistent with the goal and objectives of the WSMP. The Phase II stocking rates can also be adjusted as determined by the Aquatic SWG (also see Table 4.7-1, footnotes 2 and 3).

4.3.1.1 Progress Towards Objectives 2 and 4 - Phase II Supplementation and Monitoring Program in 2024

In 2022, the Aquatic SWG discussed stocking rates for Phase II of the supplementation program beginning in 2023. The success of the stocking actions conducted between 2018-2022 and the M&E results helped determine stocking targets in Phase II. The Aquatic SWG determined that a stocking rate of 325 (+/-10%) at a size ≥ 350 grams annually from 2023 to 2026 was appropriate. In addition, all fish will be screened for SAP prior to release.

In 2024, Douglas PUD met the stocking target for White Sturgeon and analyzed them for SAP prior to the release into the Wells Reservoir. This stocking rate will be reevaluated in 2025 following the collection of additional monitoring data.

4.3.2 Supplementation Program Review

Douglas PUD shall compile information on other White Sturgeon supplementation programs in the Columbia River Basin in order to assess whether the White Sturgeon supplementation program being implemented at the Project is: (i) consistent and comparable with the technology and methods being implemented by other supplementation programs in the region; (ii) reasonable in cost and effective to implement at the Project; and (iii) consistent with the supplementation program goals and objectives. The supplementation program review will be conducted annually in coordination with the development of the annual report (Section 4.6).

4.3.2.1 Progress Towards Objectives 2 and 4 - Phase II Supplementation and Monitoring Program

Phase II goals will be discussed in the Aquatic SWG in 2025.

4.3.3 Long-term Index Monitoring Program

Beginning in Year Twelve of the new license and every 3 to 5 years thereafter for the duration of the new license, Douglas PUD shall continue to conduct a Phase II Index Monitoring Study for juvenile and adult sturgeon in the Wells Reservoir. This program will be used to monitor age-class structure, survival rates, abundance, condition factor, growth rates, identify distribution and

habitat selection of juvenile sturgeon, and may continue to support broodstock collection activities. The indexing methods will include using gillnets or other appropriate recapture methods for juveniles and set lines for adults and will not consist of actively tracking fish. Frequency (every 3, 4, or 5 years) of implementation of long-term index monitoring activities (after year 12) will be determined by the Aquatic SWG.

4.3.3.1 Progress Towards Objectives 2 and 4 - Phase II Supplementation and Monitoring Program

In 2024, Douglas PUD completed a late summer/fall stock assessment study over a 3-5 week period. Methods used to capture White Sturgeon were similar methods that were employed in the most recent M&E effort. Result of this monitoring effort will be available in 2025.

The next indexing and monitoring session is scheduled for 2026.

4.4 Evaluation and Implementation of Adult Passage Measures (Objective 5)

In Year Eleven of the new license and every 10 years thereafter for the duration of the new license unless otherwise determined by the Aquatic SWG, the Aquatic SWG shall evaluate the biological merit to providing upstream passage for adult White Sturgeon. The assessment of biological merit shall be determined by: (i) evaluating information gathered from monitoring and evaluation activities and determining whether there is significant biological benefit and need for upstream passage; (ii) the availability of reasonable and appropriate means to provide upstream passage; and (iii) consensus from all other operators of the mid-Columbia projects to implement adult upstream passage measures[3]. If all three criteria above are met, Douglas PUD, in consultation with the Aquatic SWG shall develop adult passage measures that are consistent with measures being implemented by other mid-Columbia project operators.

4.4.1 Progress Towards Objective 5 - Phase II Evaluation and Implementation of Adult Passage Measures

During 2023, the Aquatic SWG discussed evaluating the feasibility and biological merit of adult passage measures at Wells Dam. Based on the outcome of these discussions, the Aquatic SWG agreed that a multi-step process was needed to help inform the biological merits of Adult White Sturgeon Passage at Wells Dam. This process includes compiling existing passage data, documenting passage measures at other dams, conducting a literature review of existing information on dam passage, and collecting tissue samples from White Sturgeon captured during indexing activities for future analysis. This process is defined in detail in the SOA "Statement of Agreement Regarding Evaluation and Implementation of White Sturgeon Adult Passage Measures" which was approved by the Aquatic SWG in November 8, 2023.

[3] The intent is to provide connectivity to the Hanford Reach White Sturgeon population.

The "Adult White Surgeon Upstream Passage Evaluation", which addressed the objectives outlined in the SOA, was developed and distributed to the Aquatic SWG in 2024. The final document was approved in January 2025. In addition, over 300 tissue samples were collected from White Sturgeon captured during indexing monitoring in 2024.

4.5 Educational Opportunities Coinciding with WSMP Activities (Objective 6)

Douglas PUD, in consultation with the Aquatic SWG, shall identify appropriate WSMP activities as opportunities for education to local public entities such as schools, cities, fishing and recreation groups, and other interested local groups. WSMP activities that may be appropriate for public participation are hatchery tours, release of hatchery juveniles, and tagging of juveniles prior to release.

4.5.1 Progress Towards Objective 6 in 2024 – Educational Opportunities Coinciding with WSMP Activities

In 2024, high school students from Bridgeport High School participated in the release of White Sturgeon into the Wells Reservoir. These activities are expected to continue in 2025.

4.6 Reporting

Douglas PUD will provide a draft annual report to the Aquatic SWG summarizing the previous year's activities undertaken in accordance with the WSMP. The report will document all White Sturgeon activities conducted within the Project. Furthermore, any decisions, statements of agreement, evaluations, or changes made pursuant to this WSMP will be included in the annual report. If significant activity was not conducted in a given year, Douglas PUD will prepare a memorandum providing an explanation of the circumstances in lieu of the annual report.

4.6.1 Progress Towards Meeting Annual Reporting Requirements

Consistent with the reporting requirements in Article 406 of the FERC License for the Wells Project, the 401 Certification, and the Aquatic Settlement Agreement, the WSMP Annual Report will be updated annually in consultation with the Aquatic SWG. Each year the WSMP Annual Report (this report) will be provided to the Aquatic SWG for review and then filed with the FERC on or prior to May 31st. The report will include a summary of the annual progress made towards the implantation of the WSMP and focus on the previous year's developments.

4.7 Implementation Schedule

Table 6 outlines the estimated long-term schedule of the activities described in Sections 4.1-4.4 of the WSMP.

Table 6 Project White Sturgeon Implementation Schedule

New License Year	Broodstock Plan and Collection[4]	Release Fish into Wells Reservoir[5]	Index Monitoring[6]	Tracking Marked Fish[7]	Natural Production Assessment[8]	Adult Passage Evaluation
PHASE I						
1 (2013)	X					
2 (2014)	X	X				
3 (2015)	X	X	X	X		
4 (2016)	X	X	X	X		
5 (2017)	X	X	X	X		
6 (2018)	X	X	X	X	X*	
7 (2019)	X	X	X	X	X*	
8 (2020)	X	X		X		
9 (2021)	X	X	X	X		
10 (2022)	X	X	X	X	X	
PHASE II[9]						
11 (2023)	X	X		X		X[10]
12 (2024)	X	X	X	X		X
13 (2025)	X	X		X		X
14 (2026)	X	X	X	X		
14-50 (2026+)			TBD		TBD	Every ten years after Year 11

[4]Douglas PUD broodstock plan shall be completed within one year following this issuance of the new license. Broodstock collection activities will occur at a minimum in years 1-4 during the new license term. Additional years, during Phase I, will be determined by the Aquatic SWG. In Year 11 (Phase II), level and frequency of activity will be determined by the Aquatic SWG and will be based upon the level of long-term supplementation identified from monitoring results.

[5]No more than a total of 35,000 fish will be stocked in Phase I (Years 1-10). The Phase II supplementation program will be determined by the Aquatic SWG and consistent with the goal of the WSMP.

[6] Results of the index monitoring activities will be used to determine the scope of future supplementation activities. Index monitoring activities from Year 12 through the remainder of the new license term will occur at a frequency of 3-5 years as determined by the Aquatic SWG.

[7] Active-tagged juvenile and adult sturgeon will be tracked to assess emigration, habitat use, and potential spawning locations. This activity will occur in Years 3, 4, and 5. Two additional years will be determined by the Aquatic SWG but will likely be consistent with years in which index monitoring activities are implemented.

[8] Tracking of reproductively viable adult sturgeon in combination with deployment of egg collection mats to identify natural production in the Wells Reservoir during five separate years over the term of the new license based on flow conditions or other data as determined by the Aquatic SWG. *Acoustic tracking only.

[9] Phase II activities will consist only of broodstock plan and collection, stocking activities, index monitoring, and potentially natural reproduction assessments for the remainder of the new license.

[10] Adult Passage Evaluations will occur in Year 11 and every 10 years thereafter for the term of the new license.

5.0 REFERENCES

Anchor QEA. 2015. 2014 Aquatic SWG Annual Report. Wells Hydroelectric Project. FERC License No. 2149. May 2015.

Beamesderfer, R.C., J.C. Elliot, and C.A. Foster. 1989. Report A. Pages 5-52. In: A.A. Nigro [editor]. Status and habitat requirements of White Sturgeon populations in the Columbia River downstream from McNary Dam. Annual Progress Report. Prepared for the U.S. Department of Energy, Bonneville Power Administration, Portland, OR.

Beamesderfer, R.C., T.A. Rien, and A.A. Nigro. 1995. Differences in the dynamics and potential production of impounded and unimpounded White Sturgeon populations in the lower Columbia River. Transactions of the American Fisheries Society 124: 857-872.

Brannon, E. and A. Setter. 1992. Movements of White Sturgeon in Roosevelt Lake. Final Report (1988-1991) to Bonneville Power Administration, Portland Or. Project No. 89-45:35 p.

Devore, J.D., B.W. James, C.A. Tracy, and D.A. Hale. 1995. Dynamics and potential production of White Sturgeon in the unimpounded lower Columbia River: Transactions of the American Fisheries Society, v. 124, Issue 6, p. 845-856.

Hildebrand, L. R. and M. Parsley. 2013. Upper Columbia White Sturgeon Recovery Plan – 2012 Revision. Prepared for the Upper Columbia White Sturgeon Recovery Initiative. 129p. + 1 app. Available at: www.uppercolumbiasturgeon.org

Jerald, T. 2007. White Sturgeon (*Acipenser transmontanus*) Population Assessment in Wells Reservoir. MSc Thesis. Central Washington University, Ellensburg, WA.

Kincaid, H.L. 1993. Breeding plan to preserve the genetic variability of the Kootenai River White Sturgeon. Report prepared for the Bonneville Power Administration Contract No. DE-A179-93B002886.

Lane, E.D. 1991. Status of White Sturgeon, *Acipenser transmontanus*, in Canada. Canadian Field-Nat. 105:161-68.

Lepla, K., J.A. Chandler, and P. Bates. 2001. Status of Snake River White Sturgeon associated with the Hells Canyon complex. Idaho Power Technical Report Appendix E.3.1-6 Chapter 1. 24 pp.

Van der Leeuw, B.K., M.J. Parsley, C.D. Wright, and E.E. Kofoot. 2006. Validation of critical assumption of the riparian habitat hypothesis for White Sturgeon: U.S. Geological Survey Scientific Investigation Report 2006-5225, 20 p.

Public Utility District No. 1 of Chelan County (Chelan PUD). 2005. Rocky Reach White Sturgeon Management Plan. Public Utility District No. 1 of Chelan County, Wenatchee, WA.

Robichaud, D. and A. Gingerich. 2018. Evaluations of White Sturgeon Supplementation and Management Plan Implementation in the Wells Reservoir, 2014-2017. Final Report. Report for Public Utility District No. 1 of Douglas County, East Wenatchee, WA.

Robichaud, D. and A. Gingerich. 2019. White Sturgeon Supplementation and Management Plan Implementation in the Wells Reservoir, 2018. Draft Report. Report for Public Utility District No. 1 of Douglas County, East Wenatchee, WA.

Skalski, J.R. and R.L. Townsend. 2005. Analysis of the Douglas County Public Utility District #1 Sturgeon Mark-Recapture Study. Columbia Basin Research. School of Aquatic and Fishery Sciences, University of Washington, Seattle, WA.

Upper Columbia White Sturgeon Recovery Initiative (UCWSRI). 2002. Upper Columbia White Sturgeon Recovery Plan. November 28, 2002. 90 pp.

U.S. Fish and Wildlife Service (USFWS). 1999. Recovery Plan for the White Sturgeon (*Acipenser transmontanus*): Kootenai River Population. U.S. Fish and Wildlife Service, Portland, Oregon. 96 pp. plus appendices.

Wydoski, R.S. and R.R. Whitney. 2003. Inland Fishes of Washington. Second Edition. American Fisheries Society. University of Washington Press.

Appendix D
2024 Bull Trout Management Plan and Incidental Take Annual Report

2024 BULL TROUT MANAGEMENT PLAN AND INCIDENTAL TAKE ANNUAL REPORT

WELLS HYDROELECTRIC PROJECT

FERC PROJECT NO. 2149

March 2025

Prepared by:
Public Utility District No. 1 of Douglas County
East Wenatchee, Washington

1.0 INTRODUCTION

The Bull Trout Management Plan (BTMP) and Incidental Take Annual Report includes information on existing Bull Trout measures required by the Wells Hydroelectric Project (Wells Project or Project) Federal Energy Regulatory Commission (FERC) operating license including the U.S. Department of Interior's Federal Power Act section 18 Fishway Prescriptions; the Clean Water Act section 401 Water Quality Certification; and Endangered Species Act (ESA) Section 7 Bull Trout consultation for the relicensing of the Wells Project. The 2012 Biological Opinion (BO) for the Wells Project (resulting from ESA consultation) requires Public Utility District No. 1 of Douglas County (Douglas PUD) to monitor incidental take during Wells Project license implementation activities and submit a Bull Trout annual take report to the Central Washington Field Office of the U.S. Fish and Wildlife Service (USFWS) on or before April 15th each year. In addition, Article 406 of the license requires Douglas PUD to submit to the FERC an annual report of management plan activities by May 31st of each year.

The BTMP is one of six resource management plans developed by Douglas PUD. The BTMP directs the implementation of measures to mitigate Wells Hydroelectric Project (Wells Project or Project) impacts, if any, on Bull Trout (*Salvelinus confluentus*) and to monitor incidental take of Bull Trout at the Wells Project. The BTMP directs the long-term management of Bull Trout in the Wells Project. Additionally, the BTMP is intended to continue implementation activities aimed at protecting Bull Trout in a manner consistent with measures specified in the original Wells Bull Trout Monitoring and Management Plan (WBTMMP) (Douglas 2004).

To ensure active stakeholder participation and support, Douglas PUD developed all of the resource management plans found in the Aquatic Settlement Agreement in close coordination with agency and tribal natural resource managers (Aquatic Settlement Work Group or Aquatic SWG). Entities invited to participate in the Aquatic SWG include the U.S. Fish and Wildlife Service (USFWS or the Service), National Marine Fisheries Service (NMFS), Bureau of Land Management (BLM), Bureau of Indian Affairs (BIA), Washington Department of Ecology (Ecology), Washington State Department of Fish and Wildlife (WDFW), the Confederated Tribes of the Colville Reservation (Colville), the Confederated Tribes and Bands of the Yakama Nation (Yakama Nation), and Douglas PUD.

In addition to the requirements found within the BTMP, the ESA Section 7 Consultation and the BO for the relicensing of the Wells Project, the Clean Water Act Section 401 Water Quality Certification, and the FERC license including the Federal Power Act Section 18 Fishway Prescription identify several additional Bull Trout related requirements associated with the continued operation of the Wells Project.

Since measures required by the BO are largely consistent with the measures found in the BTMP and because the reporting requirements for the BTMP, BO, Clean Water Act section 401 Water Quality Certification, and the FERC license are largely consistent, this 2024 Bull Trout Management Plan and Incidental Take Annual Report will be used to demonstrate compliance with all of Douglas PUD's Bull Trout obligations for the Wells Project.

2.0 GOALS AND OBJECTIVES

The goal of this report is to present summary information related to BTMP activities conducted in 2024 and after Wells Dam Operating license was issued in November 2012. The goal of the BTMP is to identify, monitor and address impacts, if any, on Bull Trout resulting from the Project in a manner consistent with the USFWS Bull Trout Recovery Plan and the terms of the Section 7 Incidental Take Statement (ITS) (See Section 4.7). The Protection, Mitigation and Enhancement measures (PMEs) presented within the BTMP are designed to meet the following objectives:

Objective 1: Operate the upstream fishways and downstream bypass systems in a manner consistent with the Hatchery Conservation Plan (HCP);

Objective 2: Identify any adverse Project-related impacts on adult and sub-adult Bull Trout passage;

Objective 3: Implement reasonable and appropriate options to modify upstream fishway, downstream bypass, or operations if adverse impacts on Bull Trout are identified and evaluate effectiveness of these measures;

Objective 4: Periodically monitor for Bull Trout entrapment or stranding during low Wells Reservoir elevations (similar to the WBTMMP);

Objective 5: Participate in the development and implementation of the USFWS Bull Trout Recovery Plan, including information exchange and genetic analysis. Should Bull Trout be delisted, the Aquatic SWG will re-evaluate the needs and objectives of the BTMP;

Objective 6: Identify any adverse impacts of Project-related hatchery operations on adult and sub-adult Bull Trout.

In addition to the reporting BTMP activities, this report also addresses additional terms and conditions for Bull Trout as identified in the USWFS 2012 Biological Opinion for the Operation of the Wells Project and related facilities. As such, listed below are these terms and conditions that are largely consistent with BTMP measures.

To implement Reasonable and Prudent Measures (RPM) 1: FERC shall require Douglas PUD, in coordination with the Service, to provide adequate year-round passage conditions for Bull Trout at all Project facilities.

1. Upstream and Downstream Passage for Adult and Sub-Adult Bull Trout (BTMP Section 4.1.1): FERC shall require Douglas PUD, in coordination with the Service, to provide upstream passage for Bull Trout through the existing upstream fishways and downstream passage for Bull Trout through the existing downstream bypass system consistent with the HCP and Aquatic Settlement Agreement. Both upstream fishway facilities (located on the west and east shores) shall be operational year round with maintenance occurring

on each fish way at different times during the winter to ensure that one upstream fishway is always operational. Operation of the downstream passage facilities for Bull Trout shall be consistent with bypass operations for Plan Species identified in the Wells HCP.

2. Bull Trout Passage Performance Standard (BTMP Section 4.3): FERC shall require Douglas PUD, in coordination with the Service, to implement the upstream and downstream measures contained in the Wells Hydroelectric Project BTMP to provide safe, timely, and effective upstream and downstream passage for adult and sub-adult Bull Trout at the Wells Hydroelectric Project. "Safe, timely and effective" passage shall be achieved when Douglas PUD has demonstrated that the survival and passage success rates for adult marked fish are greater than 95% and greater than or equal to 90%, respectively, and when passage studies demonstrate that the fishway facilities at Wells Dam do not impede the passage of Bull Trout. To ensure that safe, timely and effective passage at Wells Dam is maintained during the term of the new license, Douglas PUD shall implement the Bull Trout upstream and downstream measures consistent with the BTMP.

3. Upstream Fishway Operations Criteria (BTMP Section 4.1.3): FERC shall require Douglas PUD, in coordination with the Service, to operate the upstream fishway at Wells Dam in accordance with criteria outlined in the Wells HCP.

4. Bypass Operations Criteria (BTMP Section 4.1.4): FERC shall require Douglas PUD, in coordination with the Service, to operate the bypass system at Wells Dam in accordance with criteria outlined in the Wells HCP.

5. Implement Reasonable and Appropriate Measures to Modify the Upstream Fishway and Downstream Bypass if Adverse Impacts on Bull Trout are Identified (BTMP Section 4.3): FERC shall require Douglas PUD, in coordination with the Service, to identify, design, implement, and evaluate reasonable and feasible measures to modify the upstream fishway, downstream bypass, or operations to reduce the identified incidental take of Bull Trout if monitoring (Term and Condition #10) identifies upstream or downstream passage problems for Bull Trout, in consultation with the Service, WCC and the Aquatic SWG. Study protocols and radio-telemetry assessment methodologies prescribed above in Term and Condition #10 and #11[1], shall be used to evaluate the effectiveness of any additional measures implemented to reduce the incidental take of Bull Trout. Upon completion of the evaluation, the Service and the NMFS, in consultation with the Aquatic SWG, and the WCC, will determine whether the proposed measure should be made permanent, removed, or modified.

To implement RPM 2: FERC shall require Douglas PUD, in coordination with the Service, to minimize the effects of hydrographic variation to all life stages of Bull Trout at all Project facilities.

[1] Refer to the USFWS 2012 reference in the literature cited page for reference.

6. Investigate Entrapment or Stranding of Bull Trout during Periods of Low Reservoir Elevation (BTMP Section 4.4): FERC shall require Douglas PUD, in coordination with the Service, to continue to investigate potential entrapment or stranding areas for Bull Trout through periodic monitoring when periods of low reservoir elevation expose identified sites. During the first five years of the new license, Douglas will implement up to five Bull Trout entrapment/stranding assessments during periods of low reservoir elevation (below 773' msl). If no incidences of Bull Trout stranding are observed during the first five years of study, additional assessment will take place every fifth year during the remainder of the license term, unless waived by the Aquatic SWG. If Bull Trout entrapment and stranding result in take in exceedance of the authorized incidental take level, then reasonable and appropriate measures will be implemented by Douglas, in consultation with the Aquatic SWG, to address the impact.

To implement RPM 3: FERC shall require Douglas PUD, in coordination with the Service, to minimize the effects of the Hatchery Supplementation Program to all life stages of Bull Trout.

7. Bull Trout Monitoring During Hatchery Activities (BTMP 4.6.1): FERC shall require Douglas PUD, in coordination with the Service, to monitor hatchery actions (e.g., salmon trapping, sturgeon capture activities) that may encounter adult and sub-adult Bull Trout resulting from incidental capture and take. Actions to be monitored shall be associated with the Wells Hatchery, the Methow Hatchery, and any future facilities directly funded by Douglas PUD. If the incidental take of Bull Trout is exceeded due to Douglas PUD's hatchery actions then Douglas PUD will develop a plan, in consultation with the Aquatic SWG, to address the identified factors contributing to the exceedance of the allowable level of incidental take.

To implement RPM 4: FERC shall require Douglas PUD, in coordination with the Service, to minimize the effects of implementing the Aquatic Resource Management Plans (white sturgeon, Pacific lamprey, resident fish, aquatic nuisance species, and water quality) and the Predator Control Program to all life stages of Bull Trout.

8. Monitoring Other Aquatic Resource Management Plan Activities and Predator Control Program for Incidental Capture and Take of Bull Trout (BTMP Section 4.5.1): FERC shall require Douglas PUD, in coordination with the Service, to monitor activities associated with the implementation of other Aquatic Resource Management Plans for white sturgeon, Pacific lamprey, resident fish, aquatic nuisance species, and water quality and Predator Control Program that may result in the incidental capture and take of Bull Trout. If the incidental take of Bull Trout is exceeded due to the implementation of other Aquatic Resource Management Plan activities, then Douglas PUD will develop a plan, in consultation with the Aquatic SWG, to address the identified factors contributing to the exceedance of the allowable level of incidental take. If the incidental take of Bull Trout is exceeded due to the implementation of the Predator Control Program, then Douglas PUD will develop a plan, in consultation with the HCP Coordinating Committee and the Aquatic SWG, to address the identified factors contributing to the exceedance of the allowable level of incidental take.

To implement RPM 5: FERC shall require Douglas PUD, in coordination with the Service, to design and implement a Bull Trout monitoring program that will adequately detect and quantify Wells Hydroelectric Project impacts, including those associated with the Wells Dam, Twisp Weir trapping facilities, and hatchery facilities. This information will allow the Service to determine whether authorized take levels are exceeded.

9. Upstream Fishway Counts (BTMP Section 4.1.2): FERC shall require Douglas PUD, in coordination with the Service, to conduct video monitoring in the Wells Dam fishways from May 1st through November 15th to count and provide information on the population size of upstream moving Bull Trout.

10. Adult Bull Trout Upstream and Downstream Passage Evaluation (BTMP Section 4. 2.1): FERC shall require Douglas PUD, in coordination with the Service, to periodically monitor incidental take of Bull Trout through Wells Dam and in the Wells Reservoir through the implementation of a radio-telemetry study. Specifically, in years 5 and 10 of the new license, and continuing every ten years thereafter during the new license term, Douglas PUD shall conduct a 1 year monitoring study to verify continued compliance with the Bull Trout passage performance standard (Term and Condition #2). These monitoring studies shall employ the same study protocols and radio-telemetry assessment methodologies used at Wells Dam in 2006 and 2007. If the monitoring results demonstrate continued compliance with the Bull Trout passage performance standard (Term and Condition #2), then no additional actions are needed. If the monitoring results demonstrate that Douglas PUD is no longer in compliance with the Bull Trout passage performance standard (Term and Condition #2), then the monitoring study will be replicated to confirm the results. If the results after two years of monitoring demonstrate that Douglas PUD is no longer in compliance with the Bull Trout passage performance standard (Term and Condition #2), then Douglas PUD shall, pursuant to Term and Condition #5, develop and implement additional measures to improve Bull Trout passage until compliance with the Bull Trout passage performance standard (Term and Condition #2) is achieved. If the Bull Trout counts at Wells Dam increase more than twice the existing 5-year average or if there is a significant change in the operation of the fish ladders, bypass, or hydrocombine, then Douglas PUD shall, in consultation with the Service, the Aquatic SWG, and the Wells HCP Coordinating Committee, shall conduct a 1 year, follow-up monitoring study to verify continued compliance with the Bull Trout performance standard (Term and Condition #2). Although the BTMP specifies Douglas PUD to utilize radio-telemetry as the recommended monitoring method, the Service concludes that future monitoring technologies may be utilized in the implementation of this term and condition.

11. Adult Bull Trout Passage Evaluation at Off-Project Collection Facilities (BTMP Section (4.2.2): FERC shall require Douglas PUD, in coordination with the Service, beginning in year one of the new license, to conduct a one-year radio-telemetry evaluation to assess incidental take of adult Bull Trout at the adult salmon and steelhead broodstock collection facilities associated with the Wells HCP, including but not limited to, the Twisp Weir adult collection facility. Douglas PUD shall capture and tag up to 10 adult, migratory Bull Trout (>400 mm) per assessment per year and use fixed receiver stations

upstream and downstream of the collection facilities. Assessments shall employ the same study protocols and radio-telemetry assessment methodologies used at Wells Dam in 2006 and 2007. If the evaluation demonstrates that Douglas PUD is not in compliance with the Bull Trout passage performance standard (Term and Condition #2), then the evaluation will be replicated to confirm the results. If the results after two years of evaluation demonstrate that Douglas PUD is not in compliance with the Bull Trout passage performance standard (Term and Condition #2), then Douglas PUD shall develop, implement, and evaluate additional measures, in consultation with the Service, Wells HCP Coordinating Committee and the Aquatic SWG, until the Service determines that the Bull Trout passage performance standard has been achieved. At such time as the Service determines the Bull Trout passage performance standard has been achieved, the implementation of this measure shall be integrated into the 1 year telemetry monitoring program that is to be conducted every ten years (beginning in year 10 of the new license) at Wells Dam as identified in Term and Condition #10 above. Although the BTMP specifies Douglas PUD to utilize radio-telemetry as the recommended monitoring method, the Service concludes that future monitoring technologies may be utilized in the implementation of this term and condition.

12. Sub-Adult Bull Trout Monitoring (BTMP Section 4.2.3): FERC shall require Douglas PUD, if at any time during the new license term, sub-adult Bull Trout are observed passing Wells Dam in significant numbers (>10 per calendar year), in consultation with the Service, and the Aquatic SWG, implement reasonable and appropriate methods for monitoring sub-adult Bull Trout. Although the BTMP states that >10 sub-adults per calendar year as the threshold, new information leads the Service to conclude that 31 sub-adults per calendar year is a more appropriate threshold. Specifically, Douglas PUD may modify counting activities, and shall continue to provide PIT tags and equipment, and facilitate training to enable fish sampling entities to PIT tag sub-adult Bull Trout when these fish are collected incidentally during certain fish sampling operations. This activity shall occur the following year of first observation of sub-adult Bull Trout (>10 per calendar year), in consultation with the Service and the Aquatic SWG.

13. Funding Collection of Tissue Samples and Genetic Analysis (BTMP Section 4.5.2): FERC shall require Douglas PUD, in coordination with the Service, to collect up to 10 adult Bull Trout tissue samples in the Wells Dam fish way facilities over a period of one year and fund their genetic analysis. Genetic tissue collection will take place concurrent with the implementation of the Bull Trout radio-telemetry monitoring study. Any sub-adult Bull Trout collected during these activities will also be incorporated into the Bull Trout genetic analysis. Beginning in year 1 of the new license, Douglas will collect up to 10 adult Bull Trout tissue samples from the Twisp River broodstock collection facility over a period of one year and will fund their genetic analysis. Genetic tissue collection will take place concurrent with the implementation of the off-Project Bull Trout radio-telemetry monitoring study. This term and condition is consistent with other section 10(a)(l)(a) permits that involve handling of Bull Trout. The analysis will provide valuable information on the conservation status and genetic relationships between Bull Trout populations in the Columbia basin. This information will be used to determine the local populations impacted by Project operations, and when used in conjunction with

other data such as movement data and redd counts, the resiliency of local populations impacted by the proposed action may be determined. Samples will be submitted to the Service (Central Washington Field Office in Wenatchee, Washington).

Reporting Requirements

In order to monitor the impacts of incidental take, Douglas PUD shall prepare an annual report describing the progress of implementation and its impact on the Bull Trout. The report, which shall be submitted to the Service (Central Washington Field Office) annually on or before April 15th, shall list and describe the work that was completed and the number of Bull Trout, if any, observed and/or incidentally taken (i.e., injured or killed) during the course of implementation.

Upon locating a dead, injured, or sick endangered or threatened species specimen, initial notification must be immediately made to the U.S. Fish and Wildlife Service Law Enforcement Office 425-883-8122) and reported to the Washington Field Office (509-665-3508). Care should be taken in handling sick or injured specimens to ensure effective treatment and care and in handling dead specimens to preserve biological material in the best possible state for later analysis of cause of death. In conjunction with the care of sick or injured endangered species and preservation of biological materials from a dead animal, the finder has the responsibility to carry out instructions provided by Service Law Enforcement to ensure that evidence intrinsic to the specimen is not unnecessarily disturbed. The RPMs, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. If, during the course of the action, the level of incidental take described above is exceeded, such additional take represents new information requiring reinitiating consultation (assuming the Commission retains discretion or control over the action) and review of the RPMs provided. Douglas PUD must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the RPMs.

3.0 PROTECTION, MITIGATION AND ENHANCEMENT MEASURES

Consistent with the BTMP and USFWS Biological Opinion Terms and Conditions, Douglas PUD, in consultation with the Aquatic SWG, has initiated the implementation of the following measures.

3.1 Operate the Upstream Fishways and Downstream Bypass Systems in a Manner Consistent with the HCP (Objective 1)

3.1.1 Provide Upstream and Downstream Passage for Adult and Sub-adult Bull Trout

Douglas PUD will continue to provide upstream passage for adult Bull Trout through the existing upstream fishways and downstream passage of adult and sub-adult Bull Trout through the existing downstream bypass system. Both upstream fishway facilities (located on the west and east shores) are operational year round with maintenance occurring on each fishway at

different times during the winter to ensure that one upstream fishway is always operational. Maintenance activities on Wells fishways occur during the winter when Bull Trout have not been observed passing Wells Dam. Operation of the downstream passage facilities for Bull Trout will be consistent with bypass operations for Plan Species identified in the Wells HCP. Currently, the bypass system is operated between various dates in April through August of each year, and exact operating period is reported in the annual report. This operating period is consistent with the period of high Bull Trout and anadromous fish presence at the Project.

3.1.1.1 *Progress Towards Meeting Objective 1 in 2024 - Provide Upstream and Downstream Passage for Adult and Sub-adult Bull Trout*

Consistent with the FERC imposed license requirements for the Wells Project and the Wells HCP, Douglas PUD maintained safe, efficient and timely passage through the downstream juvenile fish bypass system and upstream adult fishway passage structures for Bull Trout. Winter maintenance occurred in the adult fishway structures in January and February. At least one of the adult fishways was in operation at all times during the winter maintenance period and both adult fishways were in operation for the remainder of the year (March – November). No Bull Trout have been observed in the Wells Dam fishway count windows during the months of January or February since record keeping began in 1998. In addition, there have been no detections of PIT-tagged Bull Trout on the Wells Dam fishways PIT antenna arrays (located and pools 19 and 67) during these months. Fish salvage efforts take place during dewatering of the fishways for maintenance and no Bull Trout were encountered during theses efforts in 2024, or during any previous year's efforts.

Juvenile fish bypass operations were implemented consistent with the 2024 Bypass Operations Plan. In 2024, dates of bypass operation included initiation on April 9 at midnight with the bypass system operated continuously through August 5. The 2024 dates of operation for the juvenile fish bypass system are the result of species run-timing estimates developed by the University of Washington and Columbia Basin Research annually. Operational dates were reviewed, approved and adopted by the Wells HCP Coordinating Committee and implemented by Douglas PUD prior to the beginning of the 2024 bypass season.

3.1.2 Upstream Fishway Counts

Douglas PUD shall continue to conduct video monitoring in the Wells Dam fishways from May 1st through November 15th to count and provide information on the population size of upstream moving Bull Trout.

3.1.2.1 *Progress Towards Meeting Objective 1 in 2024 - Upstream Fishway Counts*

In 2024, consistent with prior years, Douglas PUD conducted video monitoring of the adult fishways all year long toward ensuring that an accurate escapement of all Bull Trout is maintained. Total upstream counts at the Wells Dam fish ladder viewing windows was 21 Bull Trout in 2024, which was 49% of the ten-year average (Figure 1). Ninety-nine percent of the adult Bull Trout passed upstream through the fishways during the months of May and June, which is consistent with historical adult Bull Trout peak passage timing at Wells Dam. Adult Bull Trout passage at Wells Dam appear to be associated with upstream movement of fish to

natal streams in the Methow River basin where spawning occurs in the late summer and early fall.

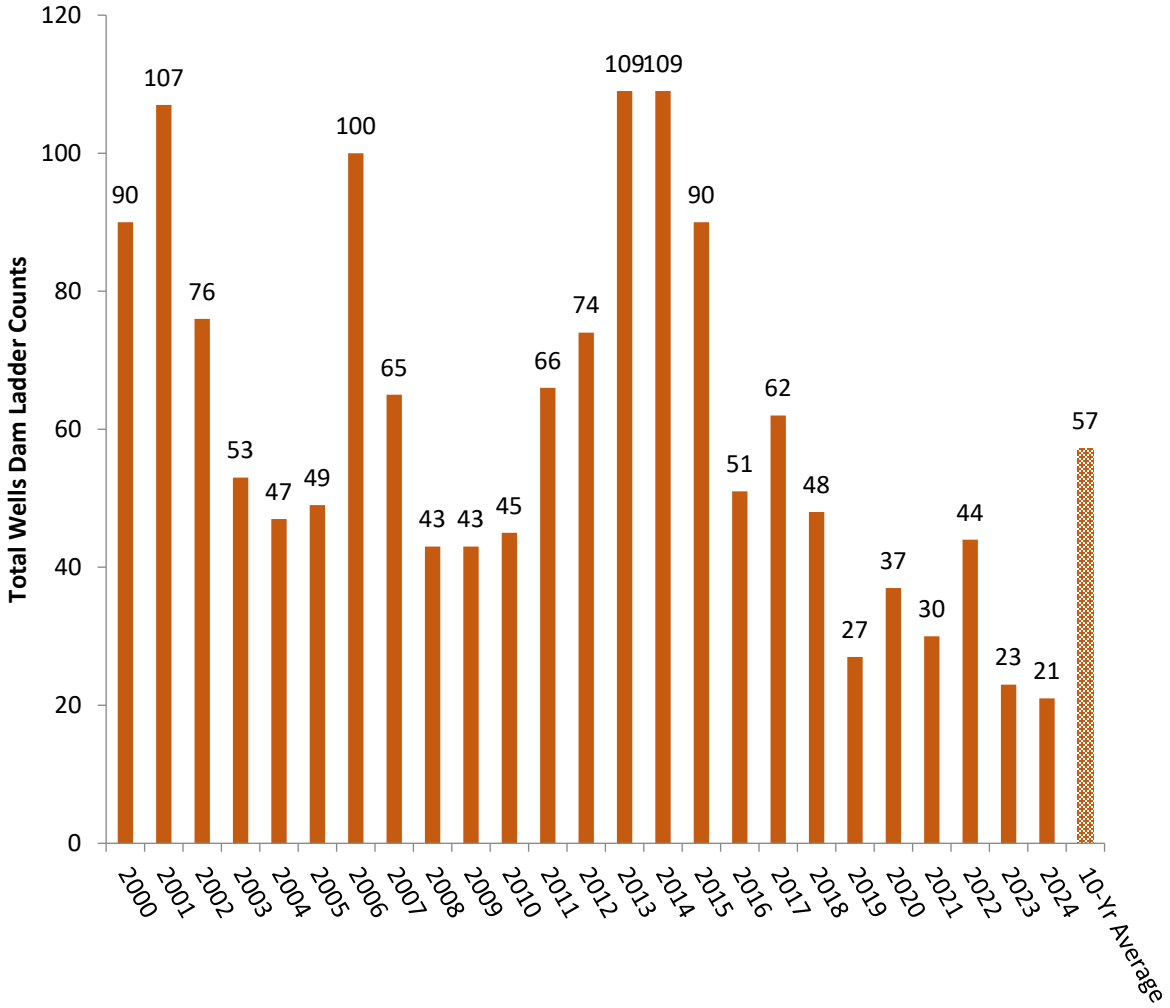


Figure 1. Bull Trout ladder counts at Wells Dam 2000-2024.

3.1.3 Upstream Fishway Operations Criteria

Douglas PUD shall continue to operate the upstream fishways at Wells Dam in accordance with criteria outlined in the Wells HCP.

3.1.3.1 *Progress Towards Meeting Objective 1 in 2024 - Upstream Fishway Operations Criteria*

Consistent with the license, Bull Trout ITS and the Wells HCP, Douglas PUD continued to operate the two upstream fishways at Wells Dam in accordance with upstream fishway criteria found in the Wells HCP and as approved by the Wells HCP Coordinating Committee. On September 5, 2024, Douglas PUD notified the Wells HCP Coordinating Committee of higher than-normal volumes of aquatic vegetation impinging on the trash racks of turbine units and fishways at Wells Dam. On September 10, 2024, an update was provided explaining that aquatic

vegetation was clogging the trash racks of intakes to five turbine units and the trash racks of the fish-pump and supplemental flow penstocks and the ladder exits for the east fishway, resulting in a several-hour outage of the east fishway to allow trash racks to be cleaned. During this time, sufficient water was maintained in the ladder, so there was no need to perform a ladder dewatering and fish salvage action, and the west fishway remained in operation during the cleaning effort. The buildup of aquatic vegetation continued resulting in pressure-differential alarms for the diffuser gratings between the supply chamber and collection gallery on both fishways. These alarms alert operators to unsafe head differentials on the diffuser gratings between the auxiliary water supply (AWS) system and the collection gallery. In 2001, this same issue occurred. At that time, NMFS recommended reducing AWS flow to reduce pressure on the diffuser gratings, which also reduced the head differential at the fishway entrance. Therefore, NMFS also recommended partially closing the collection gallery doors from 8 feet to 4 feet to maintain the head differential at the fishway entrances at 1.0 foot (normal differential is 1.5 feet). Consistent with this recommendation, Douglas PUD took this action to maintain safe fish passage through the fishways, per the Wells Hydroelectric Project Adult Fish Passage Plan. These operations were maintained in both fishways until annual winter fishway maintenance was initiated. During this period no Bull Trout were observed at the fishway video count station, and no PIT-tagged Bull Trout were detected on PIT antenna arrays within the fishway. Since Bull Trout are rarely seen at the Wells Project between September and December (when maintenance allowed the cleaning and restoration of normal operating criteria) Bull Trout were not likely effected by this temporary ladder operation.

3.1.4 Bypass Operations Criteria

Douglas PUD shall continue to operate the bypass system at Wells Dam in accordance with criteria outlined in the Wells HCP.

3.1.4.1 *Progress Towards Meeting Objective 1 in 2024 - Bypass Operations Criteria*

Consistent with the license, Bull Trout ITS and the Wells HCP, Douglas PUD has operated the juvenile fish bypass system at Wells Dam in accordance with criteria outlined in the Wells HCP and as approved by the HCP Coordinating Committee.

3.2 Identify Any Adverse Project-related Impacts on Adult and Sub-adult Bull Trout Passage (Objective 2)

3.2.1 Adult Bull Trout Upstream and Downstream Passage Evaluation

Douglas PUD shall continue to monitor upstream and downstream passage and incidental take of adult Bull Trout through Wells Dam and in the Wells Reservoir through the implementation of a radio-telemetry study. Specifically, in years 5 and 10 of the new license, and continuing every ten years thereafter during the new license term, Douglas PUD will conduct a one-year monitoring program to determine whether Douglas PUD remains in compliance with the ITS. The same study protocols used during past radio-telemetry assessments at Wells Dam (LGL and Douglas PUD 2007) will be employed for these monitoring studies.

If the adult Bull Trout counts at Wells Dam increases more than two times the existing five-year average or if there is a significant change in the operation of the fish ladders or hydrocombine, then the Aquatic SWG will determine whether additional years of take monitoring are needed beyond those identified in this section of the BTMP. If the authorized incidental take level is exceeded during any one-year period, Douglas PUD will conduct another monitoring study in the succeeding year. If the authorized incidental take level is exceeded in this second year, Douglas PUD will develop a plan, in consultation with the Aquatic SWG, to address the identified factors contributing to exceedance of the allowable level of incidental take.

3.2.1.1 *Progress Towards Meeting Objective 2 in 2024 - Adult Bull Trout Upstream and Downstream Passage Evaluation*

Douglas PUD implemented a Passage Evaluation Study in 2016 and early summer of 2017. Beginning in May 2016 and ending in early July 2016, Douglas PUD radio and Passive Integrated Transponder (PIT) tagged 60 adult sized Bull Trout at Wells Dam (n = 14) and the Twisp River Weir (Twisp Weir or Weir) (n= 46). These fish were tracked to assess downstream passage and survival at the Weir and Wells Dam in 2016 and upstream passage and survival in 2017. A final report documenting the results of this study was approved by the Aquatic SWG and filed with the FERC on November 9, 2017.

In the fall of 2016, 35 tagged fish moved downstream and were detected at the Twisp Weir, 31 of which passed successfully, with four fish being recovered (dead) immediately upstream of the Weir in an off-channel beaver pond. Two of the fish that passed downstream of the Weir died within one month of passage, but neither mortality was attributed to Twisp Weir passage.

In the spring and summer of 2017, 18 radio-tagged Bull Trout approached the Twisp Weir in the upstream direction, and all passed successfully and survived. Together, the observed interactions with the Twisp Weir indicated 92.5% (49 of 53) passage success (four fish died and were recovered in an off channel beaver pond before they could attempt to pass the Weir) and 100% survival (all 48 of the fish that successfully passed the Weir survived passage). Twelve fish made downstream passage movements at Wells Dam. None of the fish were detected in mortality mode in the tailrace, at the Gateway receiver site (~3 km downstream), or during mobile tracking. Ten of twelve made subsequent attempts to pass Wells Dam in an upstream direction, further confirming their survival. Also, eleven fish interacted with Wells Dam in the upstream direction. Of these, nine successfully moved through the fishways and into the Methow River; whereas two made forays into the fishway entrances but did not pass Wells Dam by the time the data collection portion of the study was terminated. Together Wells Dam interactions indicated 91.3% (21 of 23) passage success and 100% survival.

Bull Trout passage and success rates were higher than minimum compliance targets, suggesting minimal operational impact of the Twisp Weir and Wells Dam on Bull Trout migration, population connectivity, and survival. Results presented in this report are similar to those from the 2005-2008 studies of Bull Trout passage at Wells Dam.

A Bull Trout upstream and downstream passage evaluation study was scheduled to take place in 2021. The Study Plan for this required year ten study proposed to use radio-telemetry as the

method to meet these requirements and was approved by all parties to the Aquatic Settlement Agreement, including the USFWS during a normally scheduled monthly conference call held on February 10, 2021. After further review, the USFWS, with unanimous approval from signatories to the Aquatic Settlement Agreement, determined that local populations that interact with the Wells Project and the Twisp River Weir are low enough that radio telemetry surgeries should be avoided, especially given that estimates of survival and passage that have previously been demonstrated exceed performance standards.

On June 22, 2021, Douglas PUD submitted a request to the FERC for a variance to Article 402 of the license which includes stranding evaluations and incidental take studies as described in Sections 4.4, 4.5.1, and 4.6.1 of the Aquatic Settlement Agreement's BTMP. The variance requested suspension of the 2021 (Year-10) Bull Trout Passage and Survival Radio Telemetry Study based on concerns outlined in the Statement of Agreement (SOA) and approved by the Aquatic SWG on May 12, 2021. The SOA stated that Douglas PUD would continue to monitor Bull Trout populations via a PIT tag study and through other requirements of the Plan, Aquatic Settlement Agreement, Section 18 Fishway Prescriptions, 2012 Biological Opinion, and 401 Certification. On October 12, 2021, the FERC approved this variance.

Ten Bull Trout were PIT-tagged in 2022 as part of the Bull Trout Movement and Life History Investigation Study. In 2023, an additional 31 Bull Trout were PIT-tagged in support of the study, including 10 tagged by USFWS. Tissue samples were collected from each fish captured in 2022 and 2023 for genetic analysis for assignment of individuals to local population groups. The draft Bull Trout Movement and Life History Investigation Report was distributed to the Aquatic SWG for review in December 2023. The final report was approved during the February 14, 2024 Aquatic SWG meeting and was filed with the FERC in May 2024 (See Appendix A).

3.2.2 Adult Bull Trout Passage Evaluation at Off-Project Collection Facilities

Douglas PUD shall assess upstream and downstream passage and incidental take of adult, migratory Bull Trout at off-Project (outside of the Project boundary) adult salmon and steelhead broodstock collection facilities associated with the Wells HCP. Specifically, beginning in year one of the new license, Douglas PUD will conduct a one-year radio-telemetry study to assess passage and incidental take at off-Project adult collection facilities (i.e., Twisp Weir). Douglas PUD will capture and tag up to 10 adult, migratory Bull Trout (>400 mm) at adult collection facilities and use fixed receiver stations upstream and downstream of collection facilities to examine upstream and downstream passage characteristics and incidental take. Study protocols that have been used during past radio-telemetry assessments at Wells Dam (LGL and Douglas PUD 2008) will be employed for this assessment.

If negative impacts to passage associated with off-Project collection facilities are observed or the authorized incidental take level is exceeded during any one-year period, Douglas PUD will conduct another monitoring study in the succeeding year. If negative impacts to passage continue to be observed or the authorized incidental take level is exceeded in this second year, Douglas PUD will develop a plan, in consultation with the Aquatic SWG, to address the identified factors contributing to passage impacts or the exceedance of the allowable level of incidental take.

After year one of the new license, the implementation of this sub-objective will be integrated into the one-year telemetry monitoring program that is to be conducted every ten years (beginning in year 10 of the new license) at Wells Dam as identified in Section 4.2.1. In year 10 of the new license and every 10 years thereafter, Bull Trout will be captured and tagged only at Wells Dam (Section 4.2.1) since data show that Bull Trout passing Wells Dam are migrating back into the Methow River watershed (LGL and Douglas PUD 2008). Through the continued deployment of fixed station monitoring at off-Project adult salmon and steelhead broodstock collection facilities, these tagged Bull Trout will continue to provide passage and take information in support of this sub-objective throughout the term of the new license.

3.2.2.1 *Progress Towards Meeting Objective 2 in 2024 - Adult Bull Trout Passage Evaluation at Off-Project Collection Facilities*

During 2012, Douglas PUD, in consultation with the Aquatic SWG developed a study plan to assess incidental take of Bull Trout at the Twisp Weir broodstock collection facility. All parties including the USFWS, agreed that Douglas PUD should postpone the Off-Project Passage Evaluation until year five of the new license when the Bull Trout Passage and Enumeration Study is scheduled to take place at Wells Dam. Combining the studies would provide a more comprehensive study and potentially require less study fish than two independent studies, thereby limiting the overall impact or take of Bull Trout.

During 2013, Douglas PUD, in consultation with the Aquatic SWG filed a letter with the FERC proposing to postpone the Off-Project Passage Evaluation until year five of the new license when the Bull Trout Passage and Enumeration Study is scheduled to take place at Wells Dam. The FERC approved the deferral on October 15, 2013. Planning of the comprehensive study began

in 2015 with the development of a draft study plan and in coordination with the USFWS and the Aquatic SWG. Results from the 2016 & 2017 study were provided in a report approved by the Aquatic SWG and filed with the FERC in 2017. A summary of the results can be found above in section 3.2.1.1. Passage and survival standards at the Twisp Weir were above minimum targets.

Encounters of Bull Trout at the Twisp Weir in 2024 were well below the take limits of 118 as identified in Table 14 of the Bull Trout BO for Wells Dam (USFWS 2012) and are summarized in Table 1.

3.2.3 Sub-adult Bull Trout Monitoring

While an objective of the BTMP is to identify potential Project impacts on upstream and downstream passage of sub-adult Bull Trout, Aquatic SWG members (including the USFWS) agree that it is not feasible to assess sub-adult passage because sub-adult Bull Trout have not been observed at Wells Dam. During the previous six years of Bull Trout data collection at Wells Dam (BioAnalyst Inc. 2004; LGL and Douglas PUD 2008), sub-adult Bull Trout have not been documented passing Wells Dam (based upon fishway video counts and Bull Trout trapping for radio-telemetry). However, it is expected that through the increased monitoring associated with the implementation of the BTMP that there may be additional encounters with sub-adult Bull Trout. If at any time during the new license term sub-adult Bull Trout are observed passing Wells Dam in significant numbers (i.e., >10 per calendar year), the Aquatic SWG will recommend reasonable and appropriate methods for monitoring sub-adult Bull Trout. Specifically, Douglas PUD may modify counting activities, continue to provide PIT tags and equipment, and facilitate training to enable fish sampling entities to PIT tag sub-adult Bull Trout when these fish are collected incidentally during certain fish sampling operations. This activity would occur the following year after significant numbers of sub-adult Bull Trout (>10 per calendar year) were observed.

3.2.3.1 *Progress Towards Meeting Objective 2 in 2024 - Sub-adult Bull Trout Monitoring*

During 2024, six Bull Trout under 440 mm fork length were observed passing upstream at the Wells Dam fishway video count stations. Since the count was less than ten, no new sub-adult monitoring is required in 2025 per section 4.2.3 of the Aquatic Settlement Agreement. Adult counts remained below the five-year average. As a result, no new adult Bull Trout related monitoring activities were proposed or implemented.

3.3 Implement Reasonable and Appropriate Measures to Modify the Upstream Fishway and Downstream Bypass if Adverse Impacts on Bull Trout are Identified (Objective 3)

Douglas PUD shall continue to operate the upstream fishway and downstream bypass at Wells Dam in accordance with the Wells HCP. However, if upstream or downstream passage problems for Bull Trout are identified (as agreed to by the USFWS and Douglas PUD), Douglas PUD will identify and implement, in consultation with the Aquatic SWG and Wells HCP Coordinating Committee, reasonable and appropriate options to modify the upstream fishway, downstream bypass, or operations to reduce the identified impacts to Bull Trout passage.

3.3.1 Progress Towards Meeting Objective 3 in 2024 - Implement Reasonable and Appropriate Measures to Modify the Upstream Fishway and Downstream Bypass if Adverse Impacts on Bull Trout are Identified

No adverse impacts to Bull Trout have been identified since the Bull Trout ITS was issued including during monitoring in 2024. As a result, Douglas PUD is not proposing to implement any new upstream fishway or downstream bypass measures.

3.4 Investigate Entrapment or Stranding of Bull Trout during Periods of Low Reservoir Elevation (Objective 4)

During the implementation of the WBTMMP from 2004-2008, Douglas PUD, through the use of high resolution bathymetric information, hydraulic and elevation data, and backwater curves, identified potential Bull Trout entrapment and stranding areas in the Wells Reservoir. Although no stranded Bull Trout were observed in these areas during the implementation of the WBTMMP, Douglas PUD will continue to investigate potential entrapment or stranding areas for Bull Trout through periodic monitoring when periods of low reservoir elevation expose identified sites. During the first five years of the new license, Douglas PUD will implement up to five Bull Trout entrapment/stranding assessments during periods of low reservoir elevation (below 773' msl). If no incidences of Bull Trout stranding are observed during the first five years of study, additional assessment will take place every fifth year during the remainder of the license term, unless waived by the Aquatic SWG. If Bull Trout entrapment and stranding result in take in exceedance of the authorized incidental take level, then reasonable and appropriate measures will be implemented by Douglas PUD, in consultation with the Aquatic SWG, to address the impact.

3.4.1 Progress Towards Meeting Objective 4 in 2024 - Investigate Entrapment or Stranding of Bull Trout during Periods of Low Reservoir Elevation

Pursuant to Article 402 of the Wells Project license, Douglas PUD developed a Bull Trout Stranding, Entrapment, And Take Study Plan (Plan). This document was developed collaboratively with the USFWS and the Aquatic SWG. The Plan was filed with the FERC on September 24, 2013 and approved on October 29, 2013.

The Plan requires Douglas PUD to conduct five reservoir surveys when Wells Project operations reduce the forebay elevation to 773 feet above sea level (msl) within the first five years of the new operating license for the Project (2013-2017). These surveys are to be conducted opportunistically when reservoir elevations may be at or below 773' msl for an extended period of time. This sampling regime is also consistent with the USFWS 2013 Section 10 Biological Opinion, Section 18 Fishway Prescriptions for the Wells Project license, and Douglas PUD's BTMP.

Since issuance of the new Operating License four stranding surveys have taken place. The first stranding survey occurred on February 24, 2013. During this survey no Bull Trout were observed in stranding pools. Results from this effort were summarized in a technical

memorandum dated March 10, 2013 and submitted to the USFWS and the Aquatic SWG. These results were also filed with the FERC as part of 2013 Annual Bull Trout Management Plan report.

On September 2, 2015 the Wells Reservoir was lowered to 772' msl to facilitate a construction project at the mouth of the Methow River. On September 3, 2015, Douglas PUD biologists conducted a Bull Trout stranding survey consistent with the Plan. Although all identified stranding locations were examined no Bull Trout were observed. The results from the second Bull Trout stranding survey since license issuance in 2013 were again summarized in a technical memorandum and delivered to the USFWS.

On May 3, 2016 the Project forebay reached 773' msl. This low elevation was a result of Wells Dam hydroelectric Project operations that were designed to flush the Methow River delta using newly refurbished rock groins. This flushing was necessary to facilitate the removal of deposited fine material that builds up in the lower mile of the Methow River as the river meets the Columbia. Moving this fine material provides a safeguard against flooding areas of the town of Pateros, Washington. Consistent with license requirements, on May 4, 2016 Douglas PUD biologists conducted a Wells Project stranding, entrapment and take survey consistent with regulatory requirements. During this survey no Bull Trout were observed. Similarly to the first and second stranding survey, results of the 2016 survey were summarized and provided to the USFWS.

No standing or entrapment surveys were completed in 2017 since water levels within the Project area did not meet 773' msl. Further, 2017 was the fifth year of the new operating license and completes the requirement to complete up to five stranding surveys in the first five years. In summary, during the three stranding surveys conducted between 2013-2017, no Bull Trout were observed. In addition, stranding surveys that were conducted prior to issuance of the new Wells Project License, showed that Bull Trout were not being stranded within the Project area.

On May 15, 2023 the Wells Reservoir was lowered to 772' msl to facilitate scour of sediment from the mouth of the Methow River. Although stranding surveys were a requirement in the first five years of the new operating license, on May 16, 2023 Douglas PUD staff conducted a survey of the Wells Reservoir for stranded Bull Trout. No Bull Trout were observed during the survey. A memo detailing the results of the survey was shared with the USFWS and the Aquatic SWG and can be found in the 2023 Aquatic Settlement Agreement Annual Report.

In 2024, the Wells Reservoir did not reach levels that would necessitate a Bull Trout stranding survey.

3.5 Participate in the Development and Implementation of the USFWS Bull Trout Recovery Plan (Objective 5)

3.5.1 Monitoring Other Aquatic Resource Management Plan Activities and Predator Control Program for Incidental Capture and Take of Bull Trout

Douglas PUD will monitor activities associated with the implementation of other Aquatic Resource Management Plans (white sturgeon, Pacific lamprey, resident fish, aquatic nuisance species, and water quality) and the Predator Control Program that may result in the incidental capture and take of Bull Trout. If the incidental take of Bull Trout is exceeded due to the implementation of other Aquatic Resource Management Plan activities, then Douglas PUD will develop a plan, in consultation with the Aquatic SWG, to address the identified factors contributing to the exceedance of the allowable level of incidental take. If the incidental take of Bull Trout is exceeded due to the implementation of the Predator Control Program, then Douglas PUD will develop a plan, in consultation with the Wells HCP Coordinating Committee and the Aquatic SWG, to address the identified factors contributing to the exceedance of the allowable level of incidental take.

3.5.1.1 *Progress Towards Meeting Objective 5 in 2024 - Monitoring Other Aquatic Resource Management Plan Activities and Predator Control Program for Incidental Capture and Take of Bull Trout*

Four activities conducted under other Aquatic Resource Management Plan actions had the potential to encounter Bull Trout in 2024:

1. *Pikeminnow removal associated with the Predator Control Program*
    - *The Wells HCP required Predator Control Program, principally Douglas PUD's pikeminnow control program, did not encounter any Bull Trout in 2024. The pikeminnow control program used setlines to capture pikeminnow in deep water areas of the Wells Project. Over the program's existence (more than 21 years) no Bull Trout have been encountered.*
2. *The 2024 Northern Pike and Resident Fish Monitoring Program*
    - *Over the summer of 2024, Douglas PUD captured resident fish within the Wells Project including Smallmouth Bass, and Northern Pikeminnow. Fish were captured with hook and lines and boat electrofishing. No Bull Trout were incidentally encountered during this effort.*
3. *Resident fish gas bubble trauma monitoring*
    - *The Washington State Water Quality standard require hydro operators who employ a (Total Dissolved Gas) TDG adjustment during April through June to monitor for gas bubble trauma in both resident and migrating salmonids. Douglas PUD employs this TDG adjustment in conjunction with a Gas Abatement Plan and Biological Monitoring Plan. In 2024, boat electrofishing was conducted below Wells Dam in order to capture native fishes to monitor for signs of gas bubble trauma. During these monitoring activities no Bull Trout were encountered.*
4. *2024 Resident Fish Assemblage Study*
    - *From March to December of 2024 a variety of fish sampling methods were employed to sample resident fish species throughout the Wells Reservoir. These sampling methods included: boat electrofishing, beach seines, fyke nets, hoop nets, cod traps, minnow traps, and gill nets. No Bull Trout were encountered during these efforts at any of the over 200 locations sampled.*

3.5.2 Funding Collection of Tissue Samples and Genetic Analysis

Beginning in year 10 of the new license, and continuing every 10 years thereafter for the term of the new license, Douglas PUD will, if recommended by the Aquatic SWG, collect up to 10 adult Bull Trout tissue samples in the Wells Dam fishway facilities over a period of one year and fund their genetic analysis. Genetic tissue collection will take place concurrent with the implementation of the Bull Trout radio-telemetry monitoring study. Samples will be submitted to the USFWS Central Washington Field Office in Wenatchee, Washington. Any sub-adult Bull Trout collected during these activities will also be incorporated into the Bull Trout genetic analysis.

Beginning in year one of the new license, Douglas PUD will collect up to 10 adult Bull Trout tissue samples from the Twisp River broodstock collection facility over a period of one year and will fund their genetic analysis. Genetic tissue collection will take place concurrent with the implementation of the off-Project Bull Trout radio-telemetry monitoring study.

3.5.2.1 *Progress Towards Meeting Objective 5 in 2024 - Funding Collection of Tissue Samples and Genetic Analysis*

During the Wells Dam and Twisp Weir Passage and Survival Study, sixty genetic samples were taken. In early 2017, samples were analyzed by the WDFW Genetics Lab and study Bull Trout will therefore be assigned back to natal locations. In addition, in early 2017 previously taken genetic samples were analyzed as required under pre-licensing agreement(s) and associated with radio-telemetry studies that took place in the mid-2000 at Wells Dam. Results suggested the adult sized Bull Trout were using both natal and non-natal streams during spawning periods. Results are summarized in the Twisp Weir and Wells Dam Passage and Survival Study Report (Robichaud and Gingerich, 2017). Ten genetic samples were taken in 2022 in association with the Bull Trout Movement and Life History Investigation Study, with an additional 19 samples collected in 2023. Results from the analysis of these samples can be found in the 2022-2023 Bull Trout Movement and Life History Investigation Report.

3.5.3 Information Exchange and Regional Monitoring Efforts

Douglas PUD will continue to participate in information exchanges with other entities conducting Bull Trout research and regional efforts to explore availability of new monitoring methods and coordination of radio-tag frequencies for Bull Trout monitoring studies in the Project.

Douglas PUD will make available an informational and educational display at the Wells Dam Overlook to promote the conservation and recovery of Bull Trout in the Upper Columbia River and associated tributary streams.

3.5.3.1 *Progress Towards Meeting Objective 5 in 2024 - Information Exchange and Regional Monitoring Efforts*

In 2024, Douglas PUD participated in regional information exchange activities, which included participation in the 2024 Salvelinus Confluentus Curiosity Society meeting.

3.6 Identify Any Adverse Impacts of Project-related Hatchery Operations on Adult and Sub-adult Bull Trout (Objective 6)

3.6.1 Bull Trout Monitoring During Hatchery Activities

During the term of the new license, Douglas PUD shall monitor hatchery actions (e.g., salmon trapping, sturgeon brood stocking and capture activities) that may encounter adult and sub-adult Bull Trout for incidental capture and take. Actions to be monitored shall be associated with the Wells Hatchery, the Methow Hatchery, and any future facilities directly funded by Douglas PUD.

If incidental take of Bull Trout is exceeded due to Douglas PUD's hatchery actions then Douglas PUD will develop a plan, in consultation with the Aquatic SWG, to address the identified factors contributing to the exceedance of the allowable level of incidental take.

3.6.1.1 *Progress Towards Meeting Objective 6 in 2024 - Bull Trout Monitoring During Hatchery Activities*

Hatchery actions in 2024 were similar to other years where broodstock was collected at Wells Dam and the Twisp Weir. Screw traps used during HCP related smolt monitoring and evaluation (M&E) activities in the Methow River basin often encounter juvenile Bull Trout. Other M&E and hatchery activities that have the potential to encounter Bull Trout are adult handling at Methow Hatchery and Wells Dam Volunteer Channel. All of these trapping and hatchery activities are conducted by Douglas PUD or WDFW.

Screw traps operated by WDFW but under contract as part of Douglas PUD's Anadromous Salmonid and Habitat Conservation Plan (HCP) required monitoring and evaluation program captured 12 juvenile Bull Trout at the Twisp River screw trap.

Sixteen Bull Trout were captured at the Twisp Weir in 2024. None were encountered at the Methow Hatchery Outfall Trap. Nine were captured during broodstock collection at the Wells Dam and fish hatchery; 8 in the adult fishway traps and 1 in the hatchery volunteer channel trap.

In 2024, Douglas PUD's License Actions collectively were well below annual take estimates (limits) as described in the March 2012 issued Section 7 Biological Opinion from the USFWS. A summary of all Bull Trout encounters in 2024 and respective annual take limits are provided in Table 1.

Table 1. Summary of 2024 Bull Trout Incidental Encounters Under Douglas PUD's License Actions and Related Project Annual Encounter Limits Under the 2012 Issued Section 7 Biological Opinion.

	Project Element	2012 ISSUED BIOLOGICAL OPINION (Table 14)				2024 Annual Incidental			
		Lethal Take		Non-lethal Take		Lethal Take		Non-leth	
		Adult	Sub-adult	Adult	Sub-adult	Adult	Sub-adult	Adult	Su
Operations	Turbine Operation (A-1)	4	1	31	30				
Operations	Spillway Operation (A-2)	2	1	76	31				
Operations	Reservoir Operation (A-3)	1	2	8	3				
HCP	Passage Survival Plan								
HCP	Wells Dam Juvenile Passage Plan								
HCP	-Fish Bypass Operation (A-1)	1	1	4	6				
HCP	-Juvenile Survival Study (A-2)	2	2	4	6				
HCP	Wells Dam Adult Passage Plan	1	3	76	31				
HCP	Tributary Conservation Plan and Committee	-	-	-	-				
HCP	Hatchery Management Plans								
HCP	-Hatchery Management (A-1)	2	5	76	31			9	
HCP	-Operation of the Twisp Weir (A-2)	1	1	118	50*			16	
HCP	-HGMP Implementation (A-3)	2	2	76	31				
HCP	-Juvenile Salmonid Release (A-4)	-	-	629	132*				
HCP	Predator Control Program	2	1	76	31				
ASA	Water Quality Management Plan	1	2	76	31				
ASA	Bull Trout Management Plan	2	-	76	31				
ASA	Pacific Lamprey Management Plan	1	1	2	5				
ASA	White Sturgeon Management Plan	1	1	2	5				
ASA	Resident Fish Management Plan	1	2	76	31				
ASA	Aquatic Nuisance Management Plan	1	1	76	31				
TERRESTRIAL	Wildlife and Botanical Management Plan	-	-	-	-				
TERRESTRIAL	Line Avian Protection Plan	no effect	no effect	no effect	no effect				
TERRESTRIAL	Recreation Resources Management Plan	-	-	-	-				
TERRESTRIAL	Historic Properties Management Plan	-	-	-	-				
TERRESTRIAL	Land Use Policy	no effect	no effect	no effect	no effect				

Note: Empty shaded cells are inferred to be "0". Adult ladder counts described earlier in this report are not included in this table.

3.7 2.6.2 USFWS Section 7 Consultation

The PMEs contained within the BTMP were specifically developed, in consultation with the USFWS, to address potential RPMs for the Project relicensing and associated Section 7 consultation. All of the USFWS's potential RPMs for the Wells Project can be found in Section 2.0 above. Each of these RPMs has been cross referenced with the specific supporting objective and PME (Sections 4.1 - 4.6) found within the BTMP. The purpose of these RPMs are to

provide consistency with Douglas PUD's Aquatic Settlement Agreement and the USFWS' subsequent Section 7 consultation on the relicensing of the Wells Project.

3.7.1 Progress Towards Meeting USFWS Section 7 Consultation in 2024

On March 16, 2012, the USFWS issued a Bull Trout BO related to the relicensing of the Wells Project. The BO contained various RPMs and the terms and conditions (T&Cs). These RPMs and T&Cs can be found within Appendix E of the FERC license for the Wells Project and they are consistent with the measures identified in the BTMP and within this report. Since license issuance Douglas PUD has implemented the PME's from the BTMP and RPM's from the Biological Opinion consistent with requirements.

No formal Section 7 consultation was required in 2024.

3.8 Reporting

Douglas PUD will provide a draft annual report to the Aquatic SWG summarizing the previous year's activities undertaken in accordance with the BTMP. The report will document all Bull Trout activities conducted for the Wells Project and describe activities proposed for the following year. Furthermore, any decisions, statements of agreement, evaluations, or changes made pursuant to this BTMP will be included in the annual report. If significant activity was not conducted in a given year, Douglas PUD will prepare a memorandum providing an explanation of the circumstances in lieu of the annual report.

3.8.1 Progress Towards Meeting Annual Reporting Requirements

This 2024 report fulfills the reporting requirements identified in the BTMP and Article 406 of the Wells Project FERC operating license. In addition, this report fulfills requirements of the Bull Trout BO to submit an annual take report to the Central Washington Field Office of the USFWS on or before April 15 each year.

Because the measures required by the BO are entirely consistent with the measures found in the Aquatic Settlement Agreement's BTMP and because the reporting requirements for the BTMP, Bull Trout BO and Article 406 are consistent, the 2023 BTMP Annual Report will be used to satisfy all three of the Bull Trout annual reporting requirements.

4.0 REFERENCES

BioAnalysts, Inc. 2004. Movement of Bull Trout within the Mid-Columbia River and Tributaries, 2001-2004. Prepared by BioAnalysts, Inc., Eagle Rock, Idaho for Public Utility District No. 1 of Chelan County, Wenatchee, WA, Public Utility District No. 1 of Douglas County, East Wenatchee, WA, and Public Utility District No. 1 of Grant County, Ephrata, WA.

Douglas (Public Utility District No. 1 of Douglas County). 2004. Wells Hydroelectric Project Bull Trout Monitoring and Management Plan, 2004-2008. Public Utility District No. 1 of Douglas County, East Wenatchee, WA.

LGL and Douglas PUD. 2007. Wells Bull Trout monitoring and management plan, 2006 Annual Report. Wells Hydroelectric Project FERC No. 2149.

LGL and Douglas PUD. 2008. Bull Trout monitoring and management plan, 2005-2008 final report. Wells Hydroelectric Project FERC No. 21.49. Prepared for Public Utilities District No. 1 of Douglas County. East Wenatchee, Washington.

Robichaud, D. and A. Gingerich. 2017. Bull Trout passage and take monitoring at Wells Dam and the Twisp River Weir. Report for Public Utility District No. 1 of Douglas County, East Wenatchee, WA.

Appendix E
2024 Annual Report Water Quality Management Plan

2024 ANNUAL REPORT

WATER QUALITY MANAGEMENT PLAN

WELLS HYDROELECTRIC PROJECT

FERC PROJECT NO. 2149

May 2025

Prepared by:
Public Utility District No. 1 of Douglas County
East Wenatchee, Washington

© Copyright 2025. Public Utility District No. 1 of Douglas County. All Rights Reserved.

EXECUTIVE SUMMARY

The annual Water Quality Management Plan (WQMP) Report includes a summary of water quality measures carried out by Public Utility District No. 1 of Douglas County (Douglas PUD) in 2024. Actions taken were consistent with the Federal Energy Regulatory Commission's (FERC) license order for the Wells Hydroelectric Project (Project), and the requirements found within Appendix A (Clean Water Act section 401 Water Quality Certification [401 Certification]). The 2012 FERC Order requires Douglas PUD to submit an annual WQMP report to the FERC on or before May 31st during each year of the license.

The goal of the WQMP is to protect the quality of the surface waters affected by the Wells Project with regard to the numeric criteria. Studies conducted during the relicensing process have found water quality within the Wells Project to be within compliance. Douglas PUD, in collaboration with the Aquatic Settlement Work Group (Aquatic SWG), has agreed to implement measures in support of the WQMP. Reasonable and feasible measures will be implemented in order to maintain compliance with the numeric criteria of the Washington State Water Quality Standards (WQS), Chapter 173-201A WAC. The measures presented within the WQMP (Section 4.0) are designed to meet the following objectives:

> Objective 1: Maintain compliance with state WQS for Total Dissolved Gas (TDG). If non-compliance is observed, the Aquatic SWG will identify reasonable and feasible measures, which will be implemented by Douglas PUD.
>
> Objective 2: Maintain compliance with state WQS for water temperature. If information becomes available that suggests non-compliance is occurring or likely to occur, the Aquatic SWG will identify reasonable and feasible measures, which will be implemented by Douglas PUD.
>
> Objective 3: Maintain compliance with state WQS for other numeric criteria. If information becomes available that suggests non-compliance is occurring or likely to occur, the Aquatic SWG will identify reasonable and feasible measures, which will be implemented by Douglas PUD.
>
> Objective 4: Operate the Project in a manner that will avoid, or where not feasible to avoid, minimize, spill of hazardous materials and implement effective countermeasures in the event of a hazardous materials spill.
>
> Objective 5: Participate in regional forums tasked with improving water quality conditions and protecting designated uses in the Columbia River basin.

The WQMP is intended to be compatible with other water quality management plans in the Columbia River mainstem, including Total Maximum Daily Loads (TMDL). Furthermore, the WQMP is intended to be supportive of the Habitat Conservation Plan (HCP), Bull Trout Management Plan, Pacific Lamprey Management Plan, Resident Fish Management Plan, White Sturgeon Management Plan, and Aquatic Nuisance Species Management Plan through the

protection of designated uses (WAC 173-201A-600) in Project waters. The WQMP is intended to be not inconsistent with other management strategies of federal, state and tribal natural resource management agencies.

This 2024 annual report on the implementation of the WQMP includes all of the water quality compliance related activities implemented during the calendar year.

1.0 INTRODUCTION

The Water Quality Management Plan (WQMP) is one of six Aquatic Resource Management Plans contained within the Aquatic Settlement Agreement (Agreement). Collectively, these six plans are critical to direct implementation of Protection, Mitigation, and Enhancement measures (PMEs) during the term of the new license (issued November 9, 2012).

During the development of the WQMP plan, the Aquatic Settlement Work Group (Aquatic SWG) focused on management priorities for resources potentially impacted by Wells Hydroelectric Project (Wells Project or Project) operations. Entities that participated in the Aquatic SWG include the U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), Bureau of Land Management (BLM), Bureau of Indian Affairs (BIA), Washington Department of Ecology (Ecology), Washington State Department of Fish and Wildlife (WDFW), the Confederated Tribes of the Colville Reservation (Colville), the Confederated Tribes and Bands of the Yakama Nation (Yakama Nation), and Public Utility District No. 1 of Douglas County (Douglas PUD).

The Washington State Water Quality Standards (WQS) found at WAC 173-201A include designated uses (recreation, agriculture, domestic and industrial use, and habitat for aquatic life) and supporting numeric criteria. The WQMP is intended to address only the numeric criteria of the WQS. Aquatic life uses of the Project identified by the WQS are addressed by the five other Aquatic Resource Management Plans within the Agreement and by the measures implemented in the Wells Anadromous Fish Agreement and Habitat Conservation Plan (HCP).

This management plan report summarizes the relevant resource issues and water quality standards (Section 2), identifies goals and objectives of the plan (Section 3), and describes the relevant measures (Section 4) to maintain compliance with the numeric criteria of state WQS during the term of the new license.

2.0 WATER QUALITY STANDARDS

Section 401 of the Clean Water Act (CWA, 33 USC Chapter 26 § 1341 *et seq.*) requires that applicants for a hydroelectric project license from the Federal Energy Regulatory Commission (FERC) provide the FERC with a 401 Water Quality Certification (401 Certification) that provides reasonable assurance that the Project will comply with applicable WQS and any other appropriate requirements of state law. In Washington State, Ecology is responsible for issuing 401 Certifications. The 401 Certification for the Wells Project was issued on February 27, 2012.

Congress passed the CWA in 1972 and designated the U.S. Environmental Protection Agency (EPA) as the administering federal agency. This federal law requires that a state's water quality standards protect the surface waters of the U.S. for beneficial or designated uses, such as recreation, agriculture, domestic and industrial use, and habitat for aquatic life. Any state WQS, or amendments to these standards, do not become effective under the CWA until they have been approved by EPA.

Ecology is responsible for the protection and restoration of Washington State's waters. Ecology establishes WQS that set limits on pollution in lakes, rivers, and marine waters in order to protect water quality and specified designated uses of such water bodies. These standards are found in WAC 173-201A.

2.1.1 Water Quality Standards for the Project

The Project includes the mainstem Columbia River above Wells Dam, one mile of the mainstem Columbia River below Wells Dam, the Methow River (up to river mile [RM] 1.5) and the Okanogan River (up to RM 15.5).

Under the 2006 WQS, the Project includes designated uses for spawning/rearing (aquatic life), primary contact recreation, and all types of water supply and miscellaneous uses. Numeric criteria to support the protection of these designated uses consist of various physical, chemical, and biological parameters including total dissolved gas (TDG), temperature, dissolved oxygen (DO), pH, turbidity, and toxins.

Unless stated otherwise in the subsections below, WQS criteria discussed in this section apply to all waters within the Project.

2.1.1.1 Total Dissolved Gas

TDG is measured as a percent saturation. Based upon criteria developed by Ecology, TDG measurements shall not exceed 110% at any point of measurement in any state water body. The WQS states that an operator of a dam is not held to the TDG standards when the river flow exceeds the seven-day, 10-year-frequency (7Q10) flood. The 7Q10 flow is the highest value of a running seven consecutive day average using the daily average flows that may be seen in a 10-year period. The 7Q10 total river flow for the Project was computed by Ecology (Pickett et al 2004) using the hydrologic record from 1974 through 1998 and a statistical analysis to develop the number from 1930 through 1998. The U.S. Geological Survey Bulletin 17B, "Guidelines for Determining Flood Flow Frequency" was followed. The resulting 7Q10 flow at Wells Dam is 246,000 cubic feet per second (cfs).

In addition to allowances for TDG standard exceedances during natural flood flows in excess of 7Q10, the TDG criteria may be adjusted to accommodate spill to facilitate fish passage over hydroelectric dams when consistent with an Ecology-approved Gas Abatement Plan (GAP). Ecology has approved on a per application basis, an interim exemption to the TDG standard (110%) to allow spill for juvenile fish passage on the Columbia and Snake rivers (WAC 173-201A-200(1)(f)(ii)). Dams in the Columbia and Snake rivers may be granted such an exemption. The GAP must be accompanied by fisheries management, physical, and biological monitoring plans (173-201A-200(1)(f)(ii)).

In 2019, Ecology modified the TDG standards, which provided more liberal TDG standards during the months of April through August, which are designed to facilitate increased non-turbine fish passage in the spring up and down the Columbia and Snake River. Compliance with these standards are covered in annual TDG Reporting, Gas Abatement Plans and Bypass Operating Plans filed by Douglas PUD on an annual basis with Ecology and the FERC.

Columbia and Snake River TDG Exemption

As of spring 2020, on the Columbia and Snake rivers, two conditions apply to the TDG exemptions during the summer:

During juvenile fish bypass spill season (typically from April to June; often into August at Wells Dam):

- In the tailrace of a dam, TDG shall not exceed 125% as an average of the twelve highest hourly TDG measures in a calendar day.
- TDG shall not exceed 126% in the tailrace of a dam, as an average of any two consecutive hourly TDG measures (24-hour period), relative to atmospheric pressure.

After fish bypass spill season (typically from July – August; often just August at Wells Dam):

- TDG must not exceed an average of 115% as measured in the forebay of the next downstream dam as calculated by an average of the twelve highest hourly readings in a calendar day, relative to atmospheric pressure.
- TDG must not exceed an average of 120% in the tailrace of a dam, as calculated by an average of the twelve highest hourly readings in a calendar day, relative to atmospheric pressure.
- Within a dam's tailrace, TDG saturation may not exceed 125% calculated as an average of the two highest hourly TDG measures within a calendar day.

All of these TDG exemptions are also contingent on Ecology approving a biological monitoring plan that measures impacts of fish exposed to increased TDG conditions throughout the spill season.

Increased levels of spill resulting in elevated TDG levels are intended to allow increased fish passage without causing more harm to fish populations than caused by turbine passage. The TDG exemption provided by Ecology is based on a risk analysis study conducted by the NMFS (NMFS 2000).

2.1.1.2 Temperature

Temperature is measured by the 7-day average of the daily maximum temperatures (7-DADMax). The 7-DADMax for any individual day is calculated by averaging that day's daily maximum temperature with the daily maximum temperatures of the three days prior and the three days after that date (WAC 173-201A-020).

Under the WQS, the 7-DADMax temperature within the Columbia, Methow, and Okanogan Rivers portions of the Project shall not exceed 17.5°C (63.5°F) (WAC 173-201A-602 and 173-201A-200(1)(c)). Additionally, the WQS contains additional supplemental temperature requirements for the Project portion of the Methow River (see Methow River Supplemental Requirements section below). When a water body's temperature is warmer than 17.5°C (or within 0.3°C (0.54°F) of the criteria) and that condition is due to natural conditions, then human actions considered cumulatively may not cause the 7-DADMax temperature of that water body to increase more than 0.3°C (0.54°F).

When the background condition of the water is cooler than 17.5°C, the allowable rate of warming up to, but not exceeding, the numeric criteria from human actions is restricted as follows:

(A) Incremental temperature increases resulting from individual point source activities must not, at any time, exceed 28/(T+7) as measured at the edge of a mixing zone boundary (where "T" represents the background temperature as measured at a point or points unaffected by the discharge and representative of the highest ambient water temperature in the vicinity of the discharge).

(B) Incremental temperature increases resulting from the combined effect of all non-point source activities in the water body must not, at any time, exceed 2.8°C (5.04°F). Temperatures are not to exceed the criteria at a probability frequency of more than once every ten years on average.

Temperature measurements should be taken to represent the dominant aquatic habitat of the monitoring site. This typically means samples should:

(A) Be taken from well mixed portions of rivers and streams.

(B) Not be taken from shallow stagnant backwater areas, within isolated thermal refuges, at the surface, or at the water's edge.

The following guidelines on preventing acute lethality and barriers to migration of salmonids are also used in determinations of compliance with the narrative requirements for use protection established in WAC 173-201A (e.g., WAC 173-201A-310(1), 173-201A-400(4), and 173-201A-410 (1)(c)). The following site-level considerations do not, however, override the temperature criteria established for waters in WAC 173-201A-200(1)(c) or WAC 173-201A-602:

(A) Moderately acclimated (16-20°C, or 60.8-68.0°F) adult and juvenile salmonids will generally be protected from acute lethality by discrete human actions maintaining the 7-DADMax temperature at or below 22°C (71.6°F) and the 1-day maximum (1-DMax) temperature at or below 23°C (73.4°F).

(B) Lethality to developing fish embryos can be expected to occur at a 1-DMax temperature greater than 17.5°C (63.5°F).

(C) To protect aquatic organisms, discharge plume temperatures must be maintained such that fish could not be entrained (based on plume time of travel) for more than two seconds at temperatures above 33°C (91.4°F) to avoid creating areas that will cause near instantaneous lethality.

(D) Barriers to adult salmonid migration are assumed to exist any time the 1-DMax temperature is greater than 22°C (71.6°F) and the adjacent downstream water temperatures are 3°C (5.4°F) or cooler.

Methow River Supplemental Requirements

Ecology has identified water bodies, or portions thereof, which require special protection for spawning and incubation in accordance with Ecology publication 06-10-038. This publication indicates where and when the following criteria are to be applied to protect the reproduction of native char, salmon, and trout. Water temperatures are not to exceed 13°C (55.4°F) from October 1 to June 15 in the lower Methow River including the portion within the Project boundary (up to RM 1.5).

2.1.1.3 Dissolved Oxygen

Dissolved oxygen (DO) criteria are measured in milligrams per liter (mg/L). Under the WQS, DO measurements shall not be under the 1-day minimum of 8.0 mg/L. 1-day minimum is defined as the lowest DO reached on any given day. When a waterbody's DO is lower than the 8.0 mg/L criteria (or within 0.2 mg/L of the criteria) and that condition is due to natural conditions, then human actions considered cumulatively may not cause the DO of that water body to decrease more than 0.2 mg/L. Concentrations of DO are not to fall below 8.0 mg/L at a probability frequency of more than once every ten years on average.

DO measurements should be taken to represent the dominant aquatic habitat of the monitoring site. This typically means samples should:

(A) Be taken from well mixed portions of rivers and streams.

(B) Not be taken from shallow stagnant backwater areas, within isolated thermal refuges, at the surface, or at the water's edge.

2.1.1.4 pH

pH is defined as the negative logarithm of the hydrogen ion concentration. Under the WQS, pH measurements shall be in the range of 6.5 to 8.5, with a human-caused variation within the above range of less than 0.5 units.

2.1.1.5 Turbidity

Turbidity is measured in nephelometric turbidity units (NTUs). Turbidity shall not exceed 5 NTU over background when the background is 50 NTU or less; or a 10% increase in turbidity when the background turbidity is more than 50 NTU.

2.1.1.6 Toxins

Toxic substances shall not be introduced above natural background levels in waters of the state which have the potential either singularly or cumulatively to adversely affect characteristic water uses, cause acute or chronic toxicity to the most sensitive biota dependent upon those waters, or adversely affect public health, as determined by Ecology.

Ecology shall employ or require chemical testing, acute and chronic toxicity testing, and biological assessments, as appropriate, to evaluate compliance with WAC 173-201-240 and to ensure that aquatic communities and the existing and characteristic beneficial uses of waters are being fully protected.

Within the Project Area, specifically within the Project portion of the Okanogan River, two toxic substances are of concern: Dichloro-Diphenyl-Trichloroethane (DDT) and Polychlorinated Biphenyls (PCBs). DDT is a synthetic organochlorine insecticide that was frequently used in agriculture prior to being banned in 1972. PCBs are an organic compound that were used as coolants and insulating fluids for transformers, and capacitors. PCBs are classified as persistent organic pollutants and production was banned in the 1970s due to its high level of toxicity.

Toxic substances criteria identified in the WQS for these two substances are as follow:

> (A) In freshwater, DDT (and metabolites) shall not exceed 1.1 µg/L as an instantaneous concentration at any time. Exceedance of the criteria is defined as an acute condition. DDT (and metabolites) shall not exceed 0.001 µg/L as a 24-hour average. Exceedance of the criteria is defined as a chronic condition.
>
> (B) In freshwater, PCBs shall not exceed 2.0 µg/L as a 24-hour average. Exceedance of the criteria is defined as an acute condition. PCBs shall not exceed 0.01 µg/L as a 24-hour average. Exceedance of the criteria is defined as a chronic condition.

2.1.2 305(b) Report, 303(d) List and Total Maximum Daily Loads

Every two years, the EPA, as specified in section 305(b) of the CWA, requires Ecology to compile an assessment of the state's water bodies. Data collected from the water quality assessment are used to develop a 305(b) report. The report evaluates and assigns each water body into five categories based upon the Ecology's evaluation of the water quality parameters collected from within each water body.

(1) Category 1 states that a water body is in compliance with the State WQS for the parameter of interest.
(2) Category 2 states a water body of concern.
(3) Category 3 signifies that insufficient data are available to make an assessment.
(4) Categories 4a-4c indicates an impaired water body that does not require a Total Maximum Daily Load (TMDL) for one of three reasons:
    - Category 4a indicates a water body with a finalized TMDL.
    - Category 4b indicates a water body with a Pollution Control Program.
    - Category 4c indicates a water body impaired by a non-pollutant (e.g., low water flow, stream channelization, and dams).
(5) Category 5 represents all water bodies within the state that are considered impaired and require a Water Quality Implementation Plan (WQIP) (formerly TMDL). The 303(d) list consists of only water bodies with Category 5 listings.

Information presented below in subsections 2.1.2.1 to 2.1.2.6 are based upon the Draft 2008 Water Quality Assessment and candidate 303(d) list that has been finalized by Ecology and submitted to the EPA for approval.

2.1.2.1 Total Dissolved Gas

The reach of the Columbia River within the Project was on the state's 1998 303(d) list for TDG impairment (Category 5 listing). In 2004, Ecology developed a TDG TMDL (which was approved by EPA) for the mid-Columbia River and as such, this reach of the Columbia River, which includes the Project, is no longer on the 303(d) list for TDG (Category 4a).

Neither the reach of the Methow River within the Project (RM 1.5) nor the reach of the Okanogan River within the Project (RM 15.5) are listed on the 2008 303(d) list for TDG.

2.1.2.2 Temperature

The reach of the Columbia River within the Project is on the state's 2004 303(d) list for temperature impairment. In late 2018, the EPA has developed a draft temperature TMDL for the mainstem Columbia River, including that portion of the Columbia River contained within the Project, but pulled the draft version of the TMDL in 2019. EPA issued a final TMDL for the Columbia River on August 13, 2021. The TMDL addresses the water temperature effects of dams and other human actions, including model analyses and load allocations for mainstem hydroelectric projects including Wells Dam. It allows for 0.3° C of anthropogenic warming within the Columbia River, and grants an allotment of 0.1°C of warming to the entirety of the Columbia River hydropower system. Ecology is currently planning a strategy for implementation of the TMDL.

The reach of the Methow River within the Project (RM 1.5) is not on the 2008 303(d) list for temperature. However, reaches of the Methow River upstream of the Wells Project boundary are listed on the 2008 303(d) list for temperature.

The reach of the Okanogan River within the Project (RM 15.5) is not on the 2008 303(d) list for temperature. However, reaches of the Okanogan River upstream of the Wells Project boundary are listed on the 2008 303(d) list for temperature.

2.1.2.3 DO

No part of the Project area is on the 2008 303(d) list for DO.

2.1.2.4 pH

No part of the Project area is on the 2008 303(d) list for pH.

2.1.2.5 Turbidity

No part of the Project area is on the 2008 303(d) list for turbidity.

2.1.2.6 Toxins

Neither the reach of the Columbia River within the Project nor the reach of the Methow River within the Project (RM 1.5) is on the 2008 303(d) list for toxins.

The reach of the Okanogan River within the Project (RM 15.5) is listed on the current 303(d) list for toxins including 4, 4'-DDD, PCBs which were found to be above limits set for fish tissue equivalent concentration (FTEC) and is defined as the concentration of a contaminant in fish tissue that Washington equates to the National Toxics Rule water quality criterion for the protection of human health.

2.1.3 Summary of Compliance with WQS

Based on the Initial and Updated Study Reports the Aquatic SWG was able to determine that waters within the Wells Project currently meet state numeric criteria of WQS as defined in Chapter 173-201A WAC. The following table presents supporting studies, by standard:

Standard	Studies	Result(s)	Continued Monitoring
TDG	Politano et al. 2008, 2009a, 2009b.	Compliance met under preferred operating conditions and standard compliance scenario.	Yes
Temperature	West Consultants, Inc. 2008	Compliance met, zero exceedances. Potential future TMDL.	Yes
DO	Parametrix, Inc. 2009	Compliance met, zero exceedances	No
pH	Parametrix, Inc. 2009	Compliance met, zero exceedances	No
Turbidity	Parametrix, Inc. 2009; DCPUD and CBE 2009.	Compliance met, zero exceedances	No

A full summary of the studies and background history of project water quality monitoring results can be reviewed in previous Douglas PUD's WQMP Annual Reports appended to the ASA Annual Report and submitted to the FERC on or before May 31st during each year of the license.

3.0 GOAL AND OBJECTIVES

The goal of the WQMP is to protect the quality of the surface waters affected by the Project with regard to the numeric criteria. Studies conducted during the relicensing process have found water quality within the Wells Project to be within compliance. Douglas PUD, in collaboration with the Aquatic SWG, has agreed to implement measures in support of the WQMP. Reasonable and feasible measures are being implemented in order to maintain compliance with the numeric criteria of the Washington State WQS, Chapter 173-201A WAC. The measures presented within the WQMP (Section 4.0) are designed to meet the following objectives:

> Objective 1: Maintain compliance with state WQS for TDG. If non-compliance is observed, the Aquatic SWG will identify reasonable and feasible measures, which will be implemented by Douglas PUD;
>
> Objective 2: Maintain compliance with state WQS for water temperature. If information becomes available that suggests non-compliance is occurring or likely to occur, the Aquatic SWG will identify reasonable and feasible measures, which will be implemented by Douglas PUD;
>
> Objective 3: Maintain compliance with state WQS for other numeric criteria. If information becomes available that suggests non-compliance is occurring or likely to occur, the Aquatic SWG will identify reasonable and feasible measures, which will be implemented by Douglas PUD;
>
> Objective 4: Operate the Project in a manner that will avoid, or where not feasible to avoid, minimize, spill of hazardous materials and implement effective countermeasures in the event of a hazardous materials spill; and
>
> Objective 5: Participate in regional forums tasked with improving water quality conditions and protecting designated uses in the Columbia River basin.

The WQMP is intended to be compatible with other water quality management plans in the Columbia River mainstem, including TMDLs. Furthermore, the WQMP is intended to be supportive of the HCP, Bull Trout Management Plan, Pacific Lamprey Management Plan, Resident Fish Management Plan, White Sturgeon Management Plan, and Aquatic Nuisance Species Management Plan through the protection of designated uses (WAC 173-201A-600) in Project waters. The WQMP is intended to be not inconsistent with other management strategies of federal, state and tribal natural resource management agencies.

The schedule for implementation of specific measures within the WQMP is based on the best information available at the time the plan was developed. As new information becomes available, the measures proposed in the WQMP may be adjusted through consultation with the Aquatic SWG.

4.0 WATER QUALITY MEASURES

In order to fulfill the goals and objectives described in Section 3.0 of the WQMP, Douglas PUD, in consultation with the Aquatic SWG, has initiated the implementation of the following measures.

4.1 TDG Compliance (Objective 1)

4.1.1 Monitoring

Douglas PUD shall continue to maintain fixed monitoring stations in the forebay and tailrace area of Wells Dam to monitor TDG and barometric pressure. TDG will be monitored hourly during the fish spill season each year. Data from the Wells forebay and tailrace stations will be transmitted on a daily basis to the applicable web-accessible database used by Ecology and regional fish management agencies. Douglas PUD shall maintain this monitoring program consistent with activities described in the then-current Wells GAP (Section 4.1.3).

Douglas PUD shall provide an annual report of all spill (and predicted TDG levels in the tailrace) occurring outside the fish passage season (currently September 1 to March 31).

4.1.1.1 *Progress Towards Meeting Objective 1 in 2024 - Monitoring*

In February 2012, Ecology issued a 401 Certification for Wells Dam consistent with Federal Power Act Requirement for licensing non-federal hydro-projects. Requirements in the District's Clean Water Act Section 401 Certification are consistent with the WQMP. FERC issued a new license for the Wells Project in November 2012. Requirements in the license are consistent with the 401 Certification and the WQMP. Since 2013, hourly and real time data has been made available at all license required monitoring sites. Douglas PUD implements the Ecology-approved Quality Assurance Project Plan (QAPP) for water temperature and TDG monitoring in order to obtain and provide quality data.

In 2024 and consistent with previous years, hourly forebay and tailrace TDG values were reported on the U.S. Army Corps of Engineers Water Management Division webpage and the Columbia River Data Access Real Time webpage, consistent with regional fish management agencies. In addition, data was made available in real-time at www.douglaspud.org in accordance with 401 Certification requirements. Finally, during the calendar year Douglas PUD provided Ecology and the Aquatic SWG in-season reports on water quality.

4.1.2 Spill Operations

Within one year of issuance of the new license, Douglas PUD shall coordinate the annual HCP Project Fish Bypass/Spill Operations Plan with the Aquatic SWG and the GAP, using best available information to minimize the production of TDG during periods of spill. All operations identified within the plan shall require the approval of the Wells HCP CC and the Aquatic SWG in order to ensure that spill operations are aimed at protecting designated uses and complying with the WQS numeric criteria for TDG in the Columbia River at the Project. In consultation

with the Wells HCP CC and Aquatic SWG, the spill operations plan will be reviewed and updated, as necessary.

4.1.2.1 *Progress Towards Meeting Objective 1 in 2024 - Spill Operations*

In early 2024, Douglas PUD developed a 2024 GAP along with the 2024 Bypass Operations Plan (BOP) and coordinated the review of these two documents with the HCP CC and the Aquatic SWG. A draft copy of the 2024 GAP and BOP was provided to the Aquatic Settlement Work Group (Aquatic SWG) on January 9, 2024, to ensure close coordination between the review of the BOP and the GAP. No comments or revisions on the 2024 GAP and BOP were received from Aquatic SWG members prior to approving the final GAP and BOP. Ecology, in accordance with the requirements of the 401 Certification, section 6.7 [2][d]), and the remaining Aquatic SWG members present during the February 14, 2024, Aquatic SWG conference call approved the 2024 GAP and BOP. The CTCR approved the 2024 GAP and BOP on February 14, 2024, by email, in advance of the February 14, 2024, conference call.

The 2024 GAP and BOP were distributed to the HCP CC on January 9, 2024, and was approved by all parties present during the February 27, 2024 HCP CC meeting. The USFWS approved the 2024 GAP and BOP by email, in advance of the February 27, 2024, conference call.

Both plans were filed with the FERC on February 28, 2024, after being approved by Ecology, the NMFS and the USFWS. FERC approved the 2024 GAP and BOP by Order issues April 15, 2024.

4.1.3 Project Gas Abatement Plan and TDG Exemption

Pending Ecology's approval of each subsequent GAP (which provides for the TDG exemption), Douglas PUD shall continue to implement the activities identified within the previously approved plan. Douglas PUD shall submit the GAP to Ecology by February 28th of each year, or on a less frequent basis, as documented by Ecology in writing. Douglas PUD shall submit the GAPs through the term of the new license or until no longer required by Ecology.

The GAP will include the Spill Operations Plan (Section 4.1.2) and will be accompanied by a fisheries management plan and physical and biological monitoring plans. The GAP shall include information on any new or improved technologies to aid in the reduction in TDG.

It is anticipated that: (1) the TDG monitoring activities described in Section 4.1.1 will be adequate for the physical monitoring plan requirement; and (2) the Wells HCP and Aquatic Resource Management Plans in the Aquatic Settlement Agreement with respect to fish passage will be adequate for fish management plans, for the purposes of the GAP. Additional biological monitoring studies for purposes of Gas Bubble Trauma Monitoring may be required.

Douglas PUD shall provide an annual TDG report as required by the Ecology-approved GAP.

4.1.3.1 *Progress Towards Meeting Objective 1 in 2024 - Project Gas Abatement Plan and TDG Exemption*

On February 14, 2024, Ecology approved Douglas PUD's GAP and issued a fish passage TDG adjustment for the 2024 bypass season. Likewise, the Aquatic SWG approved the 2024 GAP and BOP on February 14, 2024, during the February conference call meeting. The HCP CC approved the 2024 GAP and BOP on February 27, 2024, during the February conference call and via email. Douglas PUD submitted the approved 2024 GAP and BOP to the FERC on February 28, 2024. See 4.1.2.1 above for more detail.

The final 2024 GAP required Douglas PUD to monitor TDG in the forebay and tailrace of Wells Dam throughout the entire fish passage season (April – August). The 2024 GAP included Douglas PUD's Spill Playbook for 2024, which serves as the Spill Operations Plan identified above. The Spill Playbook is consistent with methods used at Wells Dam to minimize the production of TDG during differing flow regimes up to 246.0 kcfs of river flow.

Additional details of spill and TDG performance will be provided in the 2024 TDG Annual Report to be filed with Ecology and the FERC in February 2025. The annual TDG report from the 2023 spill season was reviewed and approved by Ecology and the Aquatic SWG on February 14, 2024, and subsequently filed with the FERC on February 22, 2024.

4.1.4 Measures to Address Non-Compliance

Douglas PUD shall report all occurrences of non-compliance with TDG numeric criteria immediately to Ecology for regulatory discretion and to the Aquatic SWG for consideration.

If the Project is found to be consistently out of compliance with TDG at any time during the new license term, Douglas PUD shall, in coordination with the Aquatic SWG, take the following steps:

(A) Evaluate any new reasonable and feasible technologies that have been developed; and

(B) After the evaluation, if no new reasonable and feasible improvements have been identified, propose an alternative to achieve compliance with the standards, such as site-specific criteria, a use attainability analysis, or a water quality offset.

4.1.4.1 *Progress Towards Meeting Objective 1 in 2024 - Measures to Address Non-Compliance*

During the 2024 water year, Douglas PUD provided Ecology periodic TDG and water quality reports through the monthly Aquatic SWG meetings.

In consultation with Ecology and the Aquatic SWG, Douglas PUD addressed both (A) and (B) above through the development of a QAPP (Douglas PUD, 2013a) for TDG and water temperature and a Water Quality Attainment Plan (Douglas PUD, 2013b). Both plans were developed in 2013 as a requirement of the Wells Project 401 Certification and article 401(a) in the FERC license order for Wells Dam. The plans are specifically designed to determine if the Wells Project is in compliance for TDG and what measures will be used to improve or address compliance concerns. Both plans were completed prior to October 31st, 2013, and have been implemented since completion, including in 2024.

As a requirement of the Water Quality Attainment Plan, a 10-year Review is required. A draft of the Total Dissolved Gas Water Quality Attainment Plan Year 10 Report was submitted to Ecology on November 14, 2023, and is currently being collaboratively reviewed by Ecology and Douglas PUD staff. It has been delayed due to an extended vacancy at the Department of Ecology, but it is expected to be finalized in 2025.

4.2 Water Temperature Compliance (Objective 2)

4.2.1 Monitoring

Douglas PUD shall continue to monitor temperature at the Wells Dam forebay and tailrace in conjunction with its TDG monitoring program (currently April 1-September 15). Temperature data from the TDG monitoring program will be recorded hourly and reported daily to regional databases. Water temperatures shall also be monitored at all boundary conditions of the Project (Methow River RM 1.5, Okanogan River RM 10.5, and Columbia River RM 544.5) and in the Well Dam forebay and tailrace as required by the Aquatic SWG.

Douglas PUD shall continue to collect hourly fish ladder temperatures 24 hours a day between May 1 to November 15 (adult passage dates) at Pool No. 39 on the east ladder. Water temperatures shall also be monitored hourly in the auxiliary water supply system and near the east shore of the Wells Dam forebay (bottom, middle, and surface depths) during this same time period.

4.2.1.1 *Progress Towards Meeting Objective 2 in 2024 - Monitoring*

Water temperature monitoring in 2024 was consistent with requirements found in the Wells Project 401 Certification. Douglas PUD collected real time water temperature data at Project boundary locations (Methow and Okanogan River boundary locations and below Chief Joseph Dam) and at Wells Dam. Data was made available at www.douglaspud.org in real time.

Additional information on monitoring is contained within the QAPP filed and approved by the FERC in 2013. Monitoring is consistent with the WQMP, the Wells Project 401 Certification, and the Wells Dam Operating License issued by the FERC. In May of 2024, Douglas PUD submitted an annual Water Temperature Report to Ecology and the FERC as an appendix to the 2023 WQMP Annual Report, which described the monitoring that occurred during the calendar year 2023. The 2024 Water Temperature Report is attached as Appendix A to this 2024 WQMP report. The Water Temperature Report is filed with FERC by May 31st of each year.

4.2.2 Temperature TMDL Development and Implementation

Douglas PUD shall participate in EPA Region 10's water temperature TMDL development for the U.S. portion of the Columbia River, in coordination with the Parties of the Aquatic SWG. Temperature data from the monitoring program at Wells Dam (Section 4.2.1) and software and results of the CE-QUAL-W2 model will be made available to EPA and other entities to assist in the development of the Columbia River temperature TMDL.

Where the measures identified in the TMDL are more protective than other measures in this plan, provisions of the temperature TMDL and implementation plans relevant to the Project and its operations, including specified time frames for implementing improvement measures, shall be implemented at the Project.

If a TMDL is not timely approved by EPA, Ecology may establish an allocation. In this case, Ecology will work with the Aquatic SWG and other interested parties to identify reasonable and feasible measures.

This plan does not exclude the option of the Aquatic SWG to consider modifying the water quality standard through a use attainability analysis or other process.

4.2.2.1 *Progress Towards Meeting Objective 2 in 2024 - Temperature TMDL Development and Implementation*

The EPA transmitted a final TMDL on August 13, 2021 (EPA 2021) to the states of Oregon and Washington for incorporation into their WQMP. The TMDL addresses portions of the Columbia and lower Snake rivers that have been identified by the states of Washington and Oregon as impaired due to temperatures that exceed those states' WQS. Following the publication of a final temperature TMDL, Douglas PUD has begun collaboration with Ecology to implement the TMDL, as required of Douglas PUD by the 401 Certification and WQMP, including participating in a listening session with Ecology staff to provide relevant background information on Wells Dam and its relationship with Columbia River water temperature on January 19, 2022. Douglas PUD continued to work with Ecology on TMDL issues in 2024.

4.2.3 Measures to Address Non-Compliance

Douglas PUD shall report information indicative of non-compliance with water temperature immediately to Ecology for regulatory discretion and to the Aquatic SWG for consideration. Such information may include changes in Project operations likely to increase water temperature or observations inconsistent with related environmental parameters.

If the Project is found to be consistently out of compliance with water temperature at any time during the new license term, Douglas PUD shall, in coordination with the Aquatic SWG, take the following steps:

(A) Evaluate alternative Project operations or any new reasonable and feasible technologies that have been developed; and

(B) After the evaluation, if no new reasonable and feasible improvements have been identified, propose an alternative to achieve compliance with the standards, such as site-specific criteria, a use attainability analysis, or a water quality offset.

4.2.3.1 *Progress Towards Meeting Objective 2 in 2024 - Measures to Address Non-Compliance*

Between July and October, temperatures of the Wells Reservoir portion of the Columbia River often exceed the Washington State WQS. However, water temperature values that exceed the

WQS almost always enter into the Wells Reservoir already out of compliance. The River Basin Model-10 (RBM10) Water Temperature Model included as a part of the Columbia River TMDL shows that the Wells Project has an effect on Columbia River temperature that is either neutral or cooling up to 0.5°C from July - October and contributes 0.1°C of warming during the month of June, when water temperatures in the Wells Project are typically below the WQS. Douglas PUD will continue to work with Ecology to identify and address implementation actions in association with the Water Temperature TMDL. Additional water temperature information can be found in Douglas PUD's 2024 Water Temperature Annual Report appended to this WQMP Report.

4.3 Compliance with Other Numeric Criteria (Objective 3)

Douglas PUD shall report information indicative of non-compliance with other numeric criteria immediately to Ecology for regulatory discretion and to the Aquatic SWG for consideration. This includes existing or developed criteria for toxic substances in water or sediments within Project Boundaries. The Aquatic SWG shall evaluate the information, and, if needed, require Douglas PUD to develop a plan to identify and address Project-related impacts, if any.

After the evaluation, if no reasonable and feasible improvements have been identified, Douglas PUD may propose an alternative to achieve compliance with the standards, such as site-specific criteria, a use attainability analysis, or a water quality offset.

4.3.1.1 *Progress Towards Meeting Objective 3 in 2024 - Compliance with Other Numeric Criteria*

In 2024, no other numeric criteria concerns were observed in the Project Area.

4.4 Spill Prevention and Control (Objective 4)

4.4.1 Spill Prevention and Control Requirements

Douglas PUD shall operate the Project in a manner that will minimize spill of hazardous materials and implement effective countermeasures in the event of a hazardous materials spill. The Project Spill Prevention Control and Countermeasures Plan (SPCC) will be updated pursuant to the FERC requirements and recommendations as provided by Ecology. Douglas PUD shall comply with the updated version(s) of the SPCC.

4.4.1.1 *Progress Towards Meeting Objective 4 in 2024 - Spill Prevention and Control Requirements*

Pursuant to Article 401 of the Wells Project license, Douglas PUD submitted a revised SPCC Plan for the Wells Project to the FERC on December 19, 2018. Section 4.4.1 of the WQMP and Article 401 originally required Douglas PUD to file an SPCC with the FERC within one year of license issuance and following both approval by Ecology and consultation with the parties to the Agreement, NMFS and BIA. Pursuant to this requirement, Douglas PUD filed the new license required SPCC with the FERC on October 15, 2013. The 2013 SPCC was approved by FERC Order on January 24, 2014.

Douglas PUD conducts a review of its Spill Prevention, Control, and Countermeasure (SPCC) plan every five years, making revisions as necessary. The initial review took place in 2018, resulting in an updated SPCC plan that was shared with the Washington State Department of Ecology (Ecology) and filed with the Federal Energy Regulatory Commission (FERC). During the second review in September 2023, the plan was revised to enhance clarity regarding key personnel and systems critical to initiating the SPCC plan, along with updating the contact information for relevant individuals. Ecology was formally notified of this revision on January 3, 2024. The next review of the SPCC plan is scheduled for 2028 to ensure its continued effectiveness.

The Wells Project operates in full compliance with the Spill Prevention and Control requirements outlined in the Water Quality Management Plan (WQMP), 401 Certification, and the FERC license. In 2024, two oil spill incidents occurred, both of which were promptly contained, reported, and documented in accordance with the SPCC plan. The first incident, occurring on March 22, 2024, resulted from a piping failure in one of the generator units, releasing approximately 1 quart of turbine oil into the river. The second incident, occurring between May 1 and 9, 2024, was caused by a missing bolt in the generating unit's runner hub, leading to an estimated release of up to 160 gallons of turbine oil into the river. In both cases, immediate action was taken to contain and mitigate the releases, and all necessary protocols outlined in the SPCC plan were followed to ensure proper documentation and reporting. Copies of the environmental incident/non-compliance reporting forms, which were previously submitted to Ecology, are available upon request.

4.4.2 Participation in the Columbia and Snake River Spill Response Initiative

Douglas PUD shall continue participation in the Columbia and Snake River Spill Response Initiative (CSR-SRI). The CSR-SRI is a collaborative effort made up of local, state, and federal oil spill response community as well as members of industry and was developed to address the immediate need for oil spill preparedness and response in the area along the Columbia and Snake rivers. In addition to participation in the CSR-SRI, Douglas PUD shall continue to operate the Project in accordance with its SPCC (Jacobs 2007).

4.4.2.1 *Progress Towards Meeting Objective 4 in 2024 - Participation in the Columbia and Snake River Spill Response Initiative*

Douglas PUD has been an active participant in the CSR-SRI. The project continues to be operated in a manner that is consistent with the SPCC.

4.4.3 Inspections

For the term or the new license, Douglas PUD shall, upon reasonable notice, allow Ecology staff or representatives access to inspect the Project, including inside the dam, for the purpose of assessing Spill Prevention and Control measures and compliance with Section 4.4.1. Following inspection, Douglas PUD shall address oil and hazardous material prevention and control issues identified by Ecology.

4.4.3.1 *Progress Towards Meeting Objective 4 in 2024 - Inspections*

Douglas PUD allows access to the Project as required and as requested by Ecology. In 2024, Douglas PUD invited Ecology to attend a tour of the dam but no representatives from the agency attended.

4.5 Regional Forums (Objective 5)

4.5.1 Participation in Regional Water Quality Forums

Douglas PUD shall continue its participation in both the Water Quality Team and Adaptive Management Team meetings to address regional water quality issues, including sharing the results from monitoring, measuring, and evaluating water quality in the Wells Project. However, Douglas PUD will not advocate for any water quality measures in regional forums without consulting with the Aquatic SWG.

4.5.1.1 *Progress Towards Meeting Objective 5 in 2024 - Participation in Regional Water Quality Forums*

Consistent with the WQMP, 401 Certification, and Wells Project operating license, during calendar year 2024, Douglas PUD participated in regional water quality forums led by Ecology, the Sovereign Technical Team, U. S. Army Corps of Engineers and other agencies. Specifically, in the spring of 2024, Douglas PUD participated in National Oceanic and Atmospheric Administration's (NOAA) spring river and snowpack forecast webinars (led by the Northwest River Forecast Center). Douglas PUD will continue to participate in regional forums in 2025.

4.5.2 Project Operations

Douglas PUD may, following notice and opportunity for hearing, coordinate the operation of the project, electrically and hydraulically, with other mid-Columbia hydroelectric operations to the extent practicable. Coordinated operations are intended to reduce spill, increase generating efficiencies and thereby reduce the potential for exceedances of the TDG numeric criteria. These coordinated operations should be beneficial to TDG compliance and Aquatic Resources.

4.5.2.1 *Progress Towards Meeting Objective 5 in 2024 - Project Operations*

The Hourly Coordination Agreement expired in June of 2017. Since then, Douglas PUD receives discharge estimates from Bonneville Power Administration (BPA) for the immediate upstream project, Chief Joseph Dam, and these estimates include values for the next day and proceeding six days. The Douglas PUD uses these discharge estimates to inform inflow into the Wells Project. When inflow values are expected to exceed turbine discharge, or when the Douglas PUD has reason to believe that spill is likely, Douglas PUD institutes minimum generation requirements on all participants of the Wells Project. Douglas PUD has the ability to both put minimum generation requirements on the Wells Project directly, as well as enforce and control to these requirements. Douglas PUD generates to whatever minimum generation requirements are on the Wells Project without regard to the signals it receives from its participants, should those signals be less than the required minimum project generation. Further, to maintain

compliance with TDG standards, Douglas PUD also sends its Wells Project discharge estimates to the immediate downstream project, Rocky Reach, operated by Chelan County PUD.

4.6 Reporting

Douglas PUD shall provide a draft annual report to the Aquatic SWG summarizing the previous year's water quality activities and activities proposed for the coming year, in accordance with the WQMP and as determined by the Aquatic SWG. The report will include any decisions, statements of agreement, evaluations, or changes made pursuant to this WQMP. If significant activity was not conducted in a given year, Douglas PUD may prepare a memorandum providing an explanation of the circumstances in lieu of the annual report. A summary of monitoring results, any analyses and compliance with the WQS numeric criteria will be included in an appendix to the annual report.

4.6.1 *Progress Towards Meeting Annual Reporting Requirements*

In addition to the reporting requirements found within the Aquatic Settlement Agreement requiring the submission of annual reports for all six of the management plans including the WQMP, Article 406 of the FERC license for the Wells Project also requires Douglas PUD to submit annual reports detailing the implementation of each of the six Aquatic Settlement Agreement management plans. This report is intended to satisfy those reporting requirements associated with the new license for the Wells Project.

4.6.2 Study Plans

Douglas PUD shall prepare study plan(s) that include QAPP(s) for each parameter to be monitored. The QAPPs shall follow the Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies (July 2004 Ecology Publication Number 04-03-030) or its successor. The QAPPs shall contain, at a minimum, a list of parameter(s) to be monitored, a map of sampling locations, and descriptions of the purpose of the monitoring, sampling frequency, sampling procedures and equipment, analytical methods, quality control procedures, data handling and data assessment procedures and reporting protocols.

Douglas PUD shall review and update the QAPPs annually based on a yearly review of data and data quality. Ecology may also require future revisions to the QAPP based on monitoring results, regulatory changes, changes in Project operations, and/or the requirements of TMDLs.

The initial QAPPs and any changes shall be submitted to the Aquatic SWG for review and are subject to approval by Ecology. Implementation of the monitoring program shall begin upon Ecology's written approval of the QAPP, unless otherwise provided by Ecology.

4.6.2.1 *Progress Towards Meeting Objective 5 in 2024 - Study Plans*

No new QAPPs were developed in 2024 since no new monitoring was conducted. The QAPP developed and approved in 2013 for water temperature and TDG monitoring was used in 2024 as a guiding document to implement water quality monitoring in and around the Wells Project.

5.0 REFERENCES

Douglas PUD and Columbia Basin Environmental (CBE). 2009. 2009 Turbidity Monitoring on the Okanogan River. Data collected by Columbia Basin Environmental for Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.

Douglas PUD. 2013a. Quality Assurance Project Plan for Water Temperature and Total Dissolved Gas. Wells Hydroelectric Project. FERC Project 2149. Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.

Douglas PUD. 2013b. Water Quality Attainment Plan for the Wells Hydroelectric Project. FERC Project 2149. Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.

Jacobs Engineering. 2007. Wells Hydroelectric Project: Spill Prevention Control and Countermeasure (SPCC) Plan. Prepared by Jacobs Engineering, Bellevue, WA. Prepared for Public Utility District No. 1 of Douglas County, East Wenatchee, WA.

National Marine Fisheries Service (NMFS). 2000. Endangered Species Act – Section 7 Consultation: Biological Opinion. Consultation on Remand for Operation of the Columbia River Power System and 19 Bureau of Reclamation Projects in the Columbia Basin. F/NWR/2004/00727. November 30, 2005. Pages 5-6, 5-7, 5-53, 10-9, and Appendix E: Risk Analysis.

Parametrix, Inc. 2009. Continued monitoring of DO, pH, and turbidity in the Wells forebay and lower Okanogan River (DO, pH, and Turbidity Study). Wells Hydroelectric Project, FERC No. 2149. Initial Study Report required by FERC. Prepared for Public Utility District No. 1 of Douglas County. East Wenatchee, WA.

Pickett, P., H. Rueda, M. Herold. 2004. Total Maximum Daily Load for Total Dissolved Gas in the Mid-Columbia River and Lake Roosevelt. Submittal Report. Washington Department of Ecology, Olympia, WA. U.S. Environmental Protection Agency, Portland, OR. June 2004. Publication No. 04-03-002.

Politano, M., A. Arenas Amado, and L. Weber. 2008. An investigation into the total dissolved gas dynamics of the Wells Project (Total Dissolved Gas Investigation): Wells Hydroelectric Project, FERC No. 2149. Initial Study Report required by FERC. Prepared for Public Utility District No. 1 of Douglas County. East Wenatchee, WA.

Politano, M., A. Arenas Amado, and L. Weber. 2009a. An investigation into the total dissolved gas dynamics of the Wells Project (Total Dissolved Gas Investigation): Wells Hydroelectric Project, FERC No. 2149. Updated Study Report required by FERC. Prepared for Public Utility District No. 1 of Douglas County. East Wenatchee, WA.

Politano, M., A. Arenas Amado, and D. Hay. 2009b. Total dissolved gas modeling and compliance evaluation for the Wells Hydroelectric Project. Prepared for Public Utility District No. 1 of Douglas County. East Wenatchee, WA.

U.S. Environmental Protection Agency (EPA). 2021. Columbia and Lower Snake Rivers Temperature Total Maximum Daily Load. Available online at https://www.epa.gov/columbiariver/tmdl-temperature-columbia-and-lower-snake-rivers.

West Consultants, Inc. 2008. Development of a water temperature model relating Project operations to compliance with the Washington State and EPA water quality standards (Water Temperature Study). Wells Hydroelectric Project, FERC No. 2149. Initial Study Report Required by FERC. Prepared for Public Utility District No. 1 of Douglas County. East Wenatchee, WA.

APPENDIX A

2024 WATER TEMPERATURE ANNUAL REPORT

WELLS HYDROELECTRIC PROJECT

FERC NO. 2149

March 2025

Prepared by:

Public Utility District No. 1 of Douglas County
East Wenatchee, WA

Prepared for:
Washington Department of Ecology
Yakima, WA

© 2025. Public Utility District No. 1 of Douglas County. All Rights Reserved.

1.0 INTRODUCTION

The Wells Hydroelectric Project (Wells Project or Project) is owned and operated by the Public Utility District No. 1 of Douglas County (Douglas PUD). On November 9, 2012, Douglas PUD received a new 40-year license for the Wells Project from the Federal Energy Regulatory Commission (FERC). During the FERC licensing process, Douglas PUD submitted to the Washington Department of Ecology (Ecology), an application for a 401 Water Quality Certification (401 Certification) on September 30, 2010, pursuant to the provisions of 33 USC §1341 (§401 of the Clean Water Act [CWA]). On September 12, 2011, Douglas PUD withdrew its request and reapplied. On February 27, 2012, Ecology concluded that the Wells Project, as conditioned by its 401 Certification/Order No. 8981, complied with all applicable provisions of 33 USC 1311, 1312, 1313, 1316, 1317 and appropriate requirements of Washington State law (Ecology 2012).

Pursuant to the Wells Project License Order and the 401 Certification Douglas PUD is required to maintain compliance with the state Water Quality Standard (WQS) for water temperature through continued implementation of a monitoring program (Ecology 2012). In addition, Douglas PUD is required to prepare an annual report of the monitoring results and analyses for submittal by May 31 of the following year. The May 31 deadline is a refinement from the original annual deadline of April 30. This deadline was modified at the request of Douglas PUD and the Aquatic SWG and approved by the FERC.

This annual report summarizes water temperature activities implemented at the Wells Project in 2024. Background activities including the Project description, regulatory framework, past Wells Project temperature activities, and 401 Certification temperature requirements are presented in Section 2.0. Implementation results for 2024 are presented in Section 3.0 and include the implementation of an Ecology-approved Quality Assurance Project Plan (QAPP) for water temperature, and the results of water temperature monitoring activities within the Wells Project.

2.0 BACKGROUND

2.1 Project Description

The Wells Project is located at river mile (RM) 515.6 on the Columbia River in the State of Washington. Wells Dam is located approximately 30 river miles downstream from the Chief Joseph Dam, owned and operated by the U.S. Army Corps of Engineers (USACE), and 42 miles upstream from the Rocky Reach Dam, owned and operated by Public Utility District No. 1 of Chelan County (Chelan PUD). The nearest town is Pateros, Washington, which is located approximately 8 miles upstream from the Wells Dam.

The Wells Project is the chief generating resource for Douglas PUD. It includes ten generating units with a nameplate rating of 832,320 kW and a peaking capacity of approximately 840,000 kW. The design of the Wells Project is unique in that the generating units, spillways, switchyard, and fish passage facilities were combined into a single structure referred to as the hydrocombine. Fish passage facilities reside on both sides of Well Dam, which is 1,130 feet long, 168 feet wide, with a crest elevation of 795 feet in height. The juvenile fish bypass system (JBS) was developed

by Douglas PUD and uses a barrier system to modify the intake velocities on all even numbered spillways (2, 4, 6, 8 and 10).

The Wells Reservoir is approximately 30 miles long. The Methow and Okanogan rivers are tributaries of the Columbia River within the Wells Reservoir and the Wells Project boundary extends approximately 1.5 miles up the Methow River and approximately 15.5 miles up the Okanogan River. The normal maximum surface area of the reservoir is 9,740 acres with a gross storage capacity of 331,200 acre-feet and usable storage of 97,985 acre-feet at elevation of 781 feet above mean sea level (msl). The normal maximum water surface elevation of the reservoir is 781 feet (Figure 1).

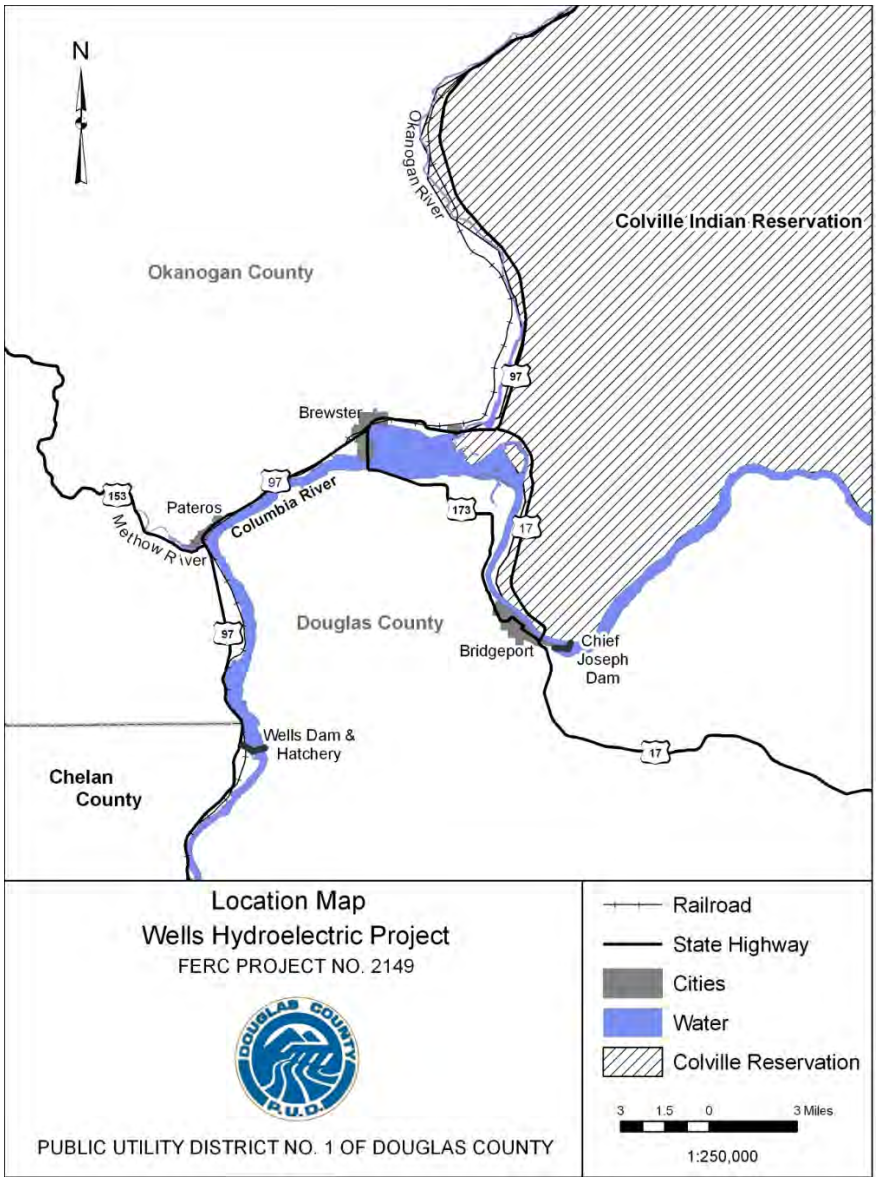


Figure 1. Location Map of the Wells Project.

2.2 Regulatory Framework

2.2.1 Temperature Water Quality Standard

In Washington State, compliance with the surface water temperature standard is measured by the 7-day average of the daily maximum temperatures (7-DADMax). The 7-DADMax for any individual day is calculated by averaging that day's daily maximum temperature with the daily maximum temperatures of the three days prior and the three days after that date (WAC 173-201A-020).

Under the Washington State WQS, the 7-DADMax temperature within the Columbia, Methow, and Okanogan River portions of the Wells Project shall not exceed 17.5°C (63.5°F) (WAC 173-201A-602 and 173-201A-200(1)(c)). When a water body's temperature is warmer than 17.5°C (or within 0.3°C (0.54°F) of the criteria) and that condition is due to natural conditions, then human actions considered cumulatively may not cause the 7-DADMax temperature of that water body to increase more than 0.3°C (0.54°F).

In addition to the numeric criteria above, the WQS contains additional supplemental temperature requirements for the Project portion of the Methow River (i.e., Methow River Supplemental Requirements). Ecology has identified water bodies, or portions thereof, which require special protection for spawning and incubation of fish in accordance with Ecology publication 06-10-038. This publication indicates where and when the following criteria are to be applied to protect the reproduction of native char, salmon, and trout. Water temperatures are not to exceed 13°C from October 1 to June 15 (generally fall through spring) in the lower Methow River including the portion within the Project boundary (up to RM 1.5).

2.2.2 305(b) Report, 303(d) List and Total Maximum Daily Loads

Every two years, the Environmental Protection Agency (EPA), as specified in section 305(b) of the CWA, requires Ecology to compile an assessment of the State's water bodies. Data collected from the water quality assessment are used to develop a 305(b) report. The report evaluates and assigns each water body into five categories based upon the Ecology's evaluation of the water quality parameters collected from within each water body.

(1) Category 1 states that a water body is in compliance with the State WQS for the parameter of interest.
(2) Category 2 states a water body of concern.
(3) Category 3 signifies that insufficient data are available to make an assessment.
(4) Categories 4a-4c indicates an impaired water body that does not require a Total Maximum Daily Load (TMDL) for one of three reasons:

- Category 4a indicates a water body with a finalized TMDL.
- Category 4b indicates a water body with a Pollution Control Program.
- Category 4c indicates a water body impaired by a non-pollutant (e.g., low water flow, stream channelization, and dams).

(5) Category 5 represents all water bodies within the State that are considered impaired and require a Water Quality Implementation Plan (WQIP) (formerly TMDL). The 303(d) list consists of only water bodies with Category 5 listings.

For temperature, the reach of the Columbia River within the Project is on the State's 2018 303(d) list for temperature impairment. The EPA approved Ecology's 2018 submittal of the latest Water Quality Assessment 305(b) report and 303(d) list on August 26, 2022. The 2018 submittal and assessment fulfills Washington State's obligation under the federal CWA §303(d) and §305(b) to identify polluted waters (known as the 303(d) list) as well as report on the status of water quality statewide where data is available.

The reach of the Methow River within the Project (RM 1.5) is not on the 2018 303(d) list for temperature. Slightly upstream of project boundary however, the Methow River is listed as a category 5 and 303(d) listed since samples taken between July 7, 2010, and September 30, 2010, showed that the 7-DADMax exceeded the criterion for this waterbody (17.5°C) on 41 of 86 days (48%).

The reach of the Okanogan River within the Project (RM 15.5) is listed as a 305(b) and category 2 for temperature. The listing is a result of one sample in 2002 that showed excursions of the criteria 17.5°C for this waterbody. However, annual reporting conducted by Douglas PUD and the U.S. Geological Survey (USGS) shows that incoming temperatures at the Project boundary in the Okanogan River routinely exceed the 17.5°C standard in the summer months and therefore is a result of loading that occurs in water prior to entry in the Project area.

On May 18, 2020, EPA issued for public review and comment the TMDL for temperature on the Columbia and lower Snake rivers. The TMDL addressed portions of the Columbia and lower Snake rivers that have been identified by the states of Washington and Oregon as impaired due to temperatures that exceed those states' WQS. Douglas PUD responded to a public comment period via letter during the comment window of May 21 through August 20, 2020 (extended from July 21). Douglas PUD's large concern was that incoming water temperatures from Canada and the Federal Columbia River Power System (FCRPS) above Wells Project are already above state WQS for water temperature and modeling within the TMDL and CE-QUAL-W2 model completed by Douglas PUD during relicensing studies shows that the Wells Project is not an additive non-point source thermal polluter in all action months besides June where the project provides modest warming of up to 0.1°C. In fact, EPA's modeling showed that Wells Project provided a cooling effect to incoming water during September and October to a greater effect than the June warming (EPA 2020).

On August 13, 2021, EPA transmitted the re-issued TMDL to the states of Oregon and Washington for incorporation into their current water quality management plans (WQMP). The TMDL addresses the water temperature effects of dams and other human actions, including model analyses and load allocations for mainstem hydroelectric projects including Wells Dam. As Ecology formulates a plan for implementation of the TMDL, Douglas PUD will continue to comply with all pertinent regulatory requirements.

2.3 Wells Project Water Temperature Activities

2.3.1 Wells Reservoir and Tributaries

Beginning in 2001, an extensive water temperature monitoring effort was initiated by Douglas PUD in order to better understand the temperature dynamics throughout the Wells Reservoir. Temperature data was collected by Douglas PUD at four locations in the Columbia River (RM 544.5, RM 535.3, RM 530.0, and RM 515.6) and at one site each on the Okanogan (RM 10.5) and Methow (RM 1.4) rivers. Data collected by Douglas PUD were collected hourly using Onset© Tidbit temperature loggers. Monitoring start and end dates varied from year to year but generally began in the early spring and ended in late fall. Quality assurance and control measures were implemented prior to deploying and upon retrieving temperature loggers to ensure that data collected was accurate.

The 7-DADMax temperature data recorded since 2001 indicates that the portion of the Columbia River upstream of and within the Project generally warms to above 17.5ºC (WQS numeric criteria) in mid-July and drops below the numeric criterion by early October. Temperatures in the Methow River upstream of the Project warm to above 17.5ºC in mid-July and drop below the numeric criterion by September, while trends in the Okanogan River upstream of the Project indicate warming above 17.5ºC starting in early June with cooling below the criteria by late September.

To assess compliance with the state WQS for temperature (during the Wells Project FERC relicensing process), two 2-dimensional laterally-averaged temperature models (using CE-QUAL-W2) were developed that represented existing (or "with Project") conditions and "without Project" conditions of the Wells Project, including the Columbia River from the Chief Joseph Dam tailrace to Wells Dam, the lowest 15.5 miles of the Okanogan River, and the lowest 1.5 miles of the Methow River. The results were processed to develop daily values of the 7-DADMax, and then compared the two conditions.

The model analyses demonstrated that "with Project" temperatures in the Columbia, Okanogan and Methow rivers do not increase more than 0.3ºC compared to ambient ("without Project") conditions anywhere in the reservoir, and that the Project complies with the state WQS for temperature (West Consultants Inc. 2008). However, as identified in the Wells Project 401 Certification, a full evaluation of potential temperature impacts of hydroelectric power generation on the Columbia River will most likely require analysis of hydraulic and temperature conditions on a system-wide basis (See EPA's TMDL above).

Importantly, the Wells Project is a "run-of-river" Project with limited storage capacity. For example, the Grand Coulee Project has more than 50 times the storage when compared to the Wells Project. Wells Reservoir has an operating range of 771-781 feet above sea level and inflows on a given day approximate outflow volumes. Water particle transport time from Chief Joseph Dam to Wells Dam is 39.4-37.0 hours under moderate 111 kcfs flows (GeoEngineers Technical Memo 2009), and therefore water has very limited time to take up thermal load. Taking storage, operations, and particle transport time together, the Wells Project temperature

profile mimics the profile of combined inflow temperatures when accounting for input volume (Methow, Okanogan and Columbia River conditions).

2.3.2 Wells Dam Fish Ladders

According to the terms and conditions found in the Biological Opinion (BO) supporting the implementation of the Wells Anadromous Fish Agreement and Habitat Conservation Plan (HCP) all entities that use the fish ladder trapping facilities at Wells Dam are required to monitor the water temperatures within the ladders every two hours from May 1 to November 15 and to discontinue trapping operations when fish ladder water temperatures exceed 69.8ºF (21.0°C). In 2001, Douglas PUD added supplemental temperature recording equipment at Pool 39 near the broodstock collection facilities in the east fishway at Wells Dam to ensure compliance with requirements in the National Marine Fisheries Service (NMFS) HCP BO. In 2001 and 2002, hourly data indicated that water temperatures at this location in the east fish ladder did not exceed 69.8º F (21.0°C) at any time during the monitoring period, which ran from late July to early December.

2.4 401 Certification Temperature Requirements

The Wells Project 401 Certification requires that Douglas PUD maintain compliance with the state WQS for water temperature (via citation of the Wells Project Water Quality Management Plan [Douglas PUD 2008]) by monitoring water temperature at various Wells Project locations at certain times of the year and transmitting these data on a daily basis to a web-accessible database. Specific 401 Certification requirements include:

1. Prepare a QAPP for each water quality parameter to be monitored. QAPPs shall follow the Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies (July 2004 Ecology Publication Number 04-03-030).

2. Monitor water temperatures at three boundary locations of the Wells Project (Methow River RM 1.5, Okanogan River RM 10.5, and Columbia River RM 544.5) and in the Well Dam Forebay and Tailrace on an hourly basis, from April 1st to October 31st.

3. Continue to collect hourly fish ladder temperatures 24 hours a day during the upstream fish passage season (currently May 1 to November 15) at the Wells Dam East Fishway Pool No. 39[1].

4. Monitor water temperatures hourly in the auxiliary water supply system and near the east shore of the Wells Dam Forebay (bottom, middle, and surface depths) during the upstream fish passage season (May 1 to November 15).

5. Transmit hourly temperature data on a daily basis to a web-accessible database maintained by Douglas PUD and available to Ecology, regional fish management agencies, and the public.

[1] Douglas PUD monitors water temperatures in the Wells Dam fishways during trapping periods in order to remain in compliance with hatchery permitting.

6. Develop an annual report of the monitoring results and analyses, in a format approved by Ecology, and submit it by April 30 of the following year[2].

3.0 IMPLEMENTATION RESULTS

3.1 Quality Assurance Project Plan

As required by the 401 Certification section 6.7(7)(a)(i), Douglas PUD developed a Wells Project QAPP for water temperature and total dissolved gas (TDG) (Douglas PUD 2013). The QAPP describes a systematic approach for collecting high quality and reliable data that may be used to determine compliance of these parameters with the State of Washington's WQS for the Wells Project. With regard to temperature, the QAPP contains a map of sampling locations, descriptions of the purpose of monitoring, sampling frequency, sampling procedures and equipment, analytical methods, quality control procedures, data handling and data assessment procedures and reporting protocols (Douglas PUD 2013). The QAPP was provided to Ecology for review on March 4, 2013, and subsequently approved. Douglas PUD submitted the QAPP to the FERC on June 21, 2013, which issued an order approving the QAPP on August 8, 2013.

3.2 Temperature Monitoring Equipment

3.2.1 Equipment Acquisition

Prior to the issuance of a new Wells Project FERC License, Douglas PUD collected temperature data using Onset© Tidbit temperature loggers (see Section 2.3.1 above), which were programmed to collect hourly data year-round and required retrieval in order to download and report data. Douglas PUD retrieved and downloaded loggers two to four times a year depending upon river conditions and access.

Per the Wells Project 401 Certification section 6.7(3)(a)(iii), hourly temperature data was required to be transmitted to a web-accessible database maintained by Douglas PUD and available to Ecology, regional fish management agencies, and the public. To meet the daily data transmission requirement, Douglas PUD applied for and received permits, before acquiring and subsequently installing new temperature monitoring equipment. At each temperature monitoring location, equipment consists of a Design Analysis H-377 temperature sensor, Sutron GOES radio/logger, GOES satellite antenna and cable, 20-watt solar panel, and voltage regulator. On shore housing includes a National Electrical Manufacturers Association enclosure, 12-volt sealed lead-acid battery, galvanized pipe, flex conduit, fittings, and other hardware (Figure 2). The system consists of a sensor connected to a communications box with wireless modem access. Data is collected hourly and sent wirelessly and uploaded to Douglas PUD's publicly available webpage in real-time. The system is powered by battery and charged using a solar panel (Douglas PUD 2013).

[2] Although the 401 Certification required reporting to be completed by April 30th each year the FERC issued an Order dated February 24, 2017, changing the reporting deadline to May 31st of each year.

Figure 2. **Remote water temperature station that sends data in real-time using GOES satellite link.**

3.2.2 Equipment Installation

Consistent with 401 Certification section 6.7(3)(a)(i-iii), remote water temperature sensors were installed at eight locations in the Wells Project during 2013 and have been collecting seasonal data since then. Locations and required durations of monitoring include:

April 1st to October 31st:

1. Methow River, RM 1.5 - Project Boundary
2. Columbia River, RM 544.5 - Chief Joseph Dam Tailrace
3. Okanogan River, RM 10.5 - Project Boundary
4. Wells Dam Forebay (data from MS5 TDG sensor)
5. Wells Dam Tailrace (data from MS5 TDG sensor)

May 1st to November 15th:

6. Wells Dam East Fishway, Pool No. 39
7. Wells Dam Auxiliary Water Supply
8. Wells Dam Forebay (at three depths)

Temperature monitoring locations are illustrated in Figures 3 through 6.

Figure 3. **Temperature monitoring at and around Wells Dam (graduated green circles are intended to show surface, middle and deep depths).**

Figure 4. **Methow River temperature monitoring location (RM 1.5). The location of the sensor is approximated by the green circle.**

Figure 5. **Okanogan River temperature monitoring location (RM 10.5). The location of the sensor is approximated by the green circle.**

Figure 6. **Chief Joseph Tailrace temperature monitoring location (Columbia River RM 544.5). The location of the sensor is approximated by the green circle.**

In May of 2013, Douglas PUD entered into a Joint Funding Agreement with the USGS to install and maintain remote water temperature equipment at four of the eight monitoring locations including the Wells Dam Forebay (three depths), the Methow River, the Okanogan River, and the Chief Joseph Dam Tailrace. The Wells Dam Forebay and Tailrace sensors are maintained by Columbia Basin Environmental (these sensors collect both temperature and TDG data year-round) but data is managed by Douglas PUD. The remaining two locations (Wells Dam East Fishway and Wells Dam Auxiliary Water Supply) were installed and are maintained by Douglas PUD.

Following approval of the QAPP, securing required permits, and equipment acquisition, the USGS began installation of temperature sensors at four locations. The Chief Joseph Dam Tailrace and Okanogan River sensors were installed in July 2013 and the Methow River and Wells Forebay locations were completed in October 2013. The Wells Dam Forebay and Tailrace sensors began collecting data on April 1, 2013, after being calibrated and installed by Columbia Basin Environmental. Douglas PUD installed sensors at two locations; the Wells Dam East Fishway and Auxiliary Water Supply, these stations were upgraded and installed respectively during the month of October 2013.

In October 2013, Douglas PUD launched a new website where hourly temperature data is transmitted daily and is publicly accessible. This webpage provides a link to all real-time temperature data at https://douglaspud.org/environmental-stewardship/for-regulatory-agencies/total-dissolved-gas-and-temperature-monitoring/. In addition, historic water temperature data is available from this website.

3.3 Temperature Data Results

Temperature data from new equipment was available towards the end of the compliance year 2013. As such, water temperature monitoring using Tidbit sensors from Onset© was discontinued by the end of 2013. The 2024 annual report consists exclusively of data from the wireless transmitting temperature equipment installed in 2013. Generally, peak summer water temperatures were consistent with the 15-year water temperature profile (2008-2024).

In all subsequent figures, horizontal lines at 17.5 or 13°C illustrate 7-DADMax thresholds, aside from Figure 14 where the 21°C trapping threshold is denoted (see section 3.3.8).

3.3.1 Chief Joseph Dam Tailrace

The Chief Joseph Dam Tailrace temperature sensor location is at RM 544.5 on the left bank (looking downstream) of the Columbia River near the town of Bridgeport, WA. This station provides data for water temperatures entering the Wells Project area from the FCRPS above Wells Dam and represents the majority of incoming flows, small tributary inputs include the Okanogan and Methow rivers. Water temperature data at the Chief Joseph Dam tailrace is collected from April 1 to October 31. 7-DADMax temperature values at this location were above the WQS numeric criteria (17.5°C) from August 2, 2024, to October 20, 2024 (Figure 7).

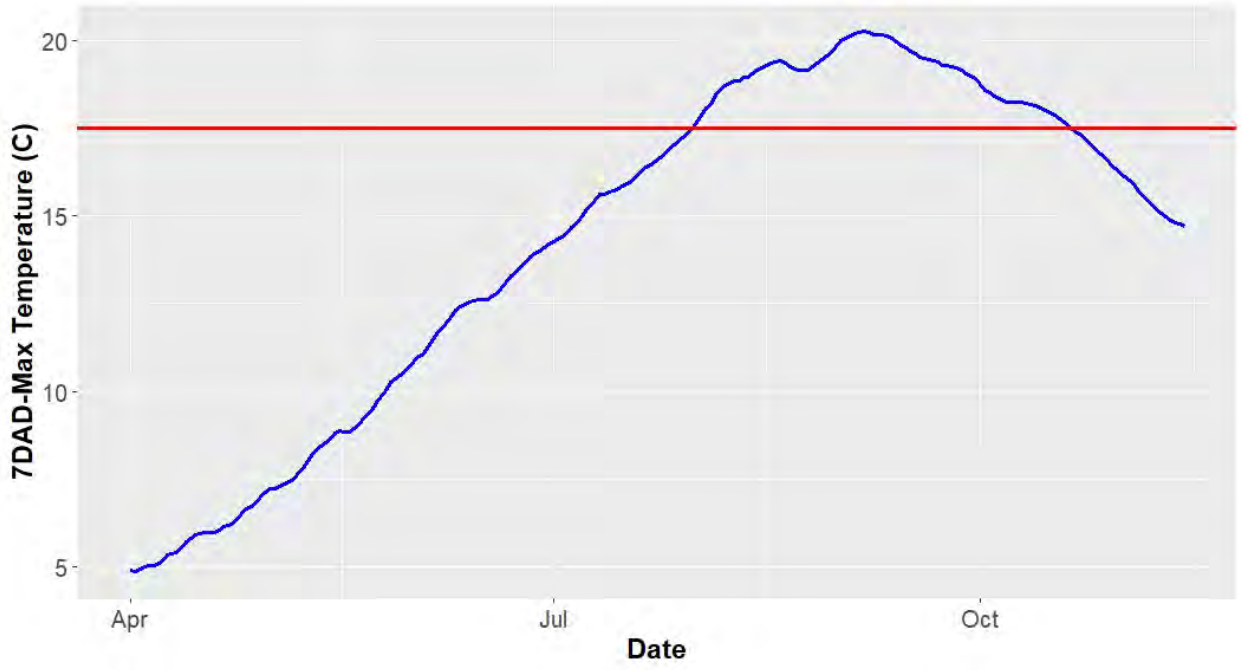


Figure 7. 2024 water temperature data collected in the Chief Joseph Tailrace at RM 544.5. Horizontal reference line indicates the 17.5°C WQS.

3.3.2 Okanogan River Boundary

The Okanogan River boundary monitoring location is at RM 10.5. This station is located upstream of the influence of the Wells Project and as such is representative of natural temperature conditions for the Okanogan River. Per requirements, water temperature is gathered at this location from April 1 to October 31 of each year and is generally indicative of incoming water temperature conditions to the Wells Project at this location. The USGS maintains operations of this sensor. 7-DADMax temperature values at this location were above the WQS numeric criteria (17.5°C) from June 8, 2024 to June 15, 2024, and June 22, 2024 to September 27, 2024, although it is likely that it may have exceeded 17.5°C between June 16 and 21, 2024 as well, but equipment malfunctions prevented data collection (Figure 8).

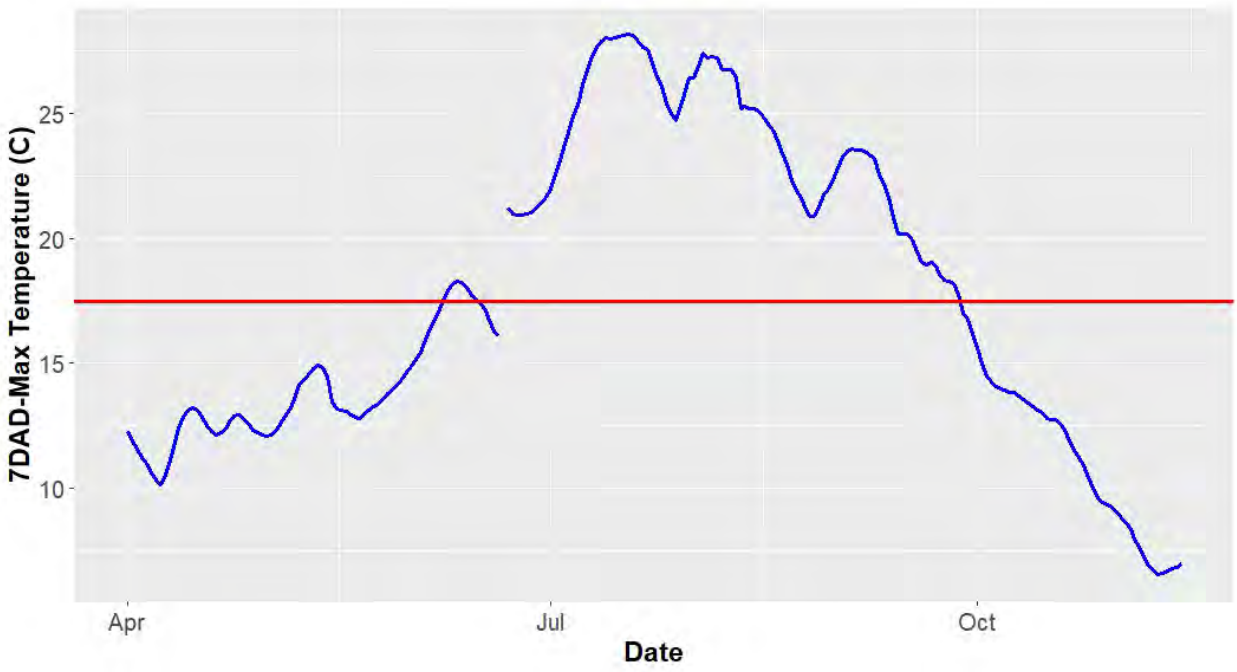


Figure 8. 2024 water temperature data collected in the Okanogan River Boundary at RM 10.5. Horizontal reference line indicates the 17.5°C WQS.

3.3.3 Methow River Boundary

The Methow River boundary monitoring location is at RM 1.5 on the left bank near Pateros, WA. This station is located upstream of Project influence and, as such, is representative of natural temperature conditions for the Methow River. Water temperature data is required to be collected from April 1 to October 31 and is indicative of incoming water temperature conditions to the Wells Project at this location. In addition to the WQS numeric criteria of 17.5°C, Ecology has identified this portion of the Methow River as requiring special protection for spawning and incubation in accordance with Ecology publication 06-10-038. This publication indicates where and when the following criteria are to be applied to protect the reproduction of native char, salmon, and trout. In the lower Methow River water temperatures are not to exceed 13°C from October 1 to June 15. During 2024, the natural flowing Methow River had daily average water temperatures that were at or above 13°C during two time periods: June 5, 2024 through June 15, 2024 and October 1 and 2, 2024. 7-DADMax temperature values at this location were above the WQS numeric criteria (17.5°C) from July 1, 2024, and September 23, 2024 (Figure 9).

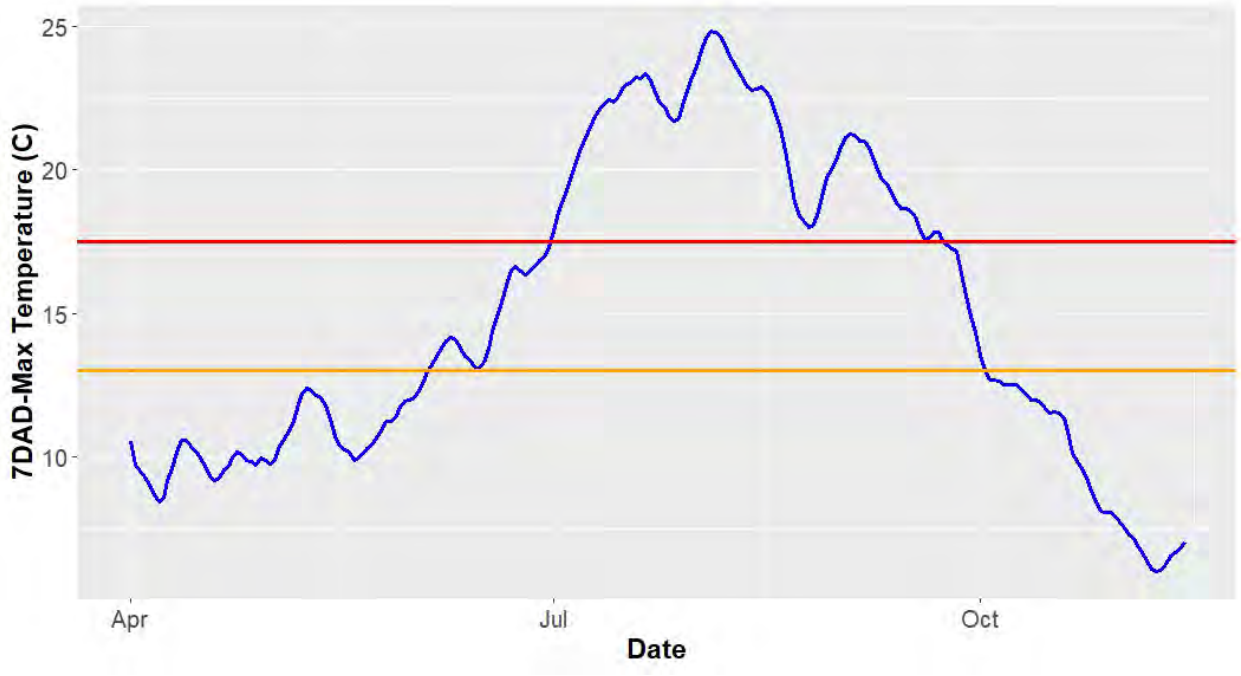


Figure 9. 2024 water temperature data from the Methow River Boundary at RM 1.5. Red reference line indicates the 17.5°C WQS. Criterion of 13°C applies only from October 1 - June 15 each year (bottom orange reference line).

3.3.4 Wells Dam Forebay

The Wells Dam Forebay location, where temperatures are required to be collected hourly from April 1 to October 31 of each year, is located on the face of pier nose 6 at Wells Dam. During the monitoring year, Columbia Basin Environmental maintained operation of this sensor (collects both temperature and TDG) and Douglas PUD managed the data. 7-DADMax temperature values at this location were above the WQS numeric criteria (17.5°C) from July 28, 2024, to October 17, 2024 (Figure 10), which is generally consistent with historic Wells Project temperature monitoring data.

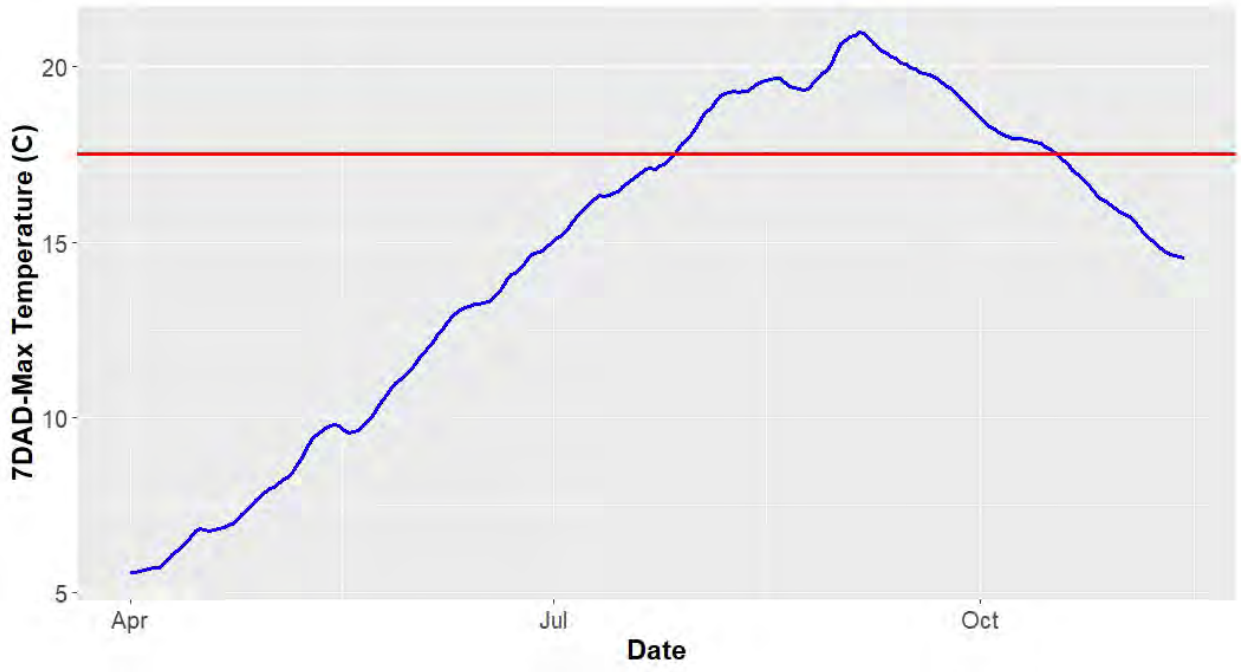


Figure 10. 2024 water temperature data collected in the Wells Dam Forebay at pier nose 6. Horizontal reference line indicates the 17.5°C WQS.

3.3.5 Wells Dam Tailrace

The Wells Dam Tailrace location, where temperatures are required to be collected hourly from April 1 to October 31 of each year, is located approximately two miles downstream of Wells Dam on the left bank of the river. During the monitoring year, Columbia Basin Environmental maintained operations of this sensor (collects both temperature and TDG) and Douglas PUD managed the data. 7-DADMax temperature values at this location were above the WQS numeric criteria (17.5°C) from July 29, 2024, to October 17, 2024 (Figure 11), which is generally consistent with historic Wells Project temperature monitoring data. The daily differences between forebay and tailrace water temperatures were within instrumentation error on most days, implying that, as in past years, Project operations had no recordable influence on 7-DADMax temperatures.

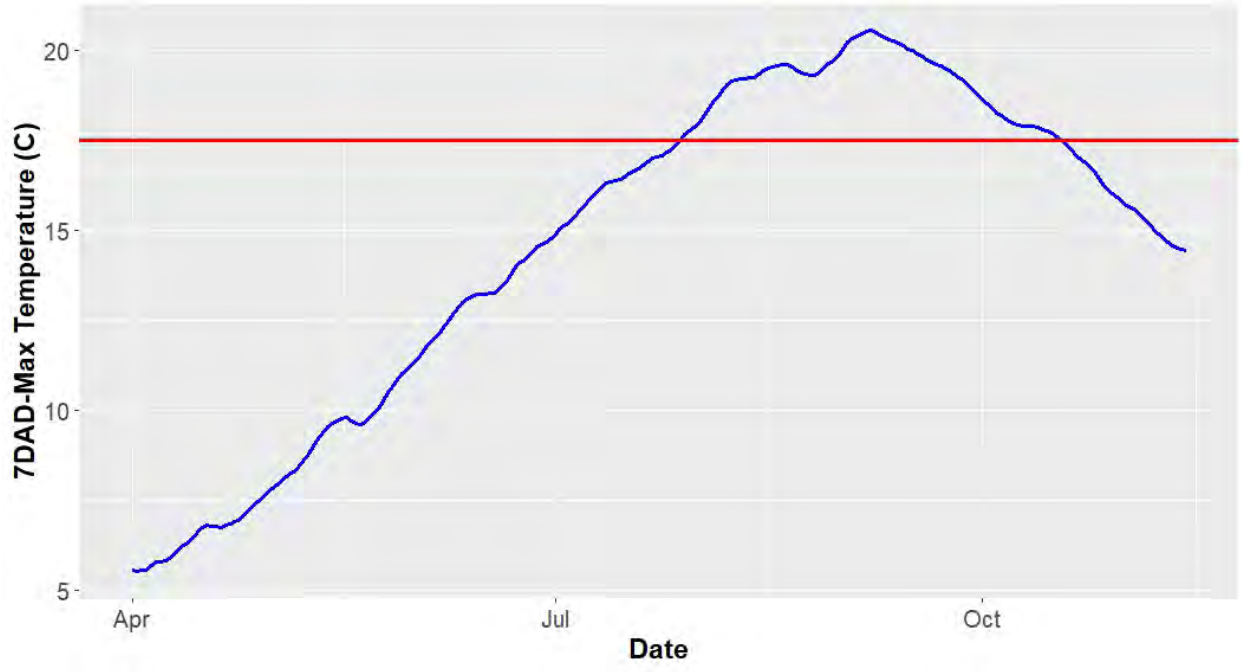


Figure 11. 2024 water temperature data collected in the Wells Dam Tailrace. Horizontal reference line indicates the 17.5°C WQS.

3.3.6 Wells Dam Forebay Multiple Depth Requirement

The Wells Dam Forebay temperature monitoring location is at RM 515.8. Monitoring at this location is required between May 1 and November 15. Temperature data is collected at three depths to provide temperature profiles throughout the water column at this location. Sensors are located near the surface (<2m depth), mid-water column (approximately 10m), and near bottom (>30m). Data obtained from 2013-2024 show that thermal stratification does not occur at this location despite small differences in 7-DADMax observations.

7-DADMax temperature values at this location were above the WQS numeric criteria (17.5°C) starting on July 28, 2024 (for the near surface and mid-water locations) and July 29, 2024 (for near bottom sensors) and ending on October 18, 2024, at all sensors (Figure 12). During this period, the differences between 7-DADMax temperatures between surface, middle, and bottom sensors ranged between 0.0 and 0.4°C. The largest average difference between these three depths was 0.12°C (between the middle and bottom sensors). These data confirm that consistent with previous years the Wells Project forebay does not thermally stratify.

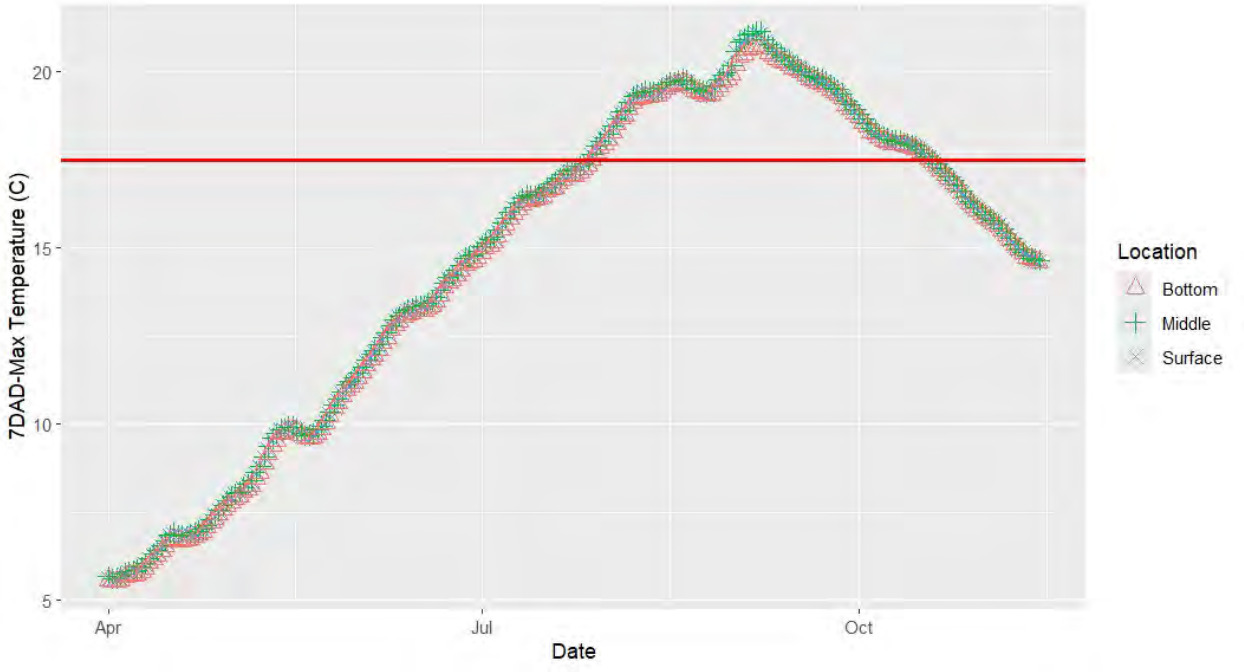


Figure 12. 2024 water temperature data collected in the Wells Dam Forebay at three depths. Temperature profiles show the lack of stratification in this location during this period. Horizontal reference line indicates the 17.5°C WQS.

3.3.7 Wells Dam Auxiliary Water Supply

The Wells Dam auxiliary water supply location is within the lower west fishway adjacent to the collection gallery. Water from this location originates from the tailrace and is used to provide additional water for the lower 22 pools of the fishway including the fish collection gallery (Douglas PUD 2001). Monitoring at this location is required between May 1 and November 15. Results indicate that temperatures were above the 7-DADMax (17.5°C) from July 27, 2024, to October 20, 2024 (Figure 13).

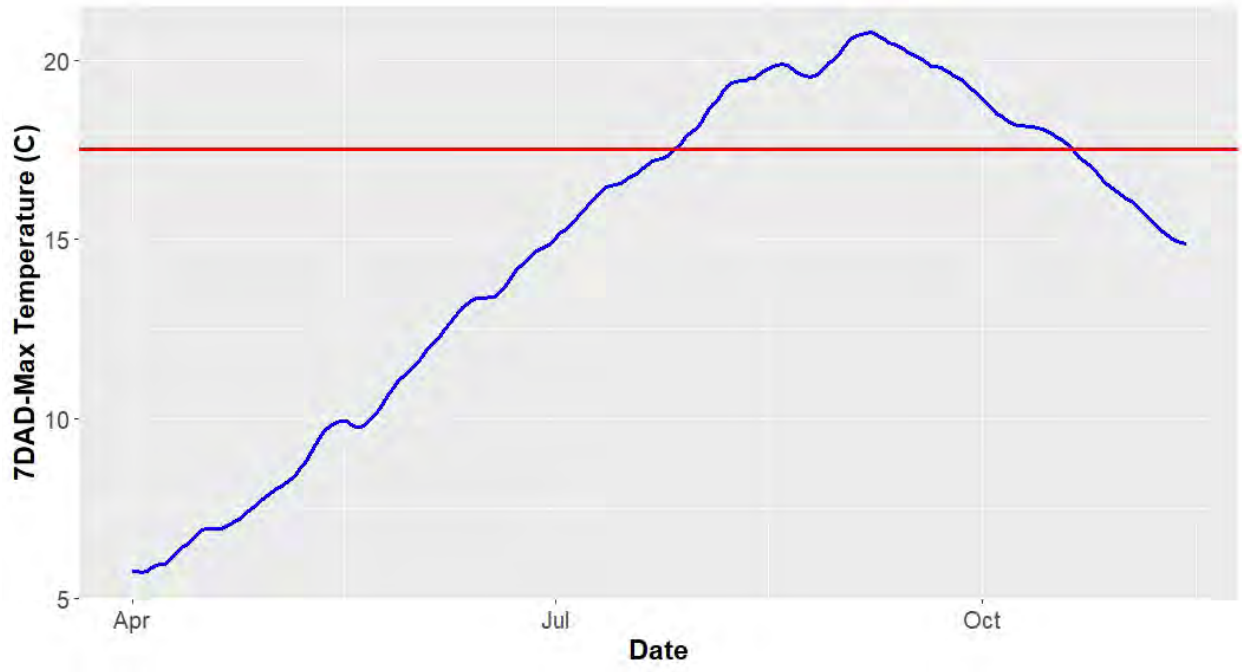


Figure 13. 2024 water temperature data collected in the Auxiliary Water Supply system at Wells Dam. Horizontal reference line indicates the 17.5°C WQS.

3.3.8 Wells Dam East Fishway Pool No. 39

According to the HCP hatchery permits, all entities that use the fish trapping facilities at Wells Dam are required to monitor the ladders every two hours May 1 to November 15 and discontinue trapping operations when fish ladder water temperatures exceed 69.8ºF (21.0°C). The Wells Project 401 Certification also adopted this requirement with the addition of hourly monitoring. Wells fish ladders reached this temperature threshold on September 4, 5, and 7, 2024, with a maximum temperature of 24.7 ºC on September 5, 2024. In addition, temperatures were above the 7-DADMax (17.5ºC) from July 29, 2024, to October 18, 2024 (Figure 14).

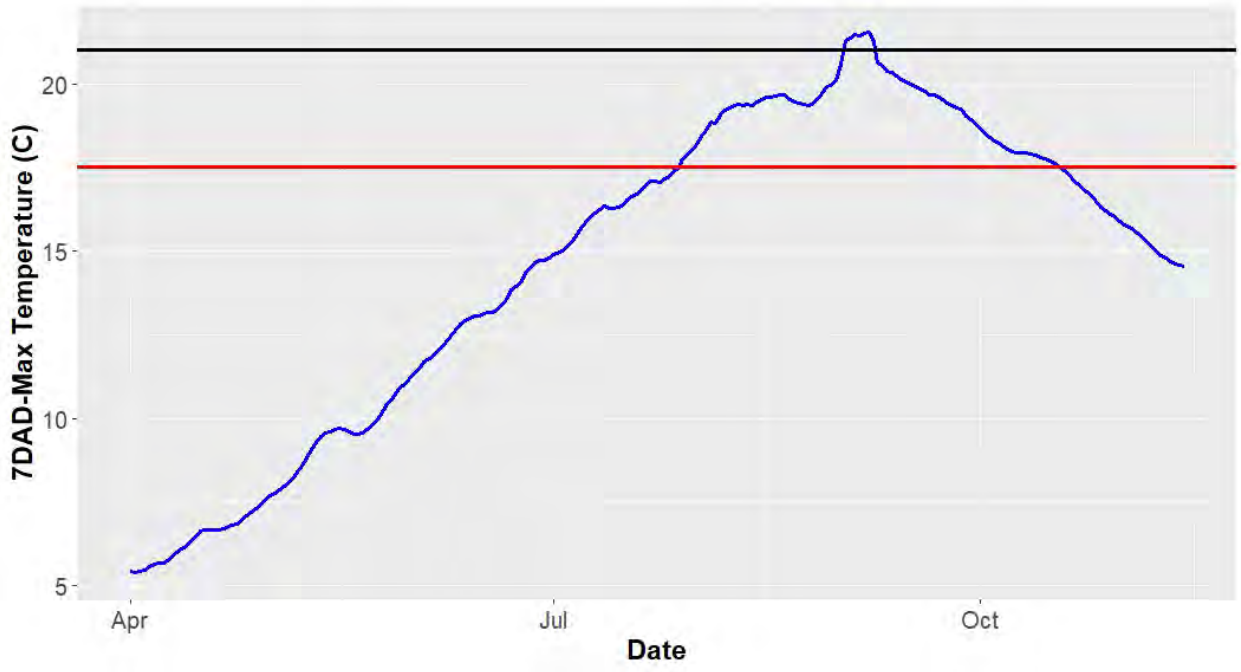


Figure 14. 2024 7DAD-Max water temperature data collected in Pool 39 of the east fish ladder at Wells Dam. The horizontal line at 21ºC (black line) denotes the threshold whereby adult broodstock trapping at Wells Dam discontinues and the horizontal line at 17.5 (red line) denotes the 17.5ºC 7-DADMax.

3.3.9 Water Temperature Data by Location

Water temperature data from the 2024 monitoring season for all locations and sources are summarized in Table 1 and indicate that during the summer, water temperatures (i.e., 7-DADMax values) at multiple locations within the Wells Project were above the state WQS of 17.5°C. However, as discussed in more detail in the conclusions, the thermal regime observed was consistent with the temperatures recorded at Chief Joseph Dam, Methow, and Okanogan rivers. The temperatures observed during 2024 were also consistent with historical temperature data collected and evaluated using the CE-QUAL-W2 model which found that the Wells Project remains in compliance with the state WQS.

Table 1. 7-DADMax by location as determined by remote real-time temperature sensor.

Location	***Number of Required Monitoring Days***	***Actual Number of Days Monitoring***	***Number of Days Exceeding 7-DADMax***	***Days Exceeding 7-DADMax (17.5°C)***
Chief Joseph Tailrace	4/1 – 10/31 (n = 214)	214	81	8/1/24 – 10/20/24
Okanogan RM 10.5	4/1 – 10/31 (n = 214)	187	106*	6/8/24 – 6/15/24 and 6/22/24 - 9/27/24
Methow RM 1.5	4/1 – 10/31 (n = 214)	214	85	7/1/24 – 9/23/24
Wells Forebay Pier Nose 6	4/1 – 10/31 (n = 214)	214	82	7/28/24 – 10/17/24
Wells Tailrace	4/1 – 10/31 (n = 214)	214	81	7/29/24 – 10/17/24
Wells Forebay Surface	5/1 – 11/15 (n = 199)	199	83	7/28/24 – 10/18/24
Wells Forebay Mid	5/1 – 11/15 (n = 199)	199	83	7/28/24 – 10/18/24
Wells Forebay Deep	5/1 – 11/15 (n = 199)	199	82	7/29/24 – 10/18/24
Auxiliary Water Supply	5/1 – 11/15 (n = 199)	199	86	7/27/24 – 10/20/24
Pool 39 East Fish Ladder	5/1 – 11/15 (n = 199)	199	82	7/29/24 – 10/18/24

**The Okanogan River may have exceeded 17.5°C 7-DADMax on more days but there was an equipment malfunction in June 2024.*

3.4 Water Temperature TMDL, Climate Change and the Wells Project

In its water temperature TMDL, EPA determined that the Columbia River warming has occurred due to climate change and has affected Columbia River temperatures since at least the 1960s (EPA 2021). These adverse thermal impacts are projected to continue to increase. A synthesis of available scientific evidence indicated that climate change has increased summer water

temperatures in the Columbia and Snake rivers by approximately 1.5°C since the 1960s. Further, based on available information, the estimated increase in river temperatures since 1960 ranges from 0.2°C to 0.4°C per decade, for a total water temperature increase to date of 1.5°C ± 0.5°C (EPA 2021). EPA also concluded that over time Columbia River water temperatures are expected to continue to increase irrespective of hydro project presence since climate change forces will continue to impact river temperatures.

With respect to Wells Dam, EPA's RBM10 model estimates that in June the Wells Project warms the Columbia River up to 0.1°C relative to naturally occurring temperature changes in a free-flowing Columbia River. These data are consistent with CE-Qual-W2 modeling completed by Douglas PUD during relicensing studies. RBM10 estimates that in July and August the Wells Project has a neutral effect on Columbia River water temperatures, and that in September and October, the Wells Project reduces river temperatures by 0.2°C and 0.5 °C, respectively (EPA 2021). This cooling effect is likely important to summer and fall-run salmonids that migrate through the Project during this period.

4.0 CONCLUSIONS

During the 2024 monitoring period, all stations recorded data in accordance with Douglas PUD's Wells Project 401 Certification requirements. Data was made available in real-time at www.douglaspud.org. Data collection in 2024 was continuous for most stations with the Okanogan River station suffering from a brief outage and being the exception to a complete dataset in 2024.

In general, data indicate that the thermal regime observed during the Wells Project relicensing process is still reflective of current observations. In 2024, temperatures warmed to above the WQS criteria of 17.5°C similarly to previous year (late-July) and remained high slightly later into the year (mid-October; Table 1). Despite the mainstem having more typical temperatures in 2024, the tributaries (Okanogan and Methow rivers) warmed earlier than usual likely because there was no typical spring run-off or freshet in the tributaries (Table 1). At each monitoring location, there was a decrease of at least ten days over 17.5°C compared to 2023 and the numbers were more similar to 2022 and 2021. The exceedances of the WQS correspond with water entering the Wells Project that was out of compliance due to the operation of large storage projects upstream of Wells Dam and inflows from the Okanogan and Methow Basin. Generally, data collected in 2024 confirms that spring temperatures and local basin snowpack drive the rate at which water temperatures increase at Project boundary locations similarly to late summer rain and flow regimes above Wells Dam. Monitoring will continue, consistent with 401 Certification requirements during the 2024 monitoring period.

5.0 REFERENCES

Douglas PUD (Public Utility District No. 1 of Douglas County). 2001. Wells Dam Fish Passage System Overview – Preliminary. Public Utility District No. 1 of Douglas County, Washington.

Douglas PUD (Public Utility District No. 1 of Douglas County). 2008. Water Quality Management Plan *in* the Aquatic Settlement Agreement. Public Utility District No. 1 of Douglas County, Washington.

Douglas PUD (Public Utility District No. 1 of Douglas County). 2013. Quality Assurance Project Plan for Water Temperature and Total Dissolved Gas. Wells Hydroelectric Project. FERC No. 2149. February 2013. Prepared for Washington Department of Ecology, Yakima, WA.

Ecology. 2012. 401 Certification Wells Hydroelectric Project. Order No. 8981 February 27, 2012.

United State Environmental Protection Agency Region 10 (EPA). 2020. Total Maximum Daily Load (TMDL) for Temperature in the Columbia and Lower Snake Rivers. Seattle, WA.

U.S. Environmental Protection Agency (EPA). 2021. Columbia and Lower Snake Rivers Temperature Total Maximum Daily Load. Available online at https://www.epa.gov/columbiariver/tmdl-temperature-columbia-and-lower-snake-rivers.

West Consultants Inc. 2008. Development of a Water Temperature Model Relating Project Operations to Compliance with the Washington State and EPA Water Quality Standards (Water Temperature Study). Prepared for Public Utility District No. 1 of Douglas County. East Wenatchee, WA

Appendix F
Pacific Lamprey Management Plan 2024 Annual Report

PACIFIC LAMPREY MANAGEMENT PLAN

2024 ANNUAL REPORT

WELLS HYDROELECTRIC PROJECT

FERC PROJECT NO. 2149

May 2025

Prepared by:
Public Utility District No. 1 of Douglas County
East Wenatchee, Washington

© Copyright 2025. Public Utility District No. 1 of Douglas County. All Rights Reserved.

EXECUTIVE SUMMARY

The annual Pacific Lamprey Management Plan (PLMP) Report includes a summary of all of the existing Pacific Lamprey measures required by the Federal Energy Regulatory Commission (FERC) including Article 406 of the license for the Wells Hydroelectric Project (Wells Project or Project), the requirements found within Appendix A of the Clean Water Act Section 401 Water Quality Certification (401 Certification). Article 406 of the license requires Public Utility District No. 1 of Douglas County (Douglas PUD) to submit an annual report of management plan activities by May 31st of each year.

The measures required by the FERC license are largely consistent with the measures found in the Aquatic Settlement Agreement's PLMP and the reporting requirements for the PLMP and 401 Certification. The 2024 PLMP annual report (this report) will be used to demonstrate compliance with all three of Douglas PUD's Wells Project Pacific Lamprey related reporting obligations.

Douglas PUD developed all six of the aquatic resource management plans in close coordination with agency and tribal natural resource managers (Aquatic Settlement Work Group or Aquatic SWG). During the development of this plan, the Aquatic SWG focused on developing management priorities for resources potentially impacted by Project operations. Members of the Aquatic SWG include the U.S. Fish and Wildlife Service (USFWS), Washington Department of Ecology (Ecology), Washington State Department of Fish and Wildlife (WDFW), the Confederated Tribes of the Colville Reservation (Colville), the Confederated Tribes and Bands of the Yakama Nation (Yakama), and Douglas PUD.

The National Marine Fisheries Service (NMFS) was invited to participate in the development of Aquatic Resource Management Plans but declined because its interests are currently satisfied by the measures within the Anadromous Fish Agreement and Habitat Conservation Plan (HCP).

The goal of the PLMP is to implement measures to monitor and address impacts, if any, on Pacific Lamprey (*Entosphenus tridentatus*) resulting from the Project during the term of the new license. Douglas PUD, in collaboration with the Aquatic SWG, has agreed to implement several Pacific Lamprey Protection, Mitigation and Enhancements (PMEs) in support of the PLMP. The PMEs presented within the PLMP are designed to meet the following objectives:

> Objective 1: Identify and address any adverse Project-related impacts on passage of adult Pacific Lamprey;
>
> Objective 2: Identify and address any Project-related impacts on downstream passage and survival and rearing of juvenile[1] Pacific Lamprey;
>
> Objective 3: Participate in the development of regional Pacific Lamprey conservation activities.

[1] Although the term juvenile typically only refers to eyed-juveniles, in this document the term "juvenile" refers to a combination of larval as well as transformed/eyed lampreys.

The PLMP is intended to be compatible with other Pacific Lamprey management plans in the Columbia River mainstem. Furthermore, the PLMP is intended to be supportive of the HCP, the critical research needs identified by the Columbia River Basin Technical Work Group, the Resident Fish Management Plan, Bull Trout Management Plan, and White Sturgeon Management Plan by continuing to monitor and address ongoing impacts, if any, on Pacific Lamprey resulting from Project operations. The PLMP is intended to be not inconsistent with other management strategies of federal, state and tribal natural resource management agencies and supportive of designated uses for aquatic life under Washington State water quality standards found at WAC 173-201A.

1.0 INTRODUCTION

The Pacific Lamprey Management Plan (PLMP) is one of six Aquatic Resource Management Plans contained within the Aquatic Settlement Agreement (Agreement). Collectively, these six Aquatic Resource Management Plans are critical to direct implementation of Protection, Mitigation, and Enhancement (PME) measures during the term of the new license and, together with the Wells Anadromous Fish Agreement and Habitat Conservation Plan (HCP), will function as the Water Quality Attainment Plan (WQAP) in support of the Clean Water Act Section 401 Water Quality Certification (401 Certification) for the Wells Hydroelectric Project (Wells Project or Project).

To ensure active stakeholder participation and support, the Public Utility District No. 1 of Douglas County (Douglas PUD) developed all of the resource management plans in close coordination with agency and tribal natural resource managers (Aquatic Settlement Work Group or Aquatic SWG). During the development of this plan, the Aquatic SWG focused on developing management priorities for resources potentially impacted by Project operations. Entities invited to participate in the Aquatic SWG include the U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), Bureau of Land Management (BLM), Bureau of Indian Affairs (BIA), Washington Department of Ecology (Ecology), Washington State Department of Fish and Wildlife (WDFW), the Confederated Tribes of the Colville Reservation (Colville), the Confederated Tribes and Bands of the Yakama Nation (Yakama), and Douglas PUD.

The PLMP will direct implementation of measures to protect against and mitigate for potential Project impacts on Pacific Lamprey (*Entosphenus tridentatus*). To ensure active stakeholder involvement and support, Douglas PUD developed this plan, along with the other aquatic management plans, in close coordination with the members of the Aquatic SWG.

2.0 GOALS AND OBJECTIVES

The goal of the PLMP is to implement measures to monitor and address impacts, if any, on Pacific Lamprey resulting from the Project during the term of the new license. Douglas PUD, in collaboration with the Aquatic SWG, has agreed to implement several Pacific Lamprey PMEs in support of the PLMP. The PMEs presented within the PLMP are designed to meet the following objectives:

Objective 1: Identify and address any adverse Project-related impacts on passage of adult Pacific Lamprey;

Objective 2: Identify and address any Project-related impacts on downstream passage and survival, and rearing of juvenile Pacific Lamprey;

Objective 3: Participate in the development of regional Pacific Lamprey conservation activities.

The PLMP is intended to be compatible with other Pacific Lamprey management plans in the Columbia River mainstem. Furthermore, the PLMP is intended to be supportive of the HCP, the critical research needs identified by the Columbia River Basin Technical Work Group, the Resident Fish Management Plan, Bull Trout Management Plan, and White Sturgeon Management Plan by continuing to monitor and address ongoing impacts, if any, on Pacific Lamprey resulting from Project operations. The PLMP is intended to be not inconsistent with other management strategies of federal, state, and tribal natural resource management agencies and supportive of designated uses for aquatic life under Washington State water quality standards found at WAC 173-201A.

The schedule for implementation of specific measures within the PLMP is based on the best information available at the time the Plan was developed. As new information becomes available, implementation of each activity may be adjusted through consultation with the Aquatic SWG.

3.0 PROTECTION, MITIGATION AND ENHANCEMENT MEASURES

Douglas PUD, in consultation with the Aquatic SWG, will implement PMEs for Pacific Lamprey in the Project consistent with the goals and objectives identified in Section 2.0. The measures proposed in this section are intended to serve as PMEs for Pacific Lamprey throughout the new license term.

3.1 Adult Pacific Lamprey Passage (Objective 1)

3.1.1 Upstream Fishway Operations Criteria

Douglas PUD shall operate the upstream fishways at Wells Dam in accordance with criteria outlined in the HCP. Based upon information collected from activities conducted in Sections 4.1.3 - 4.1.7 of the PLMP, Douglas PUD, in consultation with the Aquatic SWG and the HCP Coordinating Committee, may evaluate various operational and structural modifications to the upstream fishways (e.g., reduction in fishway flows at night) for the benefit of Pacific Lamprey passing upstream through Wells Dam during the new license term. If requested, the Aquatic SWG shall develop an Operations Study Plan (OS Plan) that specifically identifies all operational modifications to be evaluated, the proposed monitoring strategy, implementation timeline and criteria for success. The plan shall include a component to evaluate the effects of lamprey modifications on salmon. Upon completion of the evaluation, the Aquatic SWG, in consultation with the HCP Coordinating Committee, will determine whether the proposed modifications should be made permanent, removed, or modified.

3.1.1.1 Progress Towards Objective 1 in 2024

In 2024, the Wells Dam fishways were operated in accordance with the criteria outlined in the HCP. No planned modifications to fishway operating criteria were implemented therefore, no evaluation of effects on Pacific Lamprey passage were warranted. On September 9th Wells Hydro staff received pressure-differential alarms for the diffuser gratings between the supply

chamber and collection gallery on both fishways. The purpose of those alarms is to alert operators to unsafe head differentials on the diffuser gratings between the auxiliary water supply (AWS) system and the collection gallery. Head differentials develop when debris builds up on the back (AWS) side of the diffuser gratings. Two problems can result from excessive head differentials: first, the water begins cascading over the debris load on the diffuser gratings, and fish respond to the cascading water by nosing and jumping at the cascades rather than proceeding up the ladder; second, increased head differential can lead to failure of the diffuser-grating panels, which, when that occurs results in fish getting behind the diffuser gratings (from which they cannot be retrieved). This occurred once at Wells in 1970's under similar circumstances, resulting in the loss of fish, and has occurred at other projects.

In late August 2001, a low-flow year with lots of aquatic vegetation causing problems throughout the hydrosystem, Douglas PUD experienced heavy loads of aquatic vegetation at Wells that fouled the diffuser gratings resulting in head-differential alarms. However, that event did not result in failure of diffuser gratings because of prompt coordination with NMFS and action to reduce the pressure on the gratings. The instructions from NMFS (personal communication, Bryan Nordlund) were to take whatever measures necessary to maintain the integrity of the diffuser gratings. The agreed measures were to reduce the fish-pump output to reduce pressure on the diffuser screens, and to reduce the fishway entrance opening from 8.0 feet to 6.0 feet, and finally to 4.0 feet, to maintain an acceptable head-differential between the collection gallery and tailrace for fish attraction. Those measures proved effective at reducing the differential at the diffuser gratings to below 2.0 feet while also maintaining fish attraction at the fishway entrance. Operators maintained those conditions until winter maintenance allowed cleaning of the gratings, which avoided an in-season fishway dewatering.

Given the 2001 experience and in response to the September 9, 2024, alarms, Wells operations staff coordinated with Natural Resources and Dam Safety staff to implement similar measures to those employed successfully in 2001 to protect diffuser gratings in both fishways while maintaining attraction flow at the fishway entrances. As expected, the reduction in fish-pump output to reduce pressure on the AWS side of the diffuser gratings resulted in a reduced head differential between the collection gallery and the tailrace at the fishway entrance. To increase that head differential to maintain attraction flow, the operators reduced the opening width of the fishway entrance gates from 8.0 feet to 4.0 feet. These operational changes stabilized the differential between the AWS and collection gallery, and between the collection gallery and the tailrace. These modified operations remained in effect until the winter 2024 ladder outages when diffuser panels could be sufficiently cleaned and repaired. The HCP CC was notified of this change during the aquatic vegetation and alarm conflict. No observable differences in Pacific Lamprey ladder counts occurred prior to September 9th or in the days following the modified operations. Normal operations are expected to return in 2025.

3.1.2 Salvage Activities During Ladder Maintenance Dewatering

Douglas PUD shall continue to implement the Adult Fish Passage Plan and associated Adult Ladder Dewatering Plan as required by the HCP. These plans include practices and procedures utilized during fishway dewatering operations to minimize fish presence in the fish ladders and then once dewatered directs Douglas PUD staff to remove stranded fish and safely place them back into the Columbia River. All fish species, including Pacific Lamprey that are encountered

during dewatering operations are salvaged consistent with the protocol identified in the HCP. Any adult lamprey that are captured during salvage activities will be released upstream of Wells Dam, unless otherwise determined by the Aquatic SWG. Douglas PUD will coordinate salvage activities with the Aquatic SWG and allow for member participation. Douglas PUD will provide a summary of salvage activities in the annual report.

3.1.2.1 Progress Toward Objective 1 in 2024

During the fish ladder maintenance period in 2024, Douglas PUD implemented the practices and procedures in the Adult Ladder Dewatering Plan to minimize the presence of lamprey and other fish and to safely place any stranded fish back into the Columbia River. No adult lamprey were encountered during salvage activities in either fishway.

3.1.3 Upstream Fishway Counts and Alternative Passage Routes

Douglas PUD shall continue to conduct annual adult fish passage monitoring in the Wells Dam fishways using the most current technology available, to count and provide information on upstream migrating adult Pacific Lamprey 24-hours per day during the adult fishway monitoring season (May 1- November 15). Based upon information collected from activities conducted in Sections 4.1.6 - 4.1.7 of the PLMP, Douglas PUD, in consultation with the Aquatic SWG, may choose to address the use of alternative upstream passage routes around Wells Dam fishway counting stations by adult Pacific Lamprey. Potential measures to improve counting accuracy, following consultation and approval of the Aquatic SWG, may include, but may not be limited to, the development of a correction factor based upon data collected during passage evaluations (Sections 4.1.6 and 4.1.7 of the PLMP) or utilization of an alternative passage route as a counting facility for adult Pacific Lamprey.

3.1.3.1 Progress Towards Objective 1 in 2024

During 2024, Douglas PUD monitored adult fish passage, including Pacific Lamprey, 24 hours a day during the fishway monitoring season. Total adult lamprey count at Wells Dam in 2024 was 655 (Table 1).

Table 1. Total lamprey counts for the 2024 calendar year, ten-year (2015-2024) average, and range of counts for adult Pacific Lamprey at mid-Columbia River hydroelectric projects.

	Priest Rapids	Wanapum	Rock Island	Rocky Reach	Wells
2024	6,670	6,600	4,283	4,272	655
10-year Average	9,113	8,911	5,706	5,967	355
Range	1,750-26,012	1,502-28,463	481-21,137	319-23,986	0-1,684

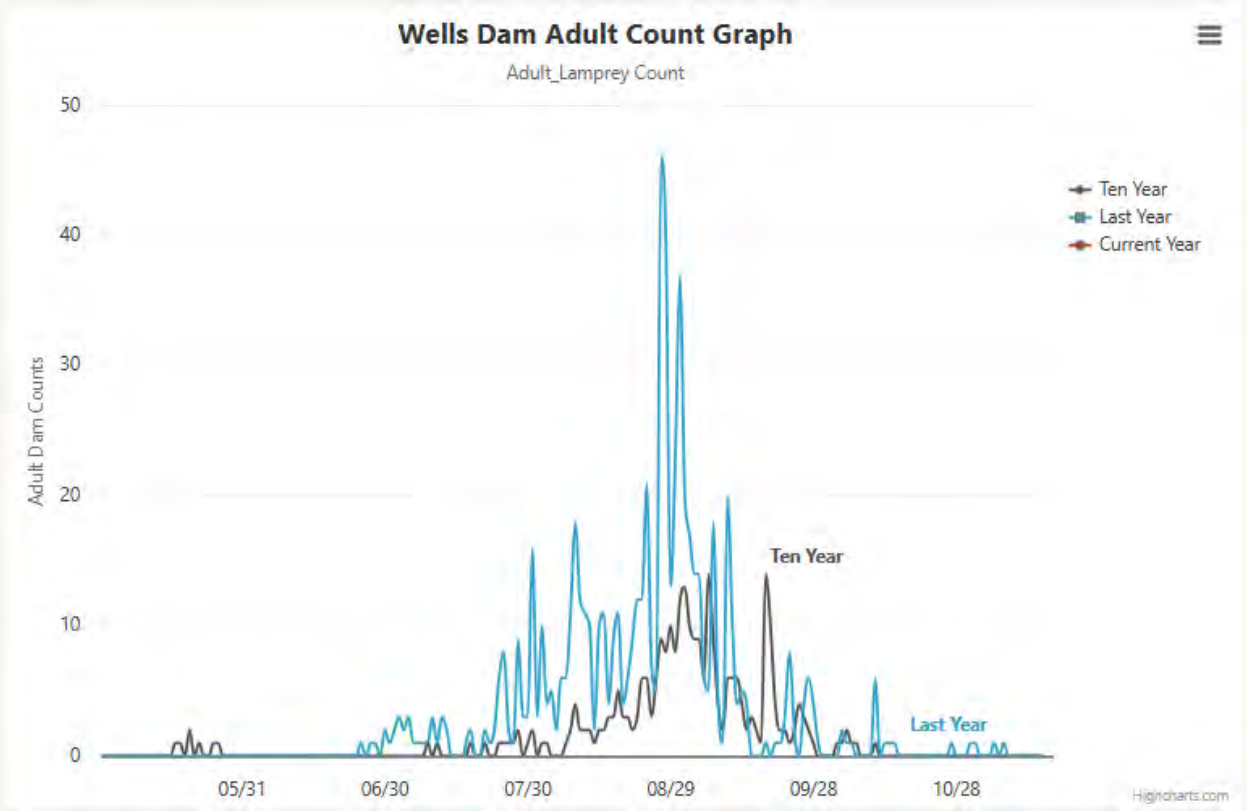


Figure 1. Adult Pacific Lamprey returns in 2024 ("last year"; blue line) versus the 10-year average at Wells Dam ("Ten Year"; black line). Data summarized from fpc.org accessed Feb. 6, 2025.

3.1.4 Upstream Passage Improvement Literature Review

If additional passage improvement measures are deemed necessary by the Aquatic SWG, then within six months after this determination, Douglas PUD, in consultation with the Aquatic SWG, shall complete a literature review on the effectiveness of upstream passage measures (i.e., lamprey passage systems, plating over diffuser grating, modifications to orifices, rounding sharp edges, fishway operational changes, etc.) implemented at other Columbia and Snake river hydroelectric facilities. The literature review will be conducted in support of activities identified in Section 4.1.5 to help in the selection of reasonable measures that may be implemented to improve adult lamprey passage at Wells Dam.

3.1.4.1 Progress Towards Objective 1 in 2024

The adult Pacific Lamprey upstream passage literature review was completed in 2018. The final document and associated literature libraries were approved by the Aquatic SWG in 2019. Additional documents and updates were added to the document libraries in 2024. These updates and additional documents were shared with the Aquatic SWG during the calendar year. The Adult and Juvenile Pacific Lamprey Passage and Survival literature reviews and document libraries can be accessed through the Aquatic SWG Extranet site (https://extranet.dcpud.net).

3.1.5 Fishway Modifications to Improve Upstream Passage

If additional passage improvement measures are deemed necessary by the Aquatic SWG then within one year or as soon as practicable following consultation with the Aquatic SWG, Douglas PUD shall identify, design and implement any reasonable upstream passage modifications (structural and/or operational). Passage measures will be designed to improve passage performance by providing safe, effective, and volitional passage for Pacific Lamprey through the Wells Dam fishways without negatively impacting the passage performance of adult anadromous salmonids. The following components shall be included in these passage measures:

- Fishway Inspection: Within one year of license issuance or as soon as practicable following consultation with the Aquatic SWG, Douglas PUD shall conduct a fishway inspection with the Aquatic SWG and regional lamprey passage experts to identify and prioritize measures to improve adult lamprey passage and enumeration at Wells Dam. Additional ladder inspections will be conducted at the request of the Aquatic SWG, consistent with winter ladder dewatering operations.
- Entrance Efficiency: Within one year of license issuance or as soon as practicable following consultation with the Aquatic SWG, Douglas PUD shall develop a Lamprey Entrance Efficiency Plan (LEE Plan) for evaluating operational and physical ladder entrance modifications intended to create an environment at the fishway entrances that are conducive to adult lamprey passage without significantly impacting the passage of adult salmonids. These improvements shall be evaluated until compliance, as described below, is attained.
- Diffuser Gratings: Within five years of license issuance or as soon as practicable following consultation with the Aquatic SWG, Douglas PUD shall identify and address, if needed, diffuser gratings within fishways at Wells Dam that adversely affect passage of adult Pacific Lamprey.
- Transition Zones: Within five years of license issuance or as soon as practicable following consultation with the Aquatic SWG, Douglas PUD shall identify and address, if needed, transition zones within fishways at Wells Dam that adversely affect passage of adult Pacific Lamprey.
- Ladder Traps and Exit Pools: Within five years of license issuance or as soon as practicable following consultation with the Aquatic SWG, Douglas PUD shall identify and address, if needed, lamprey ladder traps and exit pools within fishways at Wells Dam that adversely affect passage of adult Pacific Lamprey.

Douglas PUD shall exhibit steady progress, as agreed to by the Aquatic SWG, towards improving adult lamprey passage until performance at Wells Dam is determined to be similar to other mid-Columbia River hydroelectric dams, or until scientifically rigorous standards and evaluation techniques are established by the Lamprey Technical Workgroup, or its successor, and adopted regionally. The Aquatic SWG will then evaluate, and if applicable and appropriate, adopt these standards for use at Wells Dam. If compliance is achieved, Douglas PUD shall only be required to implement activities pursuant to Section 3.1.7 of the PLMP (Periodic Monitoring) for adult Pacific lamprey passage.

3.1.5.1 Progress Towards Objective 1 in 2024

Work to address diffuser grating gaps and install plating in both fishways was completed in early-2021. Routine maintenance and repair of the installed plating occurred during the 2024 annual fishway maintenance period. A tour of the east fishway occurred on December 10, 2024, and was attended by Aquatic SWG members representing USFWS.

Following the completion of the Wells Dam 2022 Adult Lamprey Approach and Passage Study, a new statement of agreement (SOA) for 2023 – 2024 Adult Pacific Lamprey Translocation was approved by the Aquatic SWG on June 14, 2023. Pursuant to this SOA, Douglas PUD funded four weeks of Lamprey trapping at Priest Rapids Dam and translocated up to 1000 Pacific Lamprey upstream of the Wells Project. In 2024, a total of 860 adult Lamprey were translocated by Douglas PUD above Wells Dam (Table 2). Of those, 127 lamprey were transferred to the Colville Tribes for release into Okanogan River tributaries (Table 2). The results of 2023 Pacific Lamprey translocation efforts are reported as Supplemental Information (Section 5.0).

Table 2. 2024 Translocated Pacific Lamprey Release Location and Last Known PIT Detection (as of January 1, 2025). Data Accessed at Ptagis.org

		Release Location					
		Below Wells (trapped in Wells Dam ladder)	*Starr Boat Ramp*	*Loup Loup Creek*	*Omak Creek*	*Salmon Creek*	*Similkameen River*
Last PIT Detection Location	RRF - Rocky Reach Fishway		1				
	ENL - Lower Entiat River		1				
	WEH - Wells Dam Hatchery	8	4				
	WEA - Wells Dam, DCPUD Adult Ladders	7	2				
	LMR - Lower Methow River at Pateros	8	157				
	MRC - Methow River at Carlton	3	57				
	TWR - Lwr Twisp Rvr near MSRF Ponds		1				
	MRW - Methow River at Winthrop		7				
	CRW - Chewuch River above Winthrop	2	11				
	CML - Chewuch River Middle Lower	1	32				
	CRU - Upper Chewuch Instream Array		43				
	OKL - Lower Okanogan Instream Array	4	62	1			1
	LLC - Loup Loup Creek Instream Array			1			
	OMH - Omak Creek Haley Creek Road				22		
	SA1 - Salmon Creek Instream Array					4	
	SAD - Salmon Creek Above OID Div.					5	
	No Detection Post-Release	*30*	*355*	*34*	*6*	*28*	*25*
	Total	**63**	**733**	**36**	**28**	**37**	**26**

3.1.6 Adult Pacific Lamprey Upstream Passage Evaluation

Should upstream passage measures be implemented under Section 4.1.5 of the PLMP, then within one year following the implementation of such measures, or as soon as practicable

following consultation with the Aquatic SWG, Douglas PUD shall conduct a one-year study to monitor the effectiveness of such measures on upstream passage performance of adult Pacific Lamprey through Wells Dam. If monitoring results indicate that passage rates at Wells Dam are not similar to passage rates at other mid-Columbia River dams or within standards as described in Section 4.1.5 of the PLMP, Douglas PUD, in consultation with the Aquatic SWG, shall develop and implement additional measures to improve upstream Pacific Lamprey passage. Measures described in Sections 4.1.5 and 4.1.6 may be repeated as necessary, until adult passage through Wells Dam is similar to passage rates at other mid-Columbia River hydroelectric dams or within standards as described in Section 4.1.5.

3.1.6.1 Progress Towards Objective 1 in 2024

The Wells Dam Adult Lamprey Approach and Passage Study was conducted in 2022 and included acoustic and PIT tagging of 645 adult Lamprey (170 fish tagged with acoustic and PIT; 475 tagged with PIT only). The study results were finalized via a Report that was approved by the ASWG in April 2024.

An upcoming radiotelemetry passage study is planned for summer 2025 and, in 2024, the ASWG developed a draft study plan for approval in early 2025. This study proposes radio-tagging 200 adult Pacific Lamprey from both Priest Rapids and Wells dams and tagging up to 400 fish with PIT tags only.

Douglas PUD also ran a short pilot study from August 8 to 28, 2024, to determine the efficiency of using the Wells Dam fish ladder lamprey traps for use in upcoming passage studies. Sixty-three individual fish were captured, PIT tagged and released below the dam. There were five recaptures. Twenty-two fish were detected either in or above Wells Dam after release (Table 2). Estimated efficiency of the traps within the ladders were estimated at 0.35 (90% confidence interval: 0.00 – 0.71).

3.1.7 Periodic Monitoring

Once adult Pacific Lamprey upstream passage rates at Wells Dam are similar to rates at other mid-Columbia River dams or within standards as described in Section 4.1.5 of the PLMP, Douglas PUD, in consultation with the Aquatic SWG, shall periodically monitor adult Pacific Lamprey passage performance through Wells Dam fishways to verify the effectiveness of passage improvement measures. Specifically, every ten years after compliance has been achieved, or as determined by the Aquatic SWG, Douglas PUD shall implement a one-year study to verify the effectiveness of the adult fish ladders with respect to adult lamprey passage. If results of the monitoring program confirm the effectiveness of adult lamprey passage measures and the results indicate that passage rates are still in compliance, then no additional measures are needed. If the results indicate that adult upstream passage rates are out of compliance, then the upstream passage study will be replicated to confirm the results. If the results after two years of study both indicate that passage rates have not been maintained, Douglas PUD, in consultation with the Aquatic SWG, shall develop and implement measures to improve upstream Pacific Lamprey passage, if any (see Section 4.1.5).

3.1.7.1 Progress Towards Objective 1 in 2024

Periodic monitoring will take place following the implementation of passage improvements.

3.2 Juvenile Pacific Lamprey Downstream Passage and Survival and Rearing (Objective 2)

3.2.1 Downstream Bypass Operations Criteria

Douglas PUD is required to operate the downstream bypass system at Wells Dam in accordance with criteria outlined in the HCP.

3.2.1.1 Progress Towards Objective 2 in 2024

In 2024, Douglas PUD operated the downstream bypass system at Wells Dam in accordance with the criteria outlined in the HCP.

3.2.2 Salvage Activities During Ladder Maintenance Dewatering

Douglas PUD shall continue to conduct salvage activities as required by the HCP's Adult Fish Passage Plan during fishway dewatering operations. All fish species, including Pacific Lamprey that are encountered during dewatering operations shall be salvaged consistent with the protocol identified in the HCP. Any juvenile Pacific Lamprey that are captured during salvage activities will be released downstream of Wells Dam. Douglas PUD will coordinate salvage activities with the Aquatic SWG and allow for member participation. Douglas PUD will provide a summary of salvage activities in the annual report.

3.2.2.1 Progress Towards Objective 2 in 2024

Douglas PUD conducted salvage activities during dewatering of the Wells Dam fishways for the 2024 fishway maintenance period. During the December 2024 winter maintenance outage, one larval lamprey and two juvenile lamprey were collected from the west fishway and ten juvenile lampreys were collected from the east fishway (Table 3). No adults were encountered. All larval and juvenile lampreys salvaged from the fishways were safely released into the Columbia River.

Table 3. Pacific Lamprey encountered during fishway salvage efforts in 2024.

LIFE STAGE	EAST FISHWAY	WEST FISHWAY
Larval	0	1
Juvenile	10	2
Total	**10**	**3**

3.2.3 Juvenile Pacific Lamprey Passage and Survival Literature Review

Beginning in year five and every five years thereafter during the new license, Douglas PUD, in consultation with the Aquatic SWG, shall conduct a literature review to summarize available

technical information related to juvenile lamprey passage and survival through Columbia and Snake rivers' hydroelectric facilities. This information will be used to assess the feasibility of conducting activities identified in Section 4.2.4 of the PLMP.

3.2.3.1 Progress Towards Objective 2 in 2024

A juvenile lamprey passage and survival literature review and document libraries were completed in 2018 and approved by the Aquatic SWG in 2019. New documents and updates were added to the document libraries in 2024. The juvenile lamprey literature review and document libraries can be accessed through the Aquatic SWG Extranet site (https://extranet.dcpud.net).

3.2.4 Juvenile Pacific Lamprey Downstream Passage and Survival Evaluation

During the term of the new license, if tag technology and methodologies are developed and field tested and a sufficient source of juvenile Pacific Lamprey in or upstream of the Project are identified to ensure that a field study will yield statistically rigorous and unbiased results, Douglas PUD, in consultation with the Aquatic SWG, shall implement a one-year juvenile Pacific Lamprey downstream passage and survival study.

If statistically valid study results indicate that Project operations have a significant negative impact on the Pacific Lamprey population above the Wells Dam, Douglas PUD, in consultation with the Aquatic SWG, shall identify and implement scientifically rigorous and regionally accepted measures (e.g., translocation, artificial production or habitat enhancement), if any, or additional studies to address such impacts. If operational changes are needed to improve passage survival of juvenile lamprey migrants, then those changes need to be coordinated with the HCP Coordinating Committee.

3.2.4.1 Progress Towards Objective 2 in 2024

Tag technologies and methodologies for use in studying downstream passage and survival of Pacific Lamprey are currently available commercially but are being piloted in the lower Columbia and Snake Rivers by Pacific Northwest National Laboratory and their funding partners (Deng et al. 2023). The Aquatic SWG will continue to discuss the available tag technology, study design, and source of study fish to determine if and when evaluating juvenile lamprey passage and survival at Wells Dam is appropriate. The Yakama Nation has begun collecting pertinent information related to potential sources of juvenile Pacific Lamprey. At this point, there is not a reliable source of juvenile fish upstream of Wells Dam to conduct a study.

In 2020, the Aquatic SWG determined that juvenile lamprey abundance and outmigration timing in the Methow River should be investigated. In 2024, 6,258 Pacific Lamprey (2 adults, 943 juveniles, and 5,313 larvae) were captured at the Methow River Smolt Trap at McFarland Creek Bridge, of which, 2 adults, 97 juveniles, and 525 larvae fish were PIT tagged and released (2). This was less larvae than in recent years, but the proportion of juveniles caught was much higher than recent years, likely because the lack of a spring run-off in the Methow meant the trap could be run more effectively during the out-migration period (personal communication with D. Grundy, WDFW; Figure 2). Additionally, in 2024, 31 larval Pacific Lamprey were captured at the Twisp River Smolt Trap, of which, three were PIT tagged and released (Figure 4).

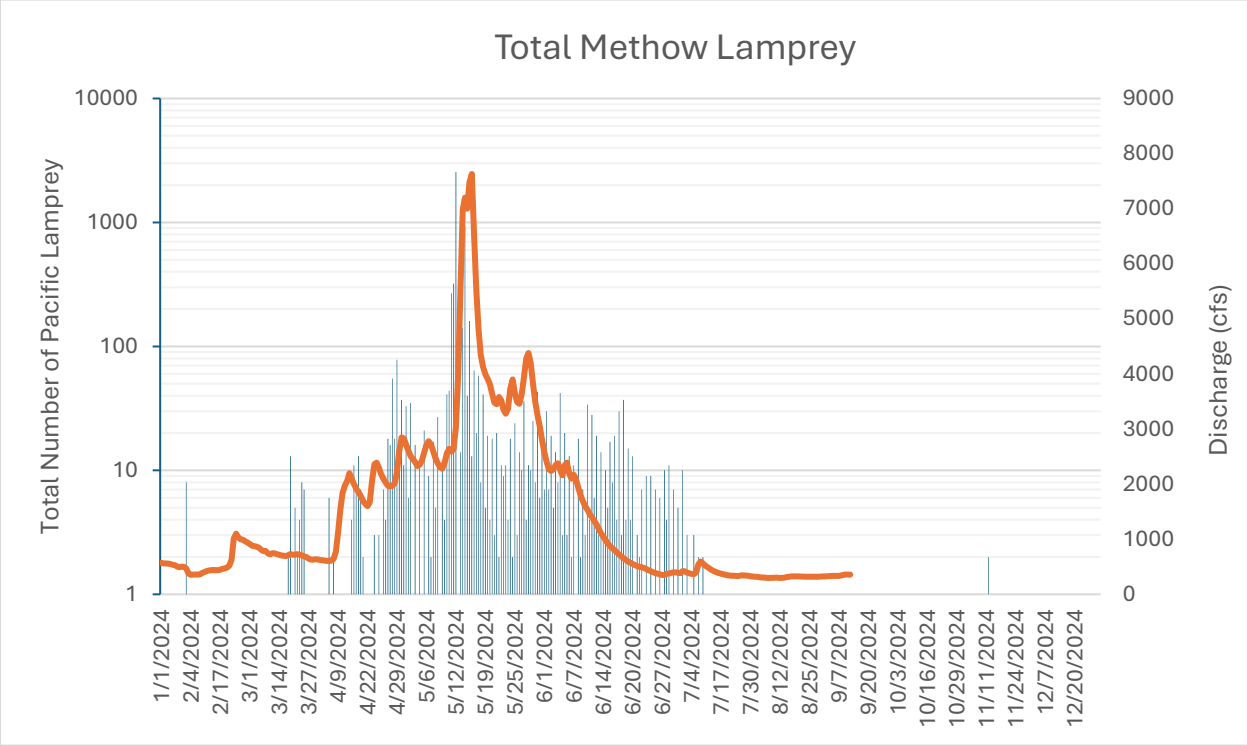


Figure 2. **Total daily Pacific Lamprey catch at Methow River Smolt Trap and mean daily discharge (orange line; secondary y-axis). Most lamprey are observed during the spring run-off period. Note the logarithmic scale of primary y-axis.**

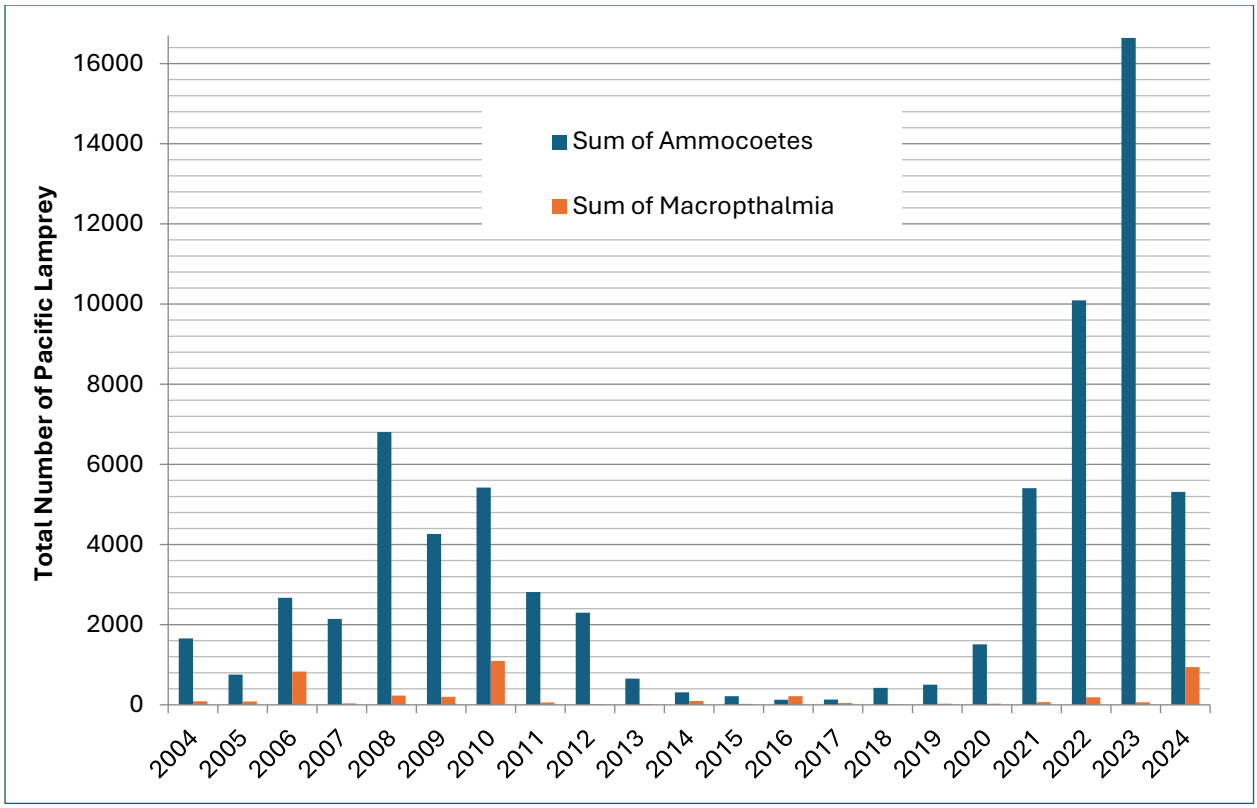


Figure 3. **Total annual lamprey observed at Methow River Smolt Trap from 2004 – 2024.**

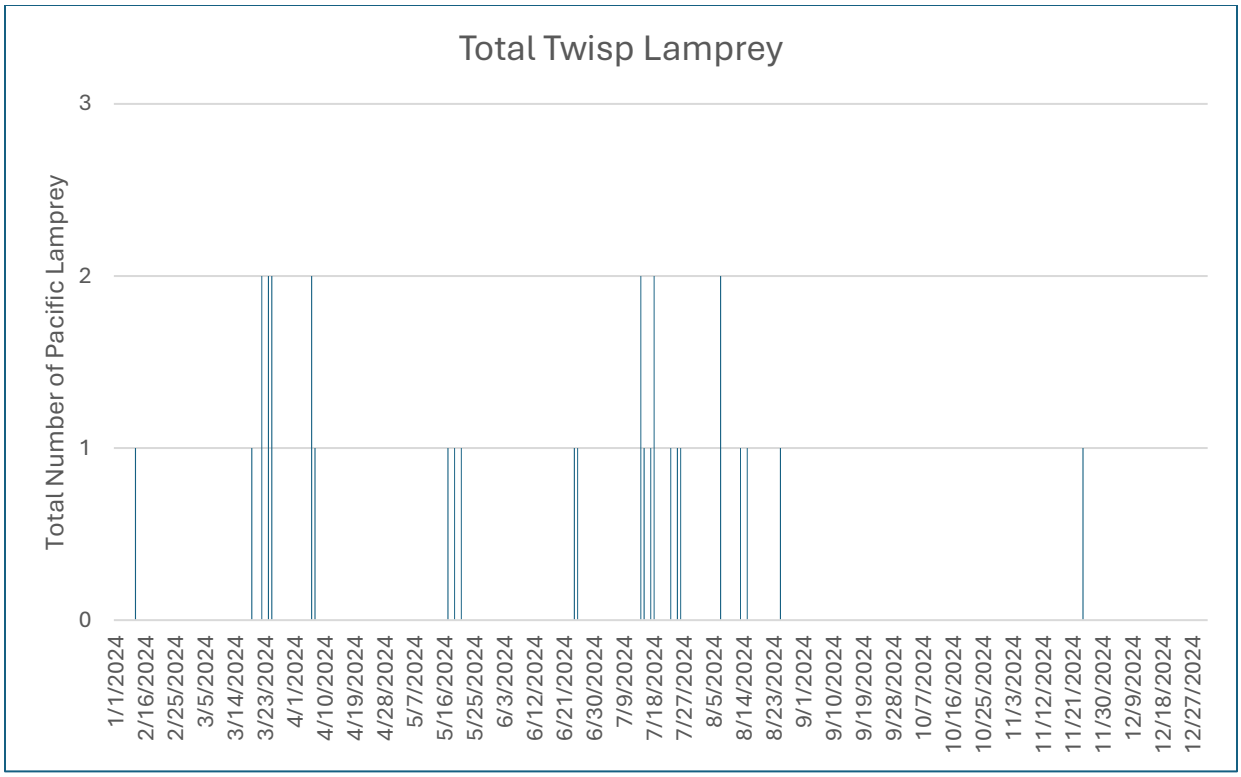


Figure 4. Total daily Pacific Lamprey catch at Twisp River Smolt Trap.

Post-tagging detection rates for lamprey tagged at the lower Methow River Smolt Trap is very low with less than 10% observed at any downstream interrogation site (Table 4). The lamprey PIT tagged at the Twisp River Smolt Trap have a much higher post-tagging detection rate although most fish are only detected at the lower Twisp River interrogation site (Table 5). These results are not surprising since PIT tag detention efficiently in the Twisp has been shown to be higher than instream arrays in larger river basins like the Methow River. None of the three 2024 Twisp River PIT tagged lamprey have been detected yet. Complete tag histories and associated biometric data are publicly available at www.ptagis.org.

Table 4. Last seen table for juvenile and larval lamprey PIT tagged at the Methow River smolt traps. All fish were observed at the lower Methow River PIT array.

Year Tagged	Total Tagged	Observed Last in 2021	Observed Last in 2022	Observed Last in 2023	Observed Last in 2024
2021	627	9	3	--	--
2022	224	NA	6	--	--
2023	429	NA	NA	1	5
2024	509	NA	NA	NA	5

Table 5. Last seen table for juvenile and larval lamprey PIT tagged at the Twisp River smolt trap.

Year Tagged	Total Tagged	Observed Last in 2021	Observed Last in 2022	Observed Last in 2023	Observed Last in 2024
2021	0	--	--	--	--
2022	32	NA	22 (all at TWR)	3 (1 at MRC; 1 at TWR; 1 at LMR)	--
2023	19	NA	NA	9 (1 at MRC; 8 at TWR)	2 (1 at MRC; 1 at TWR)
2024	3	NA	NA	NA	--

**MRC: Methow River at Carlton; TWR: Lower Twisp River near MSRF Ponds; LMR: Lower Methow River at Pateros*

3.2.5 Juvenile Pacific Lamprey Habitat Evaluation

Within three years of the effective date of the new license, Douglas PUD shall implement a one-year study to examine presence and relative abundance of juvenile Pacific Lamprey (including larvae) in habitat areas within the Project that may be affected by Project operations. As part of this measure, Douglas PUD shall identify areas of potential juvenile Pacific Lamprey habitat for future evaluation. Sampling of these areas will assess presence/absence and relative abundance. Any sampling methodologies used in support of this activity will require coordination with the HCP Coordinating Committee and regulatory approval of the federal and state agencies.

3.2.5.1 Progress Towards Objective 2 in 2024

The Juvenile Lamprey Habitat Evaluation Study was conducted in 2015. The results of the report can be found in the 2015 Aquatic SWG Annual Report (Anchor QEA 2016).

3.3 Participate in Regional Pacific Lamprey Conservation Activities (Objective 3)

3.3.1 Regional Lamprey Working Groups

Douglas PUD shall participate in Pacific Lamprey work groups in order to support regional conservation efforts (e.g., the Pacific Lamprey Technical Work Group and the USFWS Lamprey Conservation Initiative). Activities may include but are not limited to information exchanges with other entities, meeting attendance, and coordination of Douglas PUD' Pacific Lamprey activities with other entities conducting lamprey research in the mid-Columbia River. Activities may also include conducting PLMP research within the Project and sharing that information with other entities.

3.3.1.1 Progress Towards Objective 3 in 2024

In 2024, Douglas PUD representatives attended and participated in regional coordination and information exchanges related to Pacific Lamprey including: the Pacific Lamprey Technical Work Group, the Pacific Lamprey Conservation Initiative (and relevant subgroups), and the U.S. Army Corps of Engineers Anadromous Fish Evaluation Program Review. Specifically, Douglas PUD attended the 8th Annual Lamprey Information Exchange in Seattle, Washington, in December 2024.

3.3.2 Reporting

Douglas PUD will provide an annual report to the Aquatic SWG summarizing the previous year's activities and proposed activities for the following year undertaken in accordance with the PLMP. The report will document all Pacific Lamprey activities conducted within the Project and describe activities proposed for the following year. Furthermore, any decisions, statements of agreement, evaluations, or changes made pursuant to this PLMP will be included in the annual report. If significant activity was not conducted in a given year, Douglas PUD will prepare a memorandum providing an explanation of the circumstances in lieu of the annual report.

3.3.2.1 Progress Towards Objective 3 in 2024

Consistent with the FERC License Order for Wells Dam, the Wells 401 Certification, and the PLMP, this report will be updated annually with the assistance of the Aquatic SWG. Each year the report will be filed on or prior to May 31st. The report will include a summary of the progress made towards the implementation of the PLMP and focus on the previous year's developments.

4.0 REFERENCES

Anchor QEA. 2016. 2015 Aquatic SWG Annual Report. Wells Hydroelectric Project. FERC License No. 2149. May 2015.

Deng, Z.D, K.A. Deters, J.J. Martinez, R.A. Harnish, R.P. Mueller, P.S. Titzler, T. Fu, H. Li, and B. Wu. 2023. Juvenile Pacific Lamprey Passage Behavior and Survival at Lower Granite Dam, 2022. Final Report: October 2023. Pacific Northwest National Laboratory prepared for the U.S. Department of Energy.

5.0 SUPPLEMENTAL INFORMATION

Table 6. Last known location, by year, for 2023 translocated Pacific Lamprey released at Starr Boat Launch. Fifty-one fish were released into the Similkameen River and were not detected post-release.

		Date	
		1/1/2024	*1/1/2025*
Last PIT Detection Location	ENL - Lower Entiat River	0	3
	LMR - Lower Methow River at Pateros	108	123
	LBC - Libby Creek, Methow River	1	1
	MRC - Methow River at Carlton	51	95
	TWR - Lwr Twisp Rvr near MSRF Ponds	0	2
	MRW - Methow River at Winthrop	3	2
	CRW - Chewuch River above Winthrop	22	41
	MEM - Eightmile Acclimation Pond	0	1
	CML - Chewuch River Middle Lower	62	41
	CMU - Chewuch River Middle Upper	46	26
	CRU - Upper Chewuch Instream Array	22	54
	OKL - Lower Okanogan Instream Array	96	143
	LLC - Loup Loup Creek Instream Array	0	1
	OMK- Omak Creek Instream Array	0	1
	OBF - Omak Creek below Mission Falls	0	1
	ZSL - Zosel Dam	1	1
	Total	**412**	**536**

Appendix G
Aquatic Nuisance Species Management Plan 2024 Annual Report

AQUATIC NUISANCE SPECIES MANAGEMENT PLAN
2024 ANNUAL REPORT

WELLS HYDROELECTRIC PROJECT

FERC PROJECT NO. 2149

March 2025

Prepared by:
Public Utility District No. 1 of Douglas County
East Wenatchee, Washington

1.0 INTRODUCTION

The Aquatic Nuisance Species Management Plan (ANSMP) is one of six Aquatic Resource Management Plans contained within the Aquatic Settlement Agreement (Agreement). Collectively, these six Aquatic Resource Management Plans are critical to direct implementation of Protection, Mitigation, and Enhancement measures (PMEs) during the term of the new license and, together with the Wells Anadromous Fish Agreement and Habitat Conservation Plan (HCP) will function as the Water Quality Attainment Plan (WQAP) in support of the Clean Water Act Section 401 Water Quality Certification for the Wells Hydroelectric Project (Wells Project or Project).

To ensure active stakeholder participation and support, the Public Utility District No. 1 of Douglas County (Douglas PUD) developed all of the resource management plans in close coordination with agency and tribal natural resource managers (Aquatic Settlement Work Group or Aquatic SWG). During the development of this plan, the Aquatic SWG focused on developing management priorities for resources potentially impacted by Project operations. Members of the Aquatic SWG include the U.S. Fish and Wildlife Service (USFWS), Washington Department of Ecology (Ecology), Washington State Department of Fish and Wildlife (WDFW), the Confederated Tribes of the Colville Reservation (Colville), the Confederated Tribes and Bands of the Yakama Nation (Yakama), and Douglas PUD.

The National Marine Fisheries Service (NMFS) was invited to participate in the development of Aquatic Resource Management Plans, but declined because its interests are currently satisfied by the measures within the HCP.

The goal of the ANSMP is to prevent the introduction and/or spread of aquatic nuisance species (ANS) in Project waters. PUD, in collaboration with the Aquatic SWG, has agreed to implement several PMEs in support of the ANSMP. The PMEs presented within the ANSMP are designed to meet the following objectives:

The ANSMP is intended to be compatible with other ANS management plans in the Columbia River mainstem. Furthermore, this management plan is intended to be supportive of the HCP, Bull Trout Management Plan, Pacific Lamprey Management Plan, Resident Fish Management Plan, White Sturgeon Management Plan, and Water Quality Management Plan by continuing to prevent the introduction and/or spread of ANS in Project waters. The ANSMP is intended to be not inconsistent with other management strategies of federal, state and tribal natural resource management agencies.

This document outlines the goals and objectives of the ANSMP and the actions undertaken in support of each in 2024. Within Section 3.1, a section entitled “Progress Towards Objective X in 2024” outlines actions taken in 2024 and other related information. To help differentiate between existing management plan language and actions taken in 2024, new information for 2024 is presented in italicized font in each section.

Additional background information on ANS issues in the Wells Project can be found in the ANSMP, filed with the Federal Energy Regulatory Commission (FERC) in 2019.

2.0 GOAL AND OBJECTIVES

The goal of the ANSMP is to prevent the introduction and/or spread of ANS in Project waters. An up-to-date list of considered aquatic invasive species in Washington State can be found at https://invasivespecies.wa.gov/find-a-priority-species/. Douglas PUD, in collaboration with the Aquatic SWG, has agreed to implement several PMEs in support of the ANSMP. The PMEs presented within the ANSMP are designed to meet the following objectives:

Objective 1: Implement best management practices to prevent Eurasian watermilfoil *Myriophyllum spicatum* proliferation during in-water (i.e., construction, maintenance and recreation improvements) improvement activities in the Project.

Objective 2: Continue participation in regional and state efforts to prevent the introduction and spread of ANS. Activities include continued monitoring for the presence of ANS, monitoring bycatch data collected during other aquatic management plan activities and conducting education outreach within the Project.

Objective 3: In response to proposed changes in the Project requiring the FERC approval, the Aquatic SWG will assess the potential effects, if any, with respect to the introduction or proliferation of ANS in the Project to inform management decisions to support success of the ANSMP and will implement reasonable and appropriate measures to address any potential effects.

The ANSMP is intended to be compatible with other ANS management plans in the Columbia River mainstem. Furthermore, this management plan is intended to be supportive of the HCP, Bull Trout Management Plan, Pacific Lamprey Management Plan, Resident Fish Management Plan, White Sturgeon Management Plan, and Water Quality Management Plan by continuing to prevent the introduction and/or spread of ANS in Project waters. The ANSMP is intended to be not inconsistent with other management strategies of federal, state, and tribal natural resource management agencies.

The schedule for implementation of specific measures within the ANSMP is based on the best information available at the time the Plan was developed. As new information becomes available, implementation of each activity may be adjusted through consultation with the Aquatic SWG.

3.0 PROTECTION, MITIGATION AND ENHANCEMENT MEASURES

In order to fulfill the goals and objectives described in Section 3.0, Douglas PUD, in consultation with the Aquatic SWG, has agreed to implement the following PMEs.

3.1 Implement Best Management Practices During Recreational Improvement Activities (Objective 1)

If at any time during the new license term, Douglas PUD is required to construct, improve or maintain recreation access at boat launches and swim areas and the removal or disturbance of aquatic macrophtye beds that contain Eurasian watermilfoil may potentially occur, Douglas PUD will implement containment efforts utilizing best management practices agreed to by the Aquatic SWG during such activities.

Douglas PUD will implement the following best management practices (BMPs) to prevent the spread of ANS during contracted construction or maintenance of recreation enhancement measures.

For any contracted construction and maintenance activities requiring in-water work, Douglas PUD will require, as part of construction bids, the inclusion of BMPs to address potential ANS threats. Prior to contract award, Douglas PUD contract management staff will review and approve the sufficiency of proposed ANS BMPs with contractors and if necessary, require modifications in proposed ANS BMP implementation scope. Contractors will be instructed to share information with all sub-contractors prior to the start of work.

All equipment will undergo thorough inspection prior to entry into the Project to prevent the introduction of ANS. Inspections will be carried out on construction equipment and watercraft at a staging area dedicated to equipment and watercraft cleaning. This site will be located away from the ordinary high water line and away from any storm drains that run into Project waters. Douglas PUD will provide adequate training and information on ANS inspection and cleaning procedures to personnel responsible for inspections at field sites. An inspection process for vehicles and equipment that arrive onsite from other areas will be provided. Equipment from rental agencies, outside contractors, and managing partners will also be subject to inspection and cleaning. Precleaning inspections will be used to identify problem areas and determine whether hand removal of large accumulations of soil and debris is necessary before washing of equipment. Douglas PUD will provide equipment necessary for conducting proper inspections.

Douglas PUD will provide adequate training and information on ANS cleaning procedures to personnel responsible for cleaning watercraft and equipment. Specific information on cleaning of in-water equipment and watercraft will be provided. Special cleaning and decontamination protocols and methods will be required for equipment and watercraft that has been previously used in areas where zebra mussels *Dreissena polymorpha* and other Dreissenid species are present. Douglas PUD will require that records of inspections and cleanings be provided for all watercraft and construction equipment used in or near Project waters prior to, and after completion of construction projects. Inspection and cleaning records will include the location and date the watercraft or equipment was last used, date of inspection, findings of inspections, and the date and method used during the last cleaning. Inspection and cleaning records will be used to ensure that all watercraft and equipment has undergone proper inspection and cleaning before use in Project waters.

3.1.1.1 Progress Towards Objective 1 in 2024

In 2013, modifications were made to Section 4.1 of the ANSMP. Article 405 of the new FERC operating license for the Wells Project issued in November 2012 required that within 6 months of license issuance, Douglas PUD would modify Sections 4.1 of the existing ANSMP. The modifications required were:

(a) Section 4.1 of the plan must include specific best management practices that will be implemented to prevent the spread of ANS during construction of recreation enhancement measures.

In consultation with the Aquatic SWG, these modifications were made to the ANSMP and the updated plan was filed with FERC on April 30, 2013. The FERC approved the updated ANSMP on May 30, 2013. The approval of the plan also included a change in the reporting date for the ANSMP annual report from May 31 to April 1 for the preceding year's activities.

On February 13, 2017, Douglas PUD filed a request with the FERC to modify multiple reporting deadlines to May 31. This request included the ANSMP filing date to be changed from April 1 to May 31. The FERC approved Douglas PUD's request on February 24, 2017 that changed the reporting date for the ANSMP and Douglas PUD has continued to file the ANSMP each year after on May 31.

3.1.1.2 Aquatic Macrophyte Control

On July 17, 2024, aquatic herbicide was applied to control non-native Eurasian watermilfoil and other native aquatic macrophytes at swimming areas at Pateros Park, Columbia Cove Park (Brewster), and Marina Park (Bridgeport). The aquatic herbicide used was Tribune™ (active ingredient- diquat bromide). The control efforts were successful and no re-application of herbicide was required for the remainder of 2024. Since 2013, this herbicide has been used in these areas successfully reduce densities of aquatic macrophytes in the swimming areas and based upon spot surveys the species composition of the macrophyte communities in these areas has not changed to a higher or lower concentration of Eurasian watermilfoil.

3.2 Participation in Regional and State ANS Efforts (Objective 2)

3.2.1 Coordination with Regional and State Entities

Douglas PUD shall continue to coordinate with regional and state entities to implement activities in Project waters to monitor for the presence of ANS, specifically zebra *Dreissena polymorpha* and quagga mussels *Dreissena rostriformis bugensis*. Activities covered by this objective will consist of monitoring for the presence of zebra and quagga mussels as is identified in Section 2.2.3 of the ANSMP. If ANS are detected during monitoring activities, Douglas PUD will immediately notify the appropriate regional and state agencies and assist in the implementation

of reasonable and appropriate measures to address the ANS presence as is consistent with ANS management protocols.

In the event of positive identification of new ANS within the Project area, Douglas PUD will conduct the following response activities:

• Douglas PUD will immediately notify Ecology and WDFW of positive or suspected ANS species identified during monitoring and/or boat inspections. Photographs will be taken and sent to Ecology or WDFW for assistance in identification. If necessary, samples may also be collected for positive identification.

eDNA Verification - If a sample is positive for eDNA of Northern Pike or Dreissenids, resampling will be carried out to confirm the result. Within one week of the initial detection, eDNA sampling will occur at the location of the initial positive result or report (3 samples), and additional samples will be collected 1km and 5km upstream and downstream on each river bank. A positive result obtained during resampling will serve as confirmation of presence of the species. If results of resampling are negative and no other positive results are obtained at other routine eDNA monitoring sites, the initial detection will be assumed to be a false-positive result.

• Once the presence of ANS has been positively determined, Douglas PUD will within 30 days of the positive identification (requiring confirmation by relevant agencies), begin monitoring at multiple sites throughout the Project to determine the extent and distribution of the new ANS within the Project. Monitoring methods will vary depending on species and will be developed in consultation with the Aquatic SWG.

• If zebra mussels or other Dreissenid species are discovered in Project waters, Douglas PUD will also notify upstream and downstream operators (Corps and Chelan PUD) and the Columbia River Basin Team. Douglas PUD will help coordinate subsequent Columbia River Basin Team rapid response actions as applicable to the Project, such as implementing mandatory boat inspections, boat launch closures, quarantines, treatments, etc., in consultation with the Aquatic SWG.

• Douglas PUD will work collaboratively with Ecology and WDFW, and in consultation with the Aquatic SWG, to develop an appropriate control response. Douglas PUD will cooperate with the Columbia River Basin Team in implementing rapid response actions. It is anticipated that the Columbia River Basin Team will use up to the date technical information to guide decisions. The Columbia River Basin Team is also expected to follow the protocols contained within the 100th Meridian Initiative as it applies to the containment of zebra and other Dreissenid species.

• Appropriate information will also be provided to the public about any new ANS observations. Up-to-date outreach will be provided to the public with information about the presence and distribution of the ANS in Project waters, and on the appropriate measures being implemented to prevent the proliferation of the species.

• After initial response efforts are conducted, Douglas PUD will assist the Columbia River Basin Team in implementing control and/or eradication actions as appropriate based on the location, extent, and type of ANS identified. The Aquatic SWG will be consulted when selecting control and eradication methods.

Douglas PUD shall participate in information exchanges and regional efforts to coordinate monitoring activities.

3.2.1.1 Progress Towards Objective 2 in 2024

Similar to previous years, Douglas PUD coordinated zebra and quagga mussel monitoring with WDFW during 2024. Monitoring consisted of plankton net tows for mussel veligers, inspection of artificial substrate, and shoreline surveys at three locations in the Wells Reservoir on four occasions (Figure 1). In addition, environmental DNA (eDNA) sampling was employed in 2024 to monitor for the presence/absence of zebra and quagga mussels at five locations throughout the Wells Project. Plankton tow samples and eDNA samples were sent for laboratory analysis and results were provided to WDFW. Results from sample analyses determined no presence of either species at any of the sites monitored in the Wells Project (Table 1). A total of 78 samples were collected and analyzed for the presence of dreissenid mussels eDNA; all of which produced negative results (Appendix A). Douglas PUD will continue to monitor for these species in 2025, in consultation with the Aquatic SWG.

Northern Pike (Esox luscious) have been detected upstream of the Wells Project in Lake Roosevelt. The introduction and establishment of Northern Pike in the Wells Reservoir could potentially threaten native salmonid populations; therefore monitoring efforts began in 2017 and continued in 2024 to determine if Northern Pike are present. Monthly (March through October) eDNA samples were collected at five locations, two samples at each location for a total of 10 samples, throughout the Wells Project (Figure 1). These samples were collected pursuant to the Northern Pike Monitoring and Response Plan that was developed in the Aquatic SWG in May 2019 (see Aquatic Settlement Agreement 2019 Annual Report). The Plan established protocols for early detection monitoring and rapid response and suppression actions for Northern Pike should they become established in the Wells Project.

Figure 1. **Location of sites monitored for zebra and quagga mussels and Northern Pike in 2024 in the Wells Project.**

Table 1. Summary of zebra and quagga mussel monitoring efforts in 2024.

Date	Location	Sample Type	Zebra/Quagga Present
16-Jul	Pateros winter boat launch dock	Artificial Substrate	No
16-Jul	Brewster boat launch dock	Artificial Substrate	No
16-Jul	Bridgeport boat launch dock	Artificial Substrate	No
16-Jul	100 m downstream of Methow River mouth	Veliger Tow	No
16-Jul	100 m downstream of Brewster swimming area	Veliger Tow	No
16-Jul	100 m downstream of Bridgeport boat launch	Veliger Tow	No
16-Jul	Pateros winter boat launch dock	Shoreline Survey	No
16-Jul	Brewster boat launch dock	Shoreline Survey	No
16-Jul	Bridgeport boat launch dock	Shoreline Survey	No
19-Aug	Pateros winter boat launch dock	Artificial Substrate	No
19-Aug	Brewster boat launch dock	Artificial Substrate	No
19-Aug	Bridgeport boat launch dock	Artificial Substrate	No
19-Aug	100 m downstream of Methow River mouth	Veliger Tow	No
19-Aug	100 m downstream of Brewster swimming area	Veliger Tow	No
19-Aug	100 m downstream of Bridgeport boat launch	Veliger Tow	No
19-Aug	Pateros winter boat launch dock	Shoreline Survey	No
19-Aug	Brewster boat launch dock	Shoreline Survey	No
19-Aug	Bridgeport boat launch dock	Shoreline Survey	No
24-Sep	Pateros winter boat launch dock	Artificial Substrate	No
24-Sep	Brewster boat launch dock	Artificial Substrate	No
24-Sep	Bridgeport boat launch dock	Artificial Substrate	No
24-Sep	100 m downstream of Methow River mouth	Veliger Tow	No
24-Sep	100 m downstream of Brewster swimming area	Veliger Tow	No
24-Sep	100 m downstream of Bridgeport boat launch	Veliger Tow	No
24-Sep	Pateros winter boat launch dock	Shoreline Survey	No
24-Sep	Brewster boat launch dock	Shoreline Survey	No
24-Sep	Bridgeport boat launch dock	Shoreline Survey	No
22-Oct	Pateros winter boat launch dock	Artificial Substrate	No
23-Oct	Brewster boat launch dock	Artificial Substrate	No
23-Oct	Bridgeport boat launch dock	Artificial Substrate	No
22-Oct	100 m downstream of Methow River mouth	Veliger Tow	No
23-Oct	100 m downstream of Brewster swimming area	Veliger Tow	No
23-Oct	100 m downstream of Bridgeport boat launch	Veliger Tow	No
22-Oct	Pateros winter boat launch dock	Shoreline Survey	No
23-Oct	Brewster boat launch dock	Shoreline Survey	No
23-Oct	Bridgeport boat launch dock	Shoreline Survey	No

In addition to eDNA monitoring, boat electrofishing was used to monitor for the presence of Northern Pike. Monitoring occurred in four locations (Figure 2) on six occasions in March and Apil 2024 (Table 2). No Northern Pike were captured during these efforts.

Figure 2. Locations of Northern Pike electrofishing monitoring sites in 2024.

Table 2. Northern Pike electrofishing monitoring efforts in 2024.

Location	Date	Electrofishing Effort
Okanogan Lower	3/19/2024	0:19:15
Bridgeport Bar WDFW	3/19/2024	0:20:21
Okanogan Upper	3/19/2024	0:10:10
Okanogan Lower	4/10/2024	0:22:21
Bridgeport Bar WDFW	4/8/2024	0:11:53
Cassimer Bar Ponds	4/10/2024	0:15:33

In 2024, the Aquatic SWG maintained a list of contacts from various stakeholders that should be notified in the event of detection of new ANS in the Wells Project (Appendix B). This contact list is updated annually to ensure the most up to date and accurate contact information is available.

3.2.2 Monitor Bycatch from other Project Aquatic Resource Management Activities

Douglas PUD shall monitor bycatch data collected from ongoing Project aquatic resource management activities for ANS presence to support regional and state efforts and the ANSMP. Such ongoing activities may consist of summer Chinook and steelhead broodstock collection activities at Wells Dam and in associated Project tributaries, the Northern Pikeminnow removal program, water quality monitoring and any other aquatic resource activities related to implementation of Aquatic Resource Management Plans for Bull Trout, Pacific Lamprey, White Sturgeon, and other resident fish.

3.2.2.1 Progress Towards Objective 2 in 2024

Douglas PUD monitored bycatch for ANS during aquatic resource management activities in 2024. Specific activities in which monitoring of bycatch occurred included: Northern Pikeminnow removal program and the 2024 Resident Fish Assemblage Study. The 2024 Resident Fish Assemblage Study encompassed the entire Wells Reservoir and utilized sampling methods including beach seines, minnow traps, fyke nets, boat electrofishing, hoop nets, cod traps, and gill nets. During the study, no non-native fish species that had not been previously documented in the Wells Reservoir were observed at any of the 253 locations sampled. In 2024, crayfish monitoring was conducted concurrently with the 2024 Resident Fish Assemblage Study. During the study, 412 non-native Northern Crayfish were captured from 58 different locations throughout the Wells Reservoir Figure 3.

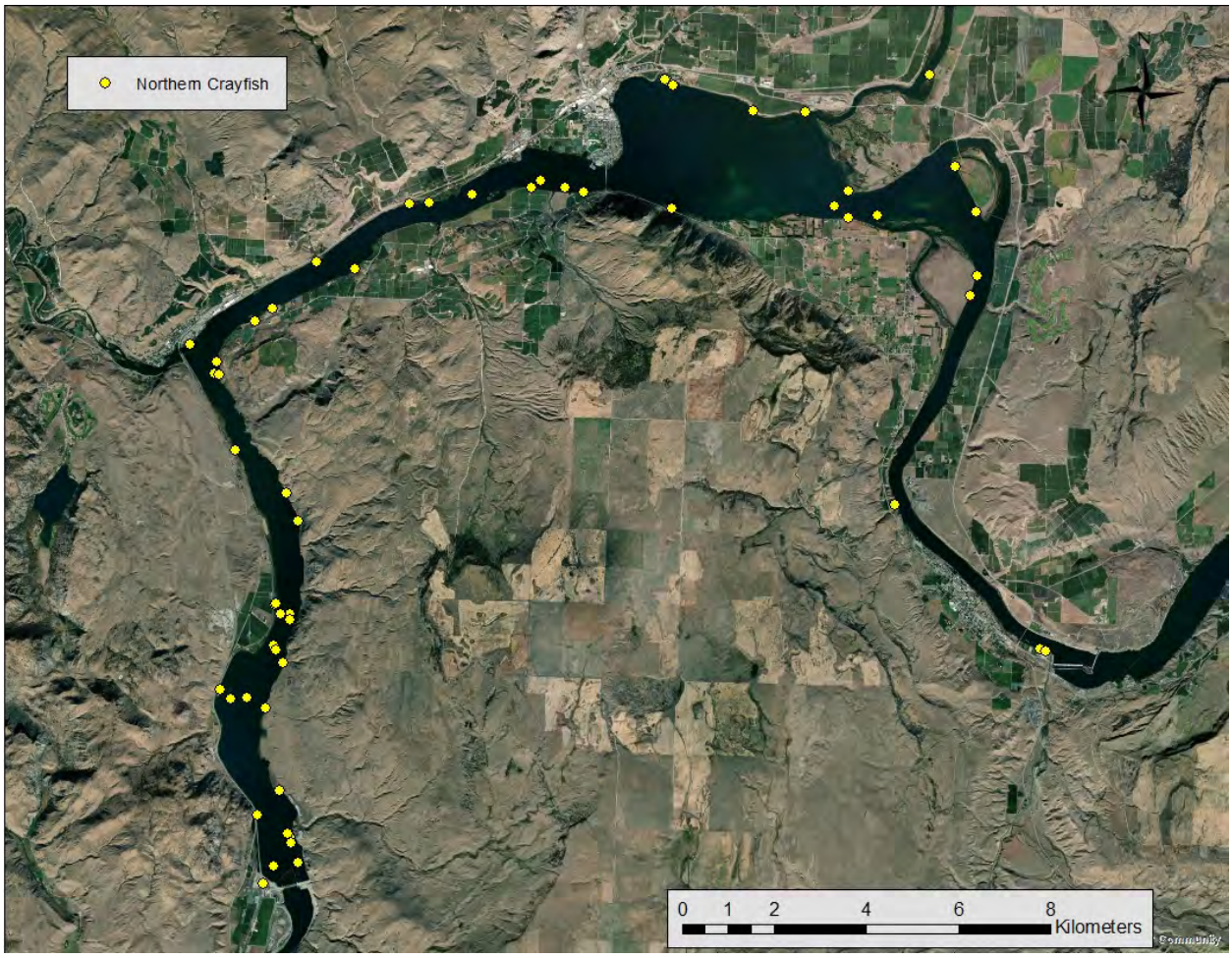


Figure 3. Map of locations (yellow dots) where Northern Crayfish were captured during the 2024 Resident Fish Assemblage Study.

3.2.3 ANS Information and Education

Douglas PUD shall make information regarding the effects of ANS introductions and the importance of prevention available to the public. Such outreach activities may consist of posting signage at Project recreation areas and boat launches.

Douglas PUD shall also provide literature produced by appropriate state entities (Ecology and WDFW) for distribution at the visitor centers of local communities of the Project (Pateros, Brewster, Bridgeport) including Wells Dam.

3.2.3.1 Progress Towards Objective 2 in 2024

In 2024, Douglas PUD maintained ANS signage at all public boat launch facilities in the Wells Project. Signs included information about preventing the spread of ANS. Douglas PUD also provided educational literature in the form of brochures and fact sheets on ANS prevention measures and the risks of ANS introductions, which were placed at boat launches around the

Project area and the Wells Dam Overlook. This information has been available to the public since May 2013. In 2018, upgraded sign kiosks were installed at public use facilities that included ANS signage and information. In 2020, signs with information about preventing the spread of Northern Pike and how the public should report sightings were added to the kiosks. See Appendix C for examples of the current signage displayed. Douglas PUD will continue to make this information available in 2025.

3.3 Monitor and Address ANS Effects to Aquatic Communities During Changes in Project Operations (Objective 3)

If at any time during the new license term, future changes in Project operations requiring the FERC approval are proposed and the Aquatic SWG concludes that such proposed operations may encourage the introduction or proliferation of ANS within the Project, the Aquatic SWG will assess the potential effects, if any, in order to make informed management decisions.

If the assessment identifies adverse effects to Aquatic Resources due to ANS attributable to changes in Project operations, Douglas PUD shall consult with the Aquatic SWG to select and implement reasonable and appropriate PMEs to address the identified adverse effect(s).

3.3.1.1 Progress Towards Objective 3 in 2024

No significant changes in Project operations occurred in 2024.

3.4 Reporting

Douglas PUD will provide a draft annual report to the Aquatic SWG summarizing the previous year's activities undertaken in accordance with the ANSMP. The report will document all ANS activities conducted within the Project. Furthermore, any decisions, statements of agreement, evaluations, or changes made pursuant to this ANSMP will be included in the annual report. If significant activity was not conducted in a given year, Douglas PUD will prepare a memorandum providing an explanation of the circumstances in lieu of the annual report.

Consistent with the FERC License Order for Wells Dam, the Wells Dam Water Quality 401 Certification and ANSMP, this report will be updated annually with the assistance of the Aquatic SWG. Each year of the new FERC license the ANS Annual Report has been filed with the FERC prior to April 1st. In 2017, Douglas PUD and in consultation with the Aquatic SWG requested that FERC move the filing deadline of the ANSMP Annual Report to May 31st each year to align with filing deadlines of the other five management plans that make up the Aquatic Settlement Agreement. Douglas PUD will continue to file this report on this schedule for the duration of the license. The report will continue to include a summary of the progress made towards the implementation of the ANSMP and focus on the previous year's developments.

Appendix A – 2024 Environmental DNA Monitoring Results

Site	Waterbody	Zone	Easting	Northing	Date Collected	Dreissenid mussels eDNA Detected?	Northern Pike eDNA Detected?
Side Channel East	Columbia River	11N	299931	5328108	3/12/2024	N	N
Side Channel West	Columbia River	11N	299865	5328165	3/12/2024	N	N
Bridgeport Left	Columbia River	11N	299280	5322462	3/12/2024	N	N
Bridgeport Right	Columbia River	11N	299599	5322484	3/12/2024	N	N
Starr Right	Columbia River	11N	284441	5318202	3/12/2024	N	N
Starr Left	Columbia River	11N	285514	5318239	3/12/2024	N	N
Mosquito Left	Okanogan River	11N	298342	5331245	3/13/2024	N	N
Mosquito Right	Okanogan River	11N	298162	5331190	3/13/2024	N	N
Wakefield Right	Okanogan River	11N	298474	5342914	3/13/2024	N	N
Wakefield Left	Okanogan River	11N	298488	5342994	3/13/2024	N	N
Side Channel East	Columbia River	11N	299931	5328108	4/17/2024	N	N
Side Channel West	Columbia River	11N	299865	5328165	4/17/2024	N	N
Mosquito Left	Okanogan River	11N	298342	5331245	4/17/2024	N	N
Mosquito Right	Okanogan River	11N	298162	5331190	4/17/2024	N	N
Wakefield Right	Okanogan River	11N	298474	5342914	4/18/2024	N	N
Wakefield Left	Okanogan River	11N	298488	5342994	4/18/2024	N	N
Bridgeport Left	Columbia River	11N	299280	5322462	4/17/2024	N	N
Bridgeport Right	Columbia River	11N	299599	5322484	4/17/2024	N	N
Starr Right	Columbia River	11N	284441	5318202	4/17/2024	N	N
Starr Left	Columbia River	11N	285514	5318239	4/17/2024	N	N
Side Channel East	Columbia River	11N	299931	5328108	5/22/2024	N	N
Side Channel West	Columbia River	11N	299865	5328165	5/22/2024	N	N
Mosquito Left	Okanogan River	11N	298342	5331245	5/23/2024	N	N

Site	Waterbody	Zone	Easting	Northing	Date Collected	Dreissenid mussels eDNA Detected?	Northern Pike eDNA Detected?
Mosquito Right	Okanogan River	11N	298162	5331190	5/23/2024	N	N
Bridgeport Left	Columbia River	11N	299280	5322462	5/22/2024	N	N
Bridgeport Right	Columbia River	11N	299599	5322484	5/22/2024	N	N
Starr Right	Columbia River	11N	284441	5318202	5/22/2024	N	N
Starr Left	Columbia River	11N	285514	5318239	5/22/2024	N	N
Side Channel East	Columbia River	11N	299931	5328108	6/20/2024	N	N
Side Channel West	Columbia River	11N	299865	5328165	6/20/2024	N	N
Mosquito Left	Okanogan River	11N	298342	5331245	6/20/2024	N	N
Mosquito Right	Okanogan River	11N	298162	5331190	6/20/2024	N	N
Wakefield Right	Okanogan River	11N	298474	5342914	6/19/2024	N	N
Wakefield Left	Okanogan River	11N	298488	5342994	6/19/2024	N	N
Bridgeport Left	Columbia River	11N	299280	5322462	6/20/2024	N	N
Bridgeport Right	Columbia River	11N	299599	5322484	6/20/2024	N	N
Starr Right	Columbia River	11N	284441	5318202	6/20/2024	N	N
Starr Left	Columbia River	11N	285514	5318239	6/20/2024	N	N
Side Channel East	Columbia River	11N	299931	5328108	7/16/2024	N	N
Side Channel West	Columbia River	11N	299865	5328165	7/16/2024	N	N
Mosquito Left	Okanogan River	11N	298342	5331245	7/16/2024	N	N
Mosquito Right	Okanogan River	11N	298162	5331190	7/16/2024	N	N
Wakefield Right	Okanogan River	11N	298474	5342914	7/15/2024	N	N
Wakefield Left	Okanogan River	11N	298488	5342994	7/15/2024	N	N
Bridgeport Left	Columbia River	11N	299280	5322462	7/16/2024	N	N
Bridgeport Right	Columbia River	11N	299599	5322484	7/16/2024	N	N
Starr Right	Columbia River	11N	284441	5318202	7/16/2024	N	N
Starr Left	Columbia River	11N	285514	5318239	7/16/2024	N	N
Side Channel East	Columbia River	11N	299931	5328108	8/19/2024	N	N

Site	Waterbody	Zone	Easting	Northing	Date Collected	Dreissenid mussels eDNA Detected?	Northern Pike eDNA Detected?
Side Channel West	Columbia River	11N	299865	5328165	8/19/2024	N	N
Mosquito Left	Okanogan River	11N	298342	5331245	8/19/2024	N	N
Mosquito Right	Okanogan River	11N	298162	5331190	8/19/2024	N	N
Wakefield Right	Okanogan River	11N	298474	5342914	8/21/2024	N	N
Wakefield Left	Okanogan River	11N	298488	5342994	8/21/2024	N	N
Bridgeport Left	Columbia River	11N	299280	5322462	8/19/2024	N	N
Bridgeport Right	Columbia River	11N	299599	5322484	8/19/2024	N	N
Starr Right	Columbia River	11N	284441	5318202	8/19/2024	N	N
Starr Left	Columbia River	11N	285514	5318239	8/19/2024	N	N
Side Channel East	Columbia River	11N	299931	5328108	9/26/2024	N	N
Side Channel West	Columbia River	11N	299865	5328165	9/26/2024	N	N
Mosquito Left	Okanogan River	11N	298342	5331245	9/25/2024	N	N
Mosquito Right	Okanogan River	11N	298162	5331190	9/25/2024	N	N
Wakefield Right	Okanogan River	11N	298474	5342914	9/25/2024	N	N
Wakefield Left	Okanogan River	11N	298488	5342994	9/25/2024	N	N
Bridgeport Left	Columbia River	11N	299280	5322462	9/26/2024	N	N
Bridgeport Right	Columbia River	11N	299599	5322484	9/26/2024	N	N
Starr Right	Columbia River	11N	284441	5318202	9/24/2024	N	N
Starr Left	Columbia River	11N	285514	5318239	9/24/2024	N	N
Side Channel East	Columbia River	11N	299931	5328108	10/23/2024	N	N
Side Channel West	Columbia River	11N	299865	5328165	10/23/2024	N	N
Mosquito Left	Okanogan River	11N	298342	5331245	10/24/2024	N	N
Mosquito Right	Okanogan River	11N	298162	5331190	10/24/2024	N	N
Wakefield Right	Okanogan River	11N	298474	5342914	10/24/2024	N	N
Wakefield Left	Okanogan River	11N	298488	5342994	10/24/2024	N	N
Bridgeport Left	Columbia River	11N	299280	5322462	10/23/2024	N	N

Site	Waterbody	Zone	Easting	Northing	Date Collected	Dreissenid mussels eDNA Detected?	Northern Pike eDNA Detected?
Bridgeport Right	Columbia River	11N	299599	5322484	10/23/2024	N	N
Starr Right	Columbia River	11N	284441	5318202	10/22/2024	N	N
Starr Left	Columbia River	11N	285514	5318239	10/22/2024	N	N

Appendix B – 2025 ANS Notification Contact List

Agency/Organization	Contact Name	Email
WDFW	Jesse Schultz	Jesse.Schultz@dfw.wa.gov
WDFW	Eric Anderson	Eric.Anderson@dfw.wa.gov
WDFW	Chelsey Buffington	Chelsey.bufington@dfw.wa.gov
Chelan County PUD	Bill Towey	Bill.Towey@chelanpud.org
Grant County PUD	Carson Keeler	ckeeler@gcpud.org
Colville Tribes	Holly McLellan	Holly.mclellan@colvilletribes.com
Yakama Nation	Blaine Parker	parb@critfc.org

Appendix C – ANS Signage Examples

ATTENTION
BOATERS
All boats registered outside of Washington State
MUST have an Aquatic Invasive Species Prevention
Permit BEFORE launching in Washington waters.
Failure to have permit may result
in $150 fine. RCW 77.15.160
How to buy:
• Online at fishhunt.dfw.wa.gov
• Find a license dealer near you at wdfw.wa.gov/licenses/dealers
Funds from permit sales supports efforts to keep Washington's waters
free of aquatic invasive species and manage infestations.
Washington Department of
FISH and WILDLIFE

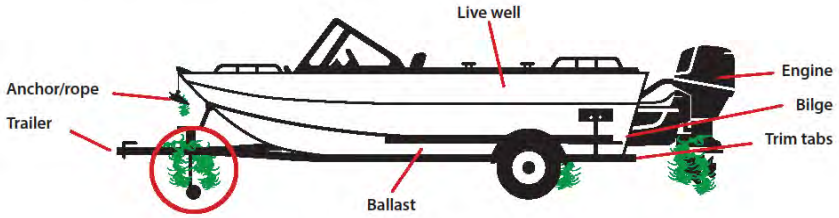
Protect Your Waters
From Aquatic Invasive Species

BEFORE and AFTER launching boat

CLEAN
Clean interior/exterior of boat, trailer, & vehicle of any organic matter such as aquatic plants & mud. Dispose organic matter & unused bait in trash.

DRAIN
Drain bilge, ballast, wells & buckets before you leave area. Keep bilge plug out during transport.

DRY
Dry equipment before launching watercraft into another body of water.



For information on FREE boat inspections, call 1-888-WDFW-AIS (933-9247) or visit wdfw.wa.gov/ais.

Before you launch a boat that is not registered in Washington, you MUST purchase an Aquatic Invasive Species Prevention Permit.

How to buy:

- Online at fishhunt.dfw.wa.gov
- Find a license dealer near you at wdfw.wa.gov/licenses/dealers

Funds from permit sales supports efforts to keep Washington's waters free of aquatic invasive species and manage infestations when prevention fails.

Avoid Citations or Fines

Failure to possess an Aquatic Invasive Species Prevention Permit – Infraction — RCW 77.15.160

Possession of aquatic conveyance not meeting clean drain requirements – Infraction — RCW 77.135.110

Introduction or possession of prohibited species – up to class C felony — RCW 77.15.160 (4)

FISH AND WILDLIFE POLICE OFFICER

Washington Department of FISH and WILDLIFE

STOP AQUATIC HITCHHIKERS!™
www.protectyourwaters.net

Protect Your Waters
From Aquatic Invasive Species

BEFORE and AFTER launching rafts, kayaks, stand-up paddleboards, or other watercraft

CLEAN
Clean watercraft, paddles, trailer, and vehicle of any organic matter such as aquatic plants and mud.

DRAIN
Drain water from watercraft, hatches and/or buckets at the boat launch. Keep bilge plug out during transport.

DRY
Dry watercraft and all equipment before launching into another body of water.

For information on FREE boat inspections, call 1-888-WDFW-AIS (933-9247) or visit wdfw.wa.gov/ais.

Before you launch a boat registered outside the State of Washington, you MUST purchase an Aquatic Invasive Species Prevention Permit.

How to buy:

- **Online at fishhunt.dfw.wa.gov**
- **Find a license dealer near you at wdfw.wa.gov/licenses/dealers**

Avoid Citations or Fines

Failure to possess an Aquatic Invasive Species Prevention Permit – Infraction — RCW 77.15.160
Possession of aquatic conveyance not meeting clean drain requirements – Infraction — RCW 77.135.110
Introduction or possession of prohibited species – up to class C felony — RCW 77.15.160 (4)

Washington Department of FISH and WILDLIFE

STOP AQUATIC HITCHHIKERS!™
www.protectyourwaters.net

Funds from permit sales supports efforts to keep Washington's waters free of aquatic invasive species and manage infestations when prevention fails.

STOP THE SPREAD OF INVASIVE NORTHERN PIKE

This site is at risk for invasion by northern pike. Northern pike pose a significant threat to Washington salmon and steelhead.

IF CAUGHT DO NOT RELEASE

Photograph and report to the Washington Department of Fish and Wildlife

1-888-WDFW-AIS

fishpgm@dfw.wa.gov

invasivespecies.wa.gov/report-a-sighting/

WASHINGTON STATE RECREATION AND CONSERVATION OFFICE
Washington Invasive Species Council

Washington Department of FISH and WILDLIFE

DON'T LET IT LOOSE!
Pets released into the wild harm native wildlife.
Be a responsible pet owner.
invasivespecies.wa.gov
Penalty includes up to $5,000 in Fines and A Year in Prison (RCW 77.15.250) and a person found guilty can also be ordered to pay all costs of capturing, controlling or killing the species or their progeny (in excess of $100,000).
Washington Department of FISH and WILDLIFE

Appendix H
Resident Fish Management Plan 2024 Annual Report

RESIDENT FISH MANAGEMENT PLAN 2024 ANNUAL REPORT

WELLS HYDROELECTRIC PROJECT

FERC PROJECT NO. 2149

March 2025

Prepared by:
Public Utility District No. 1 of Douglas County
East Wenatchee, Washington

© Copyright 2024. Public Utility District No. 1 of Douglas County. All Rights Reserved.

EXECUTIVE SUMMARY

The annual Resident Fish Management Plan (RFMP) Report includes a summary of all of the existing resident fish measures required by the Federal Energy Regulatory Commission (FERC) including Article 406 of the license for the Wells Project and the requirements found within the Clean Water Act section 401 Water Quality Certification. Article 406 of the license requires Public Utility District No. 1 of Douglas County (Douglas PUD) to submit an annual report of management plan activities by May 31st of each year.

The measures required by the FERC license are largely consistent with the measures found in the Aquatic Settlement Agreement's RFMP and the reporting requirements for the RFMP and the Clean Water Act section 401 Water Quality Certification. The 2023 RFMP annual report (this report) will be used to demonstrate compliance with all three of Douglas PUD's Wells Project resident fish-related reporting obligations.

Douglas PUD developed all six of the aquatic resource management plans in close coordination with agency and tribal natural resource managers (Aquatic Settlement Work Group or Aquatic SWG). During the development of this plan, the Aquatic SWG focused on developing management priorities for resources potentially impacted by Project operations. Members of the Aquatic SWG include the U.S. Fish and Wildlife Service (USFWS), Washington Department of Ecology (Ecology), Washington State Department of Fish and Wildlife (WDFW), the Confederated Tribes of the Colville Reservation (Colville), the Confederated Tribes and Bands of the Yakama Nation (Yakama), and Douglas PUD.

The National Marine Fisheries Service (NMFS) was invited to participate in the development of Aquatic Resource Management Plans, but declined because its interests are currently satisfied by the measures within the Anadromous Fish Agreement and Habitat Conservation Plan (HCP).

The goal of the RFMP is to protect and enhance native resident fish populations and habitat in the Project during the term of the new license. Douglas PUD, in collaboration with the Aquatic SWG, has agreed to implement several resident fish Protection, Mitigation and Enhancement (PMEs) measures in support of the RFMP. The PMEs presented within the RFMP are designed to meet the following objectives:

Objective 1: Continue to provide additional benefits to resident fishery resources in the Project as a result of continued implementation of the HCP, Predator Control Programs and Douglas PUD's Land Use Policy.

Objective 2: In year 2 and every 10 years thereafter during the new license term, Douglas PUD will conduct a resident fish study to determine the relative abundance of the various resident fish species found within the Project. The study objectives will focus on (1) identifying whether there have been major shifts in the resident fish populations resulting from the implementation of the White Sturgeon, Bull Trout, Pacific Lamprey, and Aquatic Nuisance Species (ANS) Management Plans, and (2) collecting information on resident predator fish populations found within the Wells Reservoir. The results of this study may be used to inform the implementation

activities of the other Wells aquatic resource management (ANS, Bull Trout, Pacific Lamprey, and White Sturgeon) plans and HCP predator control activities.

Objective 3: If any statistically significant negative changes to native resident fish populations of social, economic, and cultural importance are identified, and are not caused by and cannot be addressed through implementation of other aquatic resource management plans or activities (White Sturgeon, Pacific Lamprey, Bull Trout, ANS, HCP, predator control), reasonable and appropriate implementation measures to address negative changes, if any, will be undertaken by Douglas PUD.

Objective 4: In response to proposed major changes in Wells Dam operations requiring FERC approval, Douglas PUD will assess the potential effects, if any, on Project habitat functionally related to spawning, rearing, and migration of native resident fish, in order to make informed management decisions towards the success of the RFMP. Douglas PUD will implement reasonable and appropriate measures to address any effects on social, economic, and culturally important native species.

This RFMP is intended to be compatible with other resident fish management plans in the Columbia River mainstem. Furthermore, the RFMP is intended to be supportive of the HCP, Bull Trout Management Plan, Pacific Lamprey Management Plan and White Sturgeon Management Plan by continuing to monitor changes, if necessary, in the resident fish assemblage within the Project. The RFMP is intended to be not inconsistent with other management strategies of federal, state and tribal natural resource management agencies and supportive of designated uses for aquatic life under WAC 173-201A, the Washington state water quality standards.

1.0 INTRODUCTION

The Resident Fish Management Plan (RFMP) is one of six Aquatic Resource Management Plans contained within the Aquatic Settlement Agreement (Agreement). Collectively, these six Aquatic Resource Management Plans are critical to direct implementation of Protection, Mitigation, and Enhancement measures (PMEs) during the term of the new license and, together with the Wells Anadromous Fish Agreement and Habitat Conservation Plan (HCP) will function as the Water Quality Attainment Plan (WQAP) in support of the Clean Water Act Section 401 Water Quality Certification for the Wells Hydroelectric Project (Wells Project or Project).

To ensure active stakeholder participation and support, the Public Utility District No. 1 of Douglas County (Douglas PUD) developed all of the resource management plans in close coordination with agency and tribal natural resource managers (Aquatic Settlement Work Group or Aquatic SWG). During the development of this plan, the Aquatic SWG focused on developing management priorities for resources potentially impacted by Project operations. Entities invited to participate in the Aquatic SWG include the U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), Bureau of Land Management (BLM), Bureau of Indian Affairs (BIA), Washington Department of Ecology (Ecology), Washington State Department of Fish and Wildlife (WDFW), the Confederated Tribes of the Colville Reservation (Colville), the Confederated Tribes and Bands of the Yakama Nation (Yakama), and Douglas PUD.

The RFMP will direct implementation of measures to protect and enhance native resident fish populations in the Wells Reservoir. To ensure active stakeholder involvement and support, Douglas PUD developed this plan, along with the other aquatic management plans, in close coordination with the members of the Aquatic SWG.

The Aquatic SWG agrees on the need to develop a plan for the long-term management of native resident fish populations in the Project. This management plan summarizes the relevant resource issues and background (Section 2), identifies goals and objectives of the plan (Section 3), and describes the relevant PMEs (Section 4) for native resident fish during the term of the new license.

2.0 BACKGROUND

2.1 Resident Fish Species

The resident fish assemblage present in the Wells Reservoir is composed of a diverse community of native and introduced, warm and coldwater, and recreational and non-recreational fish species. Since the construction of Wells Dam several studies have either directly (McGee 1979; Beak 1999, Kyger 2015) or indirectly (Dell et al. 1975; Burley and Poe 1994) addressed the resident fish assemblage in the Wells Reservoir.

2.1.1 Project Resident Fish Assessments

In assessing the occurrence of gas bubble disease in fish in the mid-Columbia River reservoirs, Dell et al. (1975) observed that the most abundant resident fish species in the Wells Reservoir were Northern Pikeminnow (*Ptychocheilus oregonensis*), stickleback (*Gasterosteus spp.*), and suckers (*Catostomus* spp.). They also determined that mountain whitefish (*Prosopium williamsoni*) and pumpkinseed (*Lepomis gibbosus*) were the most abundant resident game fish, although these two species accounted for less than two percent of the total 32,289 fish sampled. Overall, 27 species of resident and anadromous fish were identified in the study area (Table 2.1-1).

In 1993, a one-year study was conducted to determine the relative predation by Northern Pikeminnow on outmigrating juvenile salmonids and to develop relative predation indices for each of the five mid-Columbia River reservoirs. During the study, incidental catch (species captured other than Northern Pikeminnow) was high with over 25 fish species recorded and catch dominated by Catostomidae (suckers) (Burley and Poe 1994).

Table 2.1-1 Native and non-native resident fish species that have been documented in the Wells Reservoir from past resident fish assessments, monitoring efforts, and miscellaneous studies (Dell et al. 1975; McGee 1979; Burley and Poe 1994; Beak 1999; NMFS 2002; BioAnalyst, Inc. 2004, Kyger 2015).

Native Species	Non-Native Species
White Sturgeon *Acipenser transmontanus*[*]	Carp *Cyprinus carpio*
Chiselmouth *Acrocheilus alutaceus*	Black bullhead *Ictalurus melas*
Longnose sucker *Catostomus catostomus*	Brown bullhead *Ictalurus nebulosus*
Bridgelip sucker *Catostomus columbianus*	Pumpkinseed *Lepomis gibbosus*
Largescale sucker *Catostomus macrocheilus*	Bluegill *Lepomis macrochirus*
Prickly sculpin *Cottus asper*	Smallmouth bass *Micropterus dolomieu*
Threespine stickleback *Gasterosteus aculeatus*	Largemouth bass *Micropterus salmoides*
Burbot *Lota lota*	Yellow Perch *Perca flavescens*
Peamouth *Mylocheilus caurinus*	Black crappie *Pomoxis nigromaculatus*
Rainbow trout *Oncorhynchus mykiss*	Walleye *Sander vitreus*
Mountain whitefish *Prosopium williamsoni*	Tench *Tinca tinca*
Northern Pikeminnow *Ptychocheilus oregonensis*	Lake whitefish *Coregonus clupeaformis*
Redside shiner *Richardsonius balteatus*	
Dace *Rhinichthys* spp.	
Bull Trout *Salvelinus confluentus*[*]	

[*] Individual management plans for both sturgeon and Bull Trout have been developed and as such, they are not addressed in this Resident Fish Management Plan.

McGee (1979) noted that chiselmouth (*Acrocheilus alutaceus*), redside shiners (*Richardsonius balteatus*), and largescale suckers (*Catostomus macrocheilus*) were the most abundant non-game fish captured during Wells Reservoir surveys while pumpkinseed were the most abundant game fish caught. Similar sampling design and methodology to the 1974 study (Dell et al. 1975) were employed in order to ensure that results of the study were comparable with past observations. In

total, 2,480 fish were collected during the study using live traps, beach seines and angling. Twenty of the 27 known species previously trapped in other mid-Columbia reservoirs (Dell et al. 1975) were captured in the Wells Reservoir during the study.

In 1998, Douglas PUD conducted an updated Wells Reservoir resident fish assessment (Beak 1999). Again, an effort was made to implement a sampling design similar to the two previous studies (1974 and 1979) so as to be consistent and allow comparisons with past results. In total, 22 species of fish were identified with 5,657 fish captured using beach seines and 716 fish observed via diving transects. Beak (1999) reported suckers (*Catostomus* spp.) as the most abundant resident fish captured in beach seining sampling in the Wells study area. These species represented 41 percent of the beach seining catch and 46 percent of the underwater dive survey count. Other abundant species in the beach seine catch were bluegill (*Lepomis macrochirus*) (32 percent), Northern Pikeminnow (10 percent), peamouth (*Mylocheilus caurinus*) (6 percent), and carp (*Cyprinus carpio*) (5 percent). Fifteen other species represented the remaining 7 percent of the total catch of 3,783 fish.

In 2014, Douglas conducted the 2014 Resident Fish Assemblage Study (Kyger 2015). The study utilized beach seine and snorkel sampling methods that were comparable to previous resident fish studies in the Wells Reservoir in addition to boat electrofishing and baited setline sampling methods. Another objective of the study was to estimate the abundance of smallmouth bass, in the Okanogan River from the mouth upstream to the Project boundary, and Burbot in the deeper areas of the reservoir. Twenty different species of resident fish were observed during the study and nearly 13,000 individual fish were captured or observed. Threespine Stickleback and Redside Shiner were the most abundant fish species reservoir wide. Similar to the result of past studies, sucker species and Northern Pikeminnow were some of the most abundant species. Northern pikeminnow were the most abundant predator species, followed by Smallmouth Bass. This result was also similar to what was observed in previous resident fish studies conducted in the Wells Reservoir.

2.1.2 Recreational Fish Species

Kokanee

Landlocked sockeye (*Oncorhynchus nerka*), known as kokanee are a native fish which occur in several lakes in the mid and upper Columbia basins including Lake Wenatchee, Lake Chelan, Lake Osoyoos, and Lake Roosevelt. Although previous resident fish assessments have not detected the presence of this fish species in the Project, anecdotal information exists indicating that low numbers of kokanee may be present in the Project. These fish likely originate from Lake Roosevelt, above Grand Coulee Dam, and during periods of high spring flow are displaced downstream through Grand Coulee and Chief Joseph dams and into the Wells Reservoir.

Largemouth Bass

Largemouth bass (*Micropterus salmoides*) were widely introduced in Washington in the late 1800s (Wydoski and Whitney 2003). They are listed as a priority species in Washington State because of their vulnerability to habitat loss or degradation and their recreational importance (WDFW 2002). They prefer clear water habitat with mud and sand substrates, which is best

suited for aquatic vegetation production (Wydoski and Whitney 2003). Little is known about the populations in the Wells Reservoir as they are infrequently captured (Beak 1999; Duke 2001; Burley and Poe 1994).

Mountain Whitefish

Mountain whitefish are assumed to occur in all small-order tributaries to the Methow, Okanogan, Wenatchee and Entiat rivers, and in connecting larger lake systems. They are also believed to occur in the mainstem reservoirs, although their behavior patterns are not known. They mostly inhabit riffles in summer and large pools in winter (Wydoski and Whitney 2003). Spawning typically occurs from October through December, generally in riffles, but also on gravel shoals of lake shores. Mountain whitefish feed primarily on instar forms of benthic aquatic insects, although they also occasionally eat crayfish, freshwater shrimp, leeches, fish eggs and small fish. In lakes, they feed extensively on zooplankton, particularly cladocerans. There is evidence that mountain whitefish still spawn in the lower reaches of some tributaries (NMFS 2002). Mountain whitefish appear to use the Wells Reservoir principally as a migration route between spawning areas in the Methow River and the Wells Dam tailrace (Zook 1983).

Northern Pikeminnow

Northern Pikeminnow are a slow-growing, long-lived predator native to the Columbia River basin. In summer, adult Northern Pikeminnow prefer shallow, low velocity areas in cool lakes or rivers. During the winter, they use deeper water and pools (Scott and Crossman 1973). Spawning occurs during the summer, in shallow water areas with gravel substrate. They tend to concentrate in tailrace areas downstream of mainstem dams during the juvenile salmonid migration period, holding in relatively slow-moving water areas (less than about 3 feet per second) near passage routes (NMFS 2002). Due to their large numbers and distribution throughout the Columbia River basin, Northern Pikeminnow are considered to pose the greatest predation threat to migrating juvenile anadromous salmonids (NMFS 2002).

Resident Rainbow Trout

Steelhead are an anadromous form of Rainbow Trout *(Oncorhynchus mykiss)*. Some rainbow trout remain in freshwater for most of their life but undergo a physiological change to a smolt and migrate to the ocean late in life. In addition to the potential for rainbow trout to become anadromous, the progeny of steelhead are believed to have the potential to become resident rainbow (Peven 1990). Resident rainbow trout and juvenile steelhead are not distinguishable from each other until the steelhead undergo smoltification. The mid-Columbia River tributaries contain a mixture of resident rainbow trout and anadromous steelhead. Resident rainbow trout are likely present in low numbers in the Wells Reservoir. During the 1998 resident fish assessment, rainbow trout consisted of 0.05 percent of the relative catch (Beak 1999).

Smallmouth Bass

Smallmouth bass (*Micropterus dolomieu*) are a non-native game fish that have inhabited the mid-Columbia River reach since at least the 1940s. They are listed as a priority species in Washington State because of their vulnerability to habitat loss or degradation and their

recreational importance (WDFW 2002). Preferred habitat for this species includes rocky shoals, banks, or gravel bars. Adult smallmouth bass in the mid-Columbia River are most abundant around the deltas of warmer tributary rivers. In the Wells Reservoir, smallmouth bass are typically found in the lower Okanogan River and the confluence of the Okanogan and Columbia rivers (Beak 1999). They are also abundant in areas upstream of the mid-Columbia River.

Smallmouth bass were the second most abundant predator species captured in the mid-Columbia River during predator assessment sampling conducted in 1994. They were most frequently captured from forebay sampling sites (Burley and Poe 1994). Similar relative abundance estimates of smallmouth bass were observed in recent sampling programs in other mid-Columbia River reservoirs (Beak 1999; Duke 2001). They are a significant fish predator species in the Columbia River, and prey on juvenile salmonids. In the 1994 predator assessment, fish composed 87 percent of the smallmouth bass diet, with salmonids consisting of 11 percent of the prey fish.

Walleye

Walleye (*Sander vitreus*) are a cool-water, piscivorous game fish believed to have moved downstream into the mid-Columbia River reach from a population established for recreational fishing in Lake Roosevelt in the late 1950s (Zook 1983). They were the least abundant predator species captured in the mid-Columbia River in 1994 (Burley and Poe 1994). They are listed as a priority species in Washington State because of their vulnerability to habitat loss or degradation and their recreational importance (WDFW 2002). In 2014, size and bag limit restrictions were removed for walleye and other non-native fish in the Columbia River below Chief Joseph Dam and in the Okanogan River.

Walleye occur throughout the mainstem reservoirs but are not typically found in the tributaries. Although suitable spawning habitat appears to be plentiful in the mid-Columbia River, peak summer temperatures in this section of river are suboptimal and appear to restrict the recruitment of subyearling walleye to the yearling age class (Zook 1983). Recruitment of walleye into the mid-Columbia River reservoirs is suspected to result from the entrainment of young fish through Grand Coulee Dam during spring run-off (Zook 1983).

2.1.3 Other Resident Species

Resident, non-recreational species make up the bulk of the standing crop of fish in the Wells Reservoir. Many of these species are native to the Wells Reservoir, including burbot (*Lota lota*), chiselmouth, peamouth chub, redside shiner, largescale sucker, bridgelip sucker (*C. columbianus*), longnose sucker (*C. catostomus*), Prickly sculpin (*Cottus asper*), threespine stickleback (*Gasterosteus aculeatus*), and dace species (*Rhinichthys spp.)* (See Table 2.1-1). Currently, no management actions or active fisheries for these species occur.

2.2 Resident Fish Habitat

2.2.1 Spawning habitat

Objectives of past resident fish studies (McGee 1979; Zook 1983; Beak 1999, Kyger 2015) did not specifically address spawning habitat but rather focused on species diversity, relative abundance and spatial distribution. Therefore, little information exists about the location and availability of spawning habitat for resident fish species in Project waters. It is likely that some resident fish species (cyprinids, catostomids, cottids) that spend their entire lives in Project waters utilize areas of the Wells Reservoir, tailrace, and lower tributaries (Methow and Okanogan rivers) to reproduce while other resident species, although present in the Wells Reservoir, utilize areas outside of the Project Boundary. Zook (1983) in his review of resident fish in the Wells Reservoir, hypothesized that some resident species such as mountain whitefish, rainbow trout, and walleye, although present, may not be successfully reproducing. Zook's review (1983) suggests that resident rainbow trout are primarily a product of residualism of hatchery-produced steelhead and that mountain whitefish appear to use the Wells Reservoir principally as a migration route between spawning areas in the Methow River and the Wells Tailrace. The report also suggests that walleye populations in the Wells Reservoir are recruited from the Lake Roosevelt population that was introduced in the late 1950s. The report also states that although spawning habitat appears to be available, evidence of successful reproduction has not been observed (Zook 1983).

Northern Pikeminnow control efforts have been implemented at the Wells Reservoir starting in 1995. Part of these efforts included the identification of known spawning locations through the use of radio-telemetry. Based upon results of this study, Northern Pikeminnow spawning habitat is located in the Wells Reservoir near Park Island, near river mile (RM) 1.5 on the Methow River and in the Wells tailrace immediately downstream of the east bank fish ladder (Bickford and Skillingstad 2000).

2.2.2 Rearing habitat

Past resident fish surveys (McGee 1979; Beak 1999, Kyger 2015) observed significant spatial trends in species distribution within the Wells Reservoir. Both McGee (1979) and Beak (1999) noted that in general, spiny ray species (centrarchids) were most abundant between RM 530 and RM 540 and in the lower Okanogan River portion of the Project. This unique area of the Wells Reservoir is shallow and broad with slower water velocities, finer substrate, warmer water temperatures, and higher turbidity (Beak 1999) and is conducive to rearing spiny ray fish species while excluding more streamlined fish that prefer fast flowing water. Surveys also found that the more streamlined resident fish species, such as chiselmouth and redside shiner (cyprinids), were most abundant downstream of RM 530 where water velocities increased, turbidity decreased, and the amount of shallow littoral habitat decreased. Other resident fish such as various sucker species and White Sturgeon are most likely distributed throughout the Wells Reservoir but reside and feed at depths near the river bottom. Migratory, cold water species such as Bull Trout and mountain whitefish spawn outside of the Wells Reservoir and it is likely that the majority of juvenile fish of these species rear in tributary habitats. Sub-adult Bull Trout, however, have been

observed passing over other mid-Columbia River dams and recent studies suggest that Bull Trout forage for resident species present in the Wells Reservoir (BioAnalysts Inc. 2004).

2.3 Management Activities Affecting Resident Fish

2.3.1 Habitat Conservation Plan's Predator Control Program

Section 4.3.3 of the Wells HCP includes the requirement that Douglas PUD implement a Northern Pikeminnow and piscivorous bird harassment and control program to reduce the level of predation upon anadromous salmonids in the mid-Columbia Basin. The Northern Pikeminnow removal program includes a Northern Pikeminnow control program, participation in fishing derbies and tournaments and the use of long-line fishing equipment. These efforts are designed to provide an immediate and substantial reduction in the predator populations present within the waters of the Project.

Since efforts were first initiated in 1995, Douglas PUD's Northern Pikeminnow removal program has captured over 376,262 Northern Pikeminnow (1995-2023). The continual harvest of Northern Pikeminnow from these waters will provide additional decreases in predator abundance. Yearly removal efforts will also keep the Northern Pikeminnow population in a manageable state.

The other component of the predator control program is the implementation of control measures for piscivorous birds. The focus of Douglas PUD's piscivorous bird control program is not removal but hazing and access deterrents. Hazing includes propane cannons, pyrotechnics and the physical presence of hazing staff. Access deterrents include steel wires across the hatchery ponds and tailrace, fencing and covers for hatchery ponds, and electric fencing. When hazing and access deterrents fail, options for removal are also implemented by the US Department of Agriculture (DOA) Animal Control staff hired to conduct the hazing programs.

Although the intent of the predator control program is for the protection of anadromous salmonids, reductions in aquatic and terrestrial predator abundance within the Reservoir may benefit many native resident fish species.

2.3.2 Project Shoreline Management and Land Use Policy

Douglas PUD owns approximately 89 miles of shoreline in fee title and addresses shoreline management issues through the implementation of a strict Land Use Policy that requires formal approval of all land use activities that take place within the Project Boundary. Applications to permit activities such as construction of boat docks, piers, and landscaping are reviewed and considered for approval by Douglas PUD after all required regulatory permits are acquired by the applicant. Additionally, when making land use or related permit decisions on Douglas PUD owned lands that affect habitat within the Project Boundary, Douglas PUD is required by Section 5 of the HCP to notify and consider comments from the HCP signatory parties (Douglas 2002). Shoreline management activities directly related to Project land use benefit resident fish, juvenile anadromous fish, and aquatic invertebrates and plants by minimizing impact in littoral areas within the Project Boundary.

3.0 GOALS AND OBJECTIVES

The goal of the RFMP is to protect and enhance native resident fish populations and habitat in the Project during the term of the new license. Douglas PUD, in collaboration with the Aquatic SWG, has agreed to implement several resident fish PMEs in support of the RFMP. The PMEs presented within the RFMP are designed to meet the following objectives:

Objective 1: Continue to provide additional benefits to resident fishery resources in the Project as a result of continued implementation of the HCP, Predator Control Programs and Doulas PUD's Land Use Policy.

Objective 2: In year 2 and every 10 years thereafter during the new license term, Douglas PUD will conduct a resident fish study to determine the relative abundance of the various resident fish species found within the Project. The study objectives will focus on (1) identifying whether there have been major shifts in the resident fish populations resulting from the implementation of the White Sturgeon, Bull Trout, Pacific Lamprey, and Aquatic Nuisance Species (ANS) Management Plans, and (2) collecting information on resident predator fish populations found within the Wells Reservoir. The results of this study may be used to inform the implementation activities of the other Wells aquatic resource management (ANS, Bull Trout, Pacific Lamprey, and White Sturgeon) plans and HCP predator control activities.

Objective 3: If any statistically significant negative changes to native resident fish populations of social, economic, and cultural importance are identified, and are not caused by and cannot be addressed through implementation of other aquatic resource management plans or activities (White Sturgeon, Pacific Lamprey, Bull Trout, ANS, HCP, predator control), reasonable and appropriate implementation measures to address negative changes, if any, will be undertaken by Douglas PUD.

Objective 4: In response to proposed major changes at Wells Dam requiring FERC approval, the Aquatic SWG will assess the potential effects, if any, on Project habitat functionally related to spawning, rearing, and migration of native resident fish, in order to make informed management decisions towards the success of the RFMP. Douglas PUD will implement reasonable and appropriate measures to address any effects on social, economic, and culturally important native species.

This RFMP is intended to be compatible with other resident fish management plans in the Columbia River mainstem. Furthermore, the RFMP is intended to be supportive of the HCP, Bull Trout Management Plan, Pacific Lamprey Management Plan, and White Sturgeon Management Plan by continuing to monitor changes, if necessary, in the resident fish assemblage within the Project. This management plan is intended to be not inconsistent with other management strategies of federal, state and tribal natural resource management agencies and supportive of designated uses for aquatic life under WAC 173-201A, the Washington state water quality standards.

The schedule for implementation of specific measures within the RFMP is based on the best information available at the time the Plan was developed. As new information becomes

available, implementation of each activity may be adjusted through consultation with the Aquatic SWG.

4.0 PROTECTION, MITIGATION AND ENHANCEMENT MEASURES

In order to fulfill the goal and objectives described in Section 3.0, Douglas PUD, in consultation with the Aquatic SWG, shall develop and implement a resident fish management program that includes the following PMEs.

4.1 Implementation Of Programs that Benefit Resident Fish (Objective 1)

4.1.1 HCP Predator Control Programs

Douglas PUD shall continue to conduct annual predator control activities for Northern Pikeminnow and avian predators as outlined in the HCP (Douglas 2002). Although implementation of this program is targeted at reducing predation on anadromous species covered by the HCP, it is also anticipated to have direct benefits for resident fish species.

4.1.1.1 Progress Towards Objective 1 in 2024

Douglas PUD implemented predator control activities for Northern Pikeminnow in 2024. The Northern Pikeminnow control program resulted in the removal of 12,583 Northern Pikeminnow from the Wells Project. Bycatch during the Northern Pikeminnow control program consisted of eight native and one non-native resident fish species (Table 4.1-1). Peamouth (Mylocheilus caurinus) and Chiselmouth (Acrocheilus alutaceus) comprised 81% of the bycatch.

Table 4.1-1 Bycatch during the 2024 Northern Pikeminnow Control Program

Species	Number Captured
Peamouth (*Mylocheilus caurinus*)	716
Chiselmouth (*Acrocheilus alutaceus*)	782
suckers spp. (Catostomus spp.)	199
Burbot (*Lota lota*)	48
sculpin (Cottus spp.)	32
Redside Shiner (*Richardsonius balteatus*)	28
Northern Pikeminnow / Chiselmouth hybrids	27
White Sturgeon (*Acipenser transmontanus*)	11
Brown Bullhead catfish (*Ameiurus nebulosus*)	4

4.1.2 Project Shoreline Management and Land Use Policy

Douglas PUD shall continue to implement the Douglas Land Use Policy which requires approval of all land use activities that take place within the Project Boundary. All permit activities such as

construction of boat docks, piers, and landscaping within Project Boundary will be subject to review and approval by Douglas PUD only after the applicant has received all other required regulatory permits, in addition to consideration by the HCP signatory parties and permit review by state and federal action agencies. The intent of the review and approval process captured in the Land Use Policy is to protect aquatic habitats and aquatic species that may be affected by proposed land use activities within the Project.

4.1.2.1 Progress Towards Objective 1 in 2024

Douglas PUD continued to implement its Land Use Policy in 2024.

4.2 Monitoring the Resident Fish Assemblage within the Wells Reservoir (Objective 2)

Douglas PUD shall conduct a resident fish study to determine the relative abundance of the various resident fish species found within the Wells Reservoir. This assessment shall occur in year 2 and every 10 years thereafter during the term of the new license. The study objectives will focus on (1) identifying whether there have been major shifts in the resident fish populations resulting from the implementation of the White Sturgeon, Bull Trout, Pacific Lamprey, and ANS Management Plans, and (2) collecting information on resident predator fish populations found within the Wells Reservoir.

In order to maintain comparative assemblage information over time to inform Project resident fish status and trends, methodology for monitoring activities shall remain consistent with the methods described in Beak (1999). Information collected from these monitoring activities may be used to inform the implementation activities of the other Wells aquatic resource management plans and the HCP predator control activities.

4.2.1 Progress Towards Objective 2 in 2024

A Resident Fish Assemblage Study was conducted in 2014. The final study report can be found in the 2014 Aquatic Settlement Work Group Annual Report (Anchor QEA 2015). Another Resident Fish Assemblage Study was conducted in 2024. During the study, fyke nets, beach seines, boat electrofishing, minnow traps, hoop nets, cod traps, and gill nets were used to sample resident fish at over 250 locations throughout the Wells Reservoir between March and December. The sampling effort resulted in the capture of over 25,000 individual fish with 21 different species represented. Detailed results of the study will be provided in the 2024 Resident Fish Assemblage Study Report.

4.3 Actions to Address Major Shifts in Native Resident Fish Assemblage (Objective 3)

Based upon information collected during the resident fish status and trends monitoring (Section 4.2), if any statistically significant negative changes to native resident fish populations of social, economic, and cultural importance are identified, and are not caused by and cannot be addressed through the implementation of other Aquatic Resource Management Plans or activities (White

Sturgeon, Pacific Lamprey, Bull Trout, ANS, HCP, predator control), reasonable and appropriate implementation measures to address negative changes, if any, will be undertaken by Douglas PUD.

4.3.1 Progress Towards Objective 3 in 2024

No major shifts in native resident fish populations were identified by the 2014 nor the 2024 Resident Fish Assemblage Study, based on initial results (full report will be completed in 2025).

4.4 Monitoring in Response to Proposed Changes in Project Operations (Objective 4)

If at any time during the new license term, future changes in Wells Dam operations are proposed that require FERC approval and the Aquatic SWG concludes that either reservoir or tailrace habitat within Project Boundary may be affected with regards to spawning, rearing, and migration (aquatic life designated uses) of native resident fish, an assessment will be implemented to identify potential effects, if any, in order to make informed license decisions. If the results of the assessment identify adverse effects to native resident fish species of social, economic and cultural importance, attributable to such changes in Project operations, then Douglas PUD will consult with the Aquatic SWG to select and implement reasonable and appropriate measures to address such effects.

4.4.1 Progress Towards Objective 4 in 2024

No significant changes in Wells Project operations occurred in 2024.

4.5 Reporting

Douglas PUD will provide a draft annual report to the Aquatic SWG summarizing the previous year's activities undertaken in accordance with the RFMP. The report will document all native resident fish activities conducted within the Project. Furthermore, any decisions, statements of agreement, evaluations, or changes made pursuant to this RFMP will be included in the annual report. If significant activity was not conducted in a given year, Douglas PUD will prepare a memorandum providing an explanation of the circumstances in lieu of the annual report.

4.5.1 Progress Towards Annual Reporting Requirements

Consistent with the FERC License Order for the Wells Hydroelectric Project (P-2149), and the Wells Dam Water Quality 401 Certification, the RFMP will be updated annually with the assistance of the Aquatic SWG. Each year the annual report will be filed on or prior to May 31st. The report will include a summary of the progress made towards the implementation of the RFMP and focus on the previous year's developments.

5.0 REFERENCES

Anchor QEA. 2015. 2014 Aquatic SWG Annual Report. Wells Hydroelectric Project. FERC License No. 2149. May 2015.

Beak Consultants, Inc. and Rensel Associates. 1999. Assessment of resident fish in Lake Pateros, Washington. Final Report. Prepared for Public Utility District No. 1 of Douglas County. Beak Consultants, Inc. in cooperation with Rensel Associates. Arlington, Washington.

Bickford, S. and T. Skillingstad. 2000. Movements of Northern Squawfish in the reservoir, forebay, and tailrace of the Wells Hydroelectric Project, mid-Columbia River, Washington. Public Utility District No. 1 Douglas County, East Wenatchee, Washington.

BioAnalysts, Inc. 2004. Movement of Bull Trout within the mid-Columbia River and tributaries, 2001-2004. Prepared for Public Utility District No. 1 of Chelan County, Wenatchee, WA, Public Utility District No. 1 of Douglas County, East Wenatchee, WA, and Public Utility District No. 2 of Grant County, Ephrata, WA.

Burley, C.C. and T.P. Poe. 1994. Significance of predation in the Columbia River from Priest Rapids dam to Chief Joseph dam, predator consumption indexing. Contract 430-486. Prepared for PUD No 1 of Chelan County, PUD No. 1 of Douglas County, and PUD No. 2 of Grant County.

Dell, M.B., Erho, M.W., and B.D. Leman. 1975. Occurrence of Gas Bubble Disease Symptoms On Fish In Mid-Columbia River Reservoirs. Public Utility District of Grant County, Ephrata, WA, Public Utility District of Douglas County, East Wenatchee, WA, Public Utility District of Chelan County, Wenatchee, WA.

Douglas (Public Utility District No. 1 of Douglas County). 2002. Wells Hydroelectric Project Anadromous Fish Agreement and Habitat Conservation Plan. Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.

Duke. 2001. Rocky Reach fish presence and habitat use survey. Report prepared for the Public Utility District No. 1 of Chelan County, Wenatchee, Washington.

Kyger, C.D. 2015. 2014 Resident Fish Assemblage Study. Public Utility District of Douglas County, East Wenatchee, Washington.

McGee, J.A. 1979. Fisheries Survey of Wells Reservoir. Public Utility District of Douglas County, East Wenatchee, Washington.

NMFS. 2002. Anadromous Fish Agreements and Habitat Conservation Plans: Final Environmental Impact Statement for the Wells, Rocky Reach, and Rock Island Hydroelectric Projects. U.S. Department of Commerce. National Oceanic and Atmospheric Administration. National Marine Fisheries Service, Northwest Region, Portland, Oregon. December 2002.

Peven, C.M. 1990. The life history of naturally produced steelhead trout from the mid-Columbia River basin. M.S. Thesis, University of Washington, Seattle, Washington.

Scott, W.B. and E.J. Crossman. 1973. Freshwater fishes of Canada. Fisheries Research Board of Canada, Ottawa, Canada.

WDFW (Washington Department of Fish and Wildlife). 2002. Species of concern in Washington State. Available at: https://wdfw.wa.gov/species-habitats/at-risk.

Wydoski, R.S. and R.R. Whitney. 2003. Inland Fishes of Washington. Second Edition. American Fisheries Society. University of Washington Press.

Zook, W.J. 1983. Resident fisheries of Wells Pool: A Review. Prepared for Public Utility District No. 1 of Douglas County. Fulton Fisheries Advisors. 61 pgs.

Appendix I
2024 Aquatic Settlement Agreement and Workgroup Action Plan

2024 AQUATIC SETTLEMENT AGREEMENT AND WORKGROUP ACTION PLAN
APPROVED MARCH 13, 2024

A) Annual Report and Webpage

1. Distribute 2023 Aquatic Settlement Agreement (SA) Annual Report to Aquatic SWG, BIA and NMFS **March 2024**
2. Final Annual Report approved by Aquatic SWG and NMFS **May 2024**
3. Annual Report filed with FERC **May 31, 2024**
4. Maintain Aquatic Settlement Web Portal/Database **Throughout 2024**
5. Maintain/Update public website **Throughout 2024**

B) White Sturgeon MP

1. Continue rearing BY2023 juvenile sturgeon **January-June 2024**
2. BY2023 Juvenile sturgeon tagging/marking/SAP sampling **April-May 2024**
3. Incorporate 2022 White Sturgeon MP activities into Aquatic SA Annual Report to the FERC **May 2024**
4. Release n ~ 325 (≥350 g) juvenile sturgeon (BY2023) with Educational Outreach **May/June 2024**
5. Results of Evaluation of Adult Passage Measures (2023 SOA) to Aquatic SWG **November 2024**
6. Phase II larvae collection for BY2024 **June-July 2024**
7. Indexing and monitoring of Wells Reservoir White Sturgeon Population **September 2024**
8. Rearing of BY2024 juvenile sturgeon for 2025 release **July-December 2024**
9. Technical participation in regional forums **Throughout 2024**

C) Bull Trout MP

1. Enumerate Bull Trout in Wells Dam count windows **Throughout 2024**
2. Monitor (via counts) for sub-adults at Wells Dam (>10/year triggers additional measures) **Throughout 2024**
3. ESA Bull Trout Incidental Take Report to the FWS for review and approval **April 2024**
4. Incorporate 2023 Bull Trout MP activities and incidental take monitoring into Aquatic SA annual Report to the FERC **May 2024**
5. Final Bull Trout Movement and Life History Study Report Approval **February 2024**
6. Bull Trout salvage during ladder maintenance **December 2024**
7. PIT tag incidental encounters of Bull Trout at Project Facilities and add data to annual reporting **Throughout 2024**
8. Recovery planning participation/regional coordination **Throughout 2024**

D) Water Quality MP

1. 2023 Gas Abatement Plan (GAP) Report to ASWG and NMFS for review **January 2024**
2. 2023 Gas Abatement Plan Report approval **February 2024**
3. 2023 Gas Abatement Plan Report filed with the FERC **February 2024**
4. Update the QAPP at the request of the Aquatic SWG **Throughout 2024**
5. 2024 Gas Abatement Plan and Bypass Operating Plan Draft for review **January 2024**
6. 2024 Gas Abatement Plan approval **February 2024**
7. 2024 Gas Abatement Plan filed with the FERC for approval **February 2024**
8. Biological monitoring of resident and salmonid fishes for Gas Bubble Trauma **April-August 2024**
9. Year-round TDG monitoring at three locations (hourly with web-accessibility) **Throughout 2024**
10. Real-time temperature monitoring at n = 6 locations (hourly with web-accessibility) **Throughout 2024**
11. 2023 Water Temperature Report to Aquatic SWG and HCP CC for comments **March 2024**
12. 2023 Water Temperature Report approval **May 2024**
13. 2023 Water Temperature Report to the FERC **May 2024**
14. Water Quality Attainment Plan Approval (WQAP) **April 2024**
15. Water Quality Protection Plan, as needed (60 d before action), for Future Construction Activities **Throughout 2024**
16. Participate in WQ forums (e.g., Temperature TMDL, TMT etc.) **Throughout 2024**
17. Incorporate Water Quality MP Activities into Aquatic SA Annual Report to the FERC **May 2024**
18. Participate in the implementation of final EPA issued water temperature TMDL **Throughout 2024**

E) Pacific Lamprey MP

1. Draft Adult Approach and Passage Report to Aquatic SWG **March 2024**
2. Discussion of Future Adult Passage Study (or Continuation of Translocation) **April-December 2024**
3. Update PIT Tag Detection “last seen table” History tables **December 2024**
4. Juvenile lamprey PIT tagging and migration monitoring Methow River at Carlton RST and discussion of future juvenile passage studies **Throughout 2024**
5. Adult Pacific Lamprey trapping (proof-of-concept study) in Wells Dam Fishways (pending ASWG approval) **August-September 2024**
6. Ladder salvage during winter maintenance **December 2024/January 2025**
7. Translocation of up to 1,000 Adult Lamprey from Priest Rapids to above Wells **July-Sept 2024**
8. Regional participation in forums and technical information sharing **Throughout 2024**
9. Incorporate Pacific Lamprey MP activities into Aquatic SA Annual Report to the FERC **May 2024**
10. Update lamprey literature review document libraries November **2024**

F) Aquatic Nuisance Species MP

1. Apply ANS Best Management Practices for all in-water construction work **Throughout 2024**
2. Verify condition of ANS signs at boat launches and add Northern Pike signage **Throughout 2024**
3. ANS pamphlets at Wells Project boat launches and visitor overlook **Throughout 2024**
4. Zebra mussel monitoring with substrate mats and plankton tows **June-October 2024**
5. Crayfish incidental captures database management **Throughout 2024**
6. Crayfish monitoring **October 2024**
7. Northern Pike monitoring – eDNA and ASWG approved suppression **March-October 2024**
8. Update, as needed, the Northern Pike Rapid Response and Eradication Plan **Throughout 2024**
9. Cyanobacteria monitoring and if needed public health advisories **Throughout 2024**
10. Regional coordination e.g. Northwest Regional Northern Pike Coordination Forum **Throughout 2024**
11. Incorporate 2023 ANSMP activities into Aquatic SA Annual Report to the FERC **May 2024**

G) Resident Fish MP

1. 2023 Pikeminnow Report to Aquatic SWG and HCP CC for review **February 2024**
2. 2023 Pikeminnow Report incorporated into Aquatic SA Annual Report to the FERC **May 2023**
3. Draft 2024 Resident Fish Assemblage Study Plan to Aquatic SWG for Approval **March 2024**
4. Resident Fish Assemblage Study Sampling **March-December 2024**
5. 2024 Pikeminnow control activities **March-November 2024**
6. Incorporate Resident Fish MP activities into Aquatic SA Annual Report to the FERC **May 2024**

Appendix J
Bull Trout Movement and Life History Investigation 2022–2023, including Appendices A, B, and C

BULL TROUT MOVEMENT AND LIFE HISTORY INVESTIGATION 2022-2023

WELLS HYDROELECTRIC PROJECT

FERC NO. 2149

December 2023

Public Utility District No. 1 of Douglas County

© Copyright 2023. Public Utility District No.1 of Douglas County. All Rights Reserved.

1.0 BACKGROUND

According to the Wells Hydroelectric Project (Wells Project) license requirements, Public Utility District No. 1 of Douglas County (Douglas PUD) is to perform a Year-10 study to verify the ongoing safe and effective passage of migratory Bull Trout at the Wells Hydroelectric Project (Wells Project) and the Twisp River Weir (See Sections 4.2.1 and 4.2.2 of the Bull Trout Management Plan [BTMP] as required by the Aquatic Settlement Agreement and Clean Water Act Section 401 Water Quality Certification [401 Certification], 4.1, 4.6, and 4.7 of the Section 18 Fishway Prescriptions, and Terms and Conditions of the 2012 Biological Opinion for the Wells Project). The Incidental Take Statement requires the use of radio telemetry to determine if 95% survival and 90% passage rates continue at the Wells Project and the Twisp River Weir (see Terms and Conditions #2, #10, #11).

During late 2020 and early 2021, Douglas PUD worked with the Aquatic Settlement Workgroup (Aquatic SWG), including the Washington Department of Ecology (Ecology) and the United States Fish and Wildlife Service (USFWS), to develop a study plan that would meet Section 4.2.1 and 4.2.1 of the BTMP, Section 18 Fishway Prescription, the Terms and Conditions of the 2012 Biological Opinion, and the 401 Certification. The Study Plan for this required Year-10 study proposed to use radio-telemetry as the method to meet these requirements and was approved by all parties to the Aquatic Settlement Agreement, including the USFWS during a normally scheduled monthly conference call held on February 10, 2021. After further review, the USFWS, with unanimous approval from signatories to the Aquatic Settlement Agreement, determined that local Bull Trout populations that interact with the Wells Project and the Twisp River Weir were low enough, based on the recent counts of Bull Trout passing Wells Dam and numbers of Bull Trout redds observed in the Methow River Basin, that radio telemetry surgeries should be avoided, especially given that estimates of survival and passage that have previously been demonstrated exceed performance standards (Figure 1; Approved Aquatic SWG Bull Trout SOA May 12, 2021).

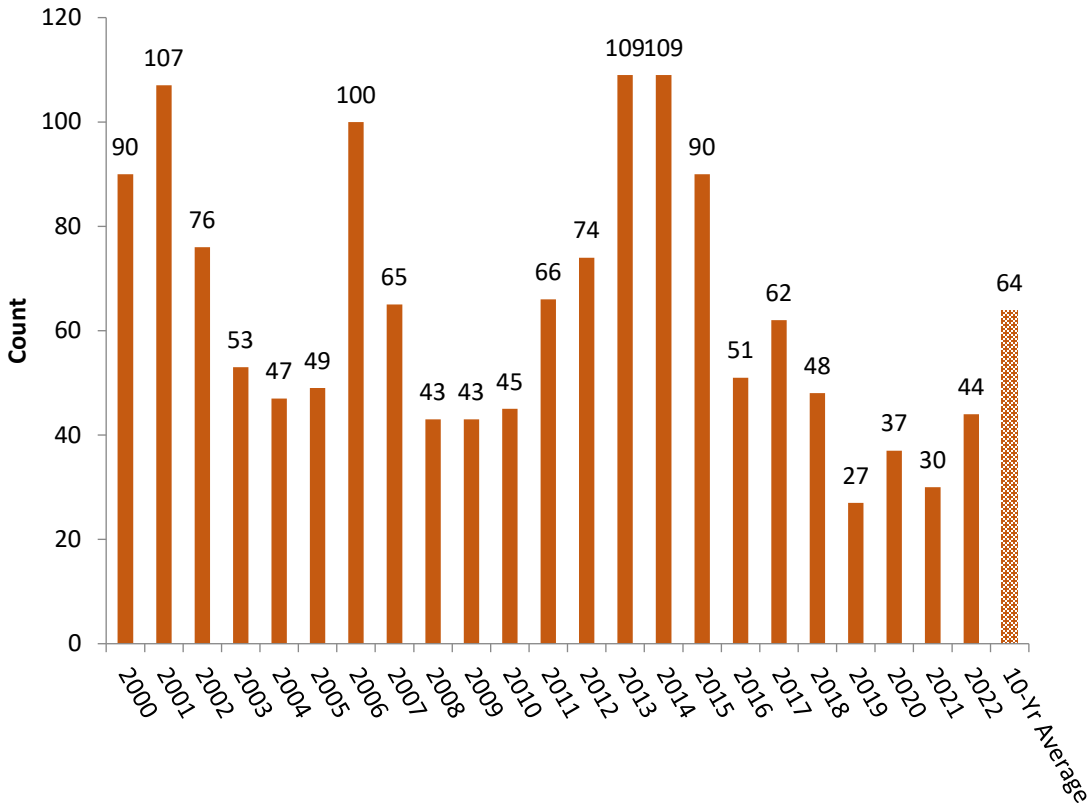


Figure 1. Bull Trout counts in the Wells Project fishways 2000-2022.

On June 22, 2021, Douglas PUD submitted a request to the Federal Energy Regulatory Commission (FERC) for a variance to Article 402 of the license which includes stranding evaluations and incidental take studies as described in Sections 4.4, 4.5.1, and 4.6.1 of the Aquatic Settlement Agreement BTMP. The variance requested suspension of the 2021 (Year-10) Bull Trout Passage and Survival Radio Telemetry Study based on concerns outlined in the Statement of Agreement (SOA) and approved by the Aquatic SWG on May 12, 2021. The SOA stated that Douglas PUD would continue to monitor Bull Trout populations via a passive integrated transponder (PIT) tag study and through other requirements of the Plan, Aquatic Settlement Agreement, Section 18 Fishway Prescriptions, 2012 Biological Opinion, and 401 Certification. On October 12, 2021, the FERC approved this variance (Appendix A).

This report presents the results of a PIT-tag monitoring of adult Bull Trout (≥400 mm fork length) movements and interactions with the Wells Project Fishways and Twisp River Weir in 2022 and 2023.

1.1 Wells Project Upstream and Downstream Fish Passage

In 2022 and 2023 the Wells Project fishways and downstream bypass system were operated in a manner consistent with the Wells Habitat Conservation Plan and the Section 18 Fishway Prescription to provide upstream and downstream fish passage. Plating installed over diffuser gratings to address gaps and Pacific Lamprey passage considerations were reviewed and

approved by the HCP-CC as having no substantial effects on the hydraulics of the fishways and salmon and steelhead passage.

1.2 Previous Studies and Monitoring

The most recent Bull Trout Passage and Survival evaluation at the Wells Project and the Twisp Weir occurred in 2016/2017. During the study, radio tagged Bull Trout were observed interacting with the Wells Project and the Twisp Weir during upstream migrations in the late spring and summer. Study fish interacted with Wells Dam between May 19 and July 4, 2016 (n=11). Study fish interacted with the Twisp Weir between June 29 and July 17, 2016 (n=18). Downstream movements were observed at the Wells Project in the months of September through December (n=12). Downstream movements past the Twisp Weir were observed from September 1 to November 18 (n=35). During the study, fish that interacted with the Wells Project and the Twisp Weir had passage and survival success that exceeded the minimum standards for those metrics as written in the USFWS's Biological Opinion (see Terms and Conditions) and the Bull Trout Management Plan for the Wells Project. Specifically, in the 2016 investigation, observed interactions with the Twisp River Weir indicated 92.5% (49 of 53) passage success (four fish died and were recovered in an off channel beaver pond before they could attempt to pass the Weir) and 100% survival (all 48 of the fish that successfully passed the Twisp Weir survived passage; Robichaud and Gingerich, 2017). These results were similar to those of relicensing studies at the Wells Project (2005- 2008), radio-tagged Bull Trout moved upstream and downstream past Wells Dam freely with no observed mortality or passage delay (LGL and Douglas PUD, 2008).

Video monitoring of the Wells Project fishways for Bull Trout occurs 24 hours per day, every day. This monitoring provides information about the total numbers of Bull Trout passing upstream and the seasonal patterns of upstream passage. From 2010 to 2021, the mean passage date of Bull Trout is June 13 (SE=1.04, n=757).

2.0 OBJECTIVES

- **Objective 1 (BTMP 4.2.1)** Determine the frequency of and describe (timing, upstream passage counts) interactions of PIT-tagged adult Bull Trout with the Wells Project Fishways.

- **Objective 2 (BTMP 4.2.2)** Determine the frequency of and describe (timing) interactions of PIT-tagged adult Bull Trout within the Twisp River basin [upstream and downstream counts at Twisp River (TWR)] and Weir (trap counts).

- **Objective 3 (BTMP 4.5.3)** To support information exchange and regional monitoring efforts, describe tributary use, residency times, and migration extent of PIT-tagged adult Bull Trout within the mid-Columbia River and tributaries (including the Okanogan, Methow, Entiat and Wenatchee River Basins).

  Objective 4 (BTMP 4.5.2) Collect tissue samples from up to n=60 adult Bull Trout and fund genetic analysis to assign individual fish to local population groups.

3.0 METHODS

3.1 Study Area

The main focus of this investigation was the mainstem Columbia River from Wells Project upstream and the Methow River Basin and tributaries, specifically the Twisp River. However, queries of detections of PIT-tagged Bull Trout (study fish) included adult fishway arrays and in-stream remote arrays from Rock Island Dam upstream, including detection sites in the Wenatchee, Entiat, Methow, and Okanogan River Basins (Figure 2). Information from video monitoring of fish count stations and PIT arrays within the fishways of the Wells Project was also used to describe Bull Trout interactions specifically with Wells Dam (Figure 3).

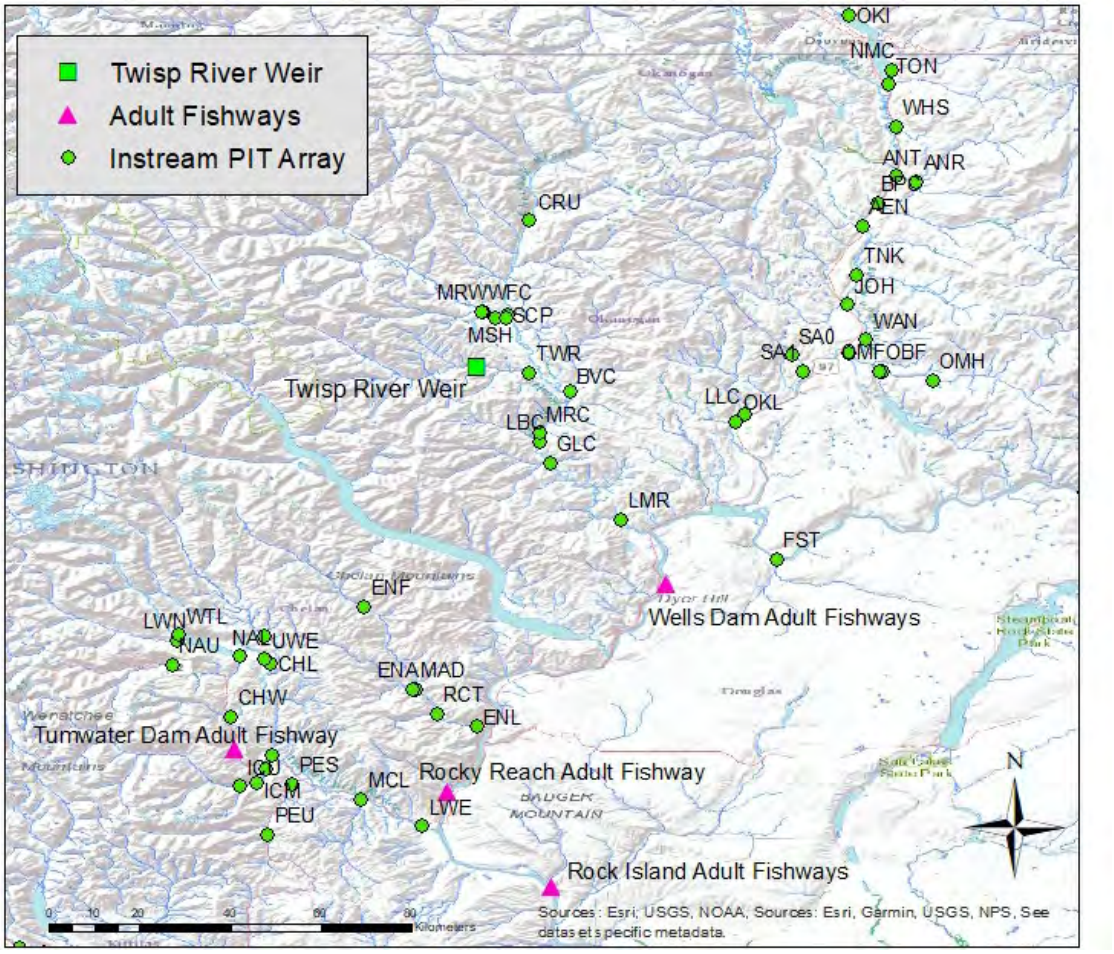


Figure 2. Locations of adult fishway and instream remote PIT arrays included in the study and analysis.

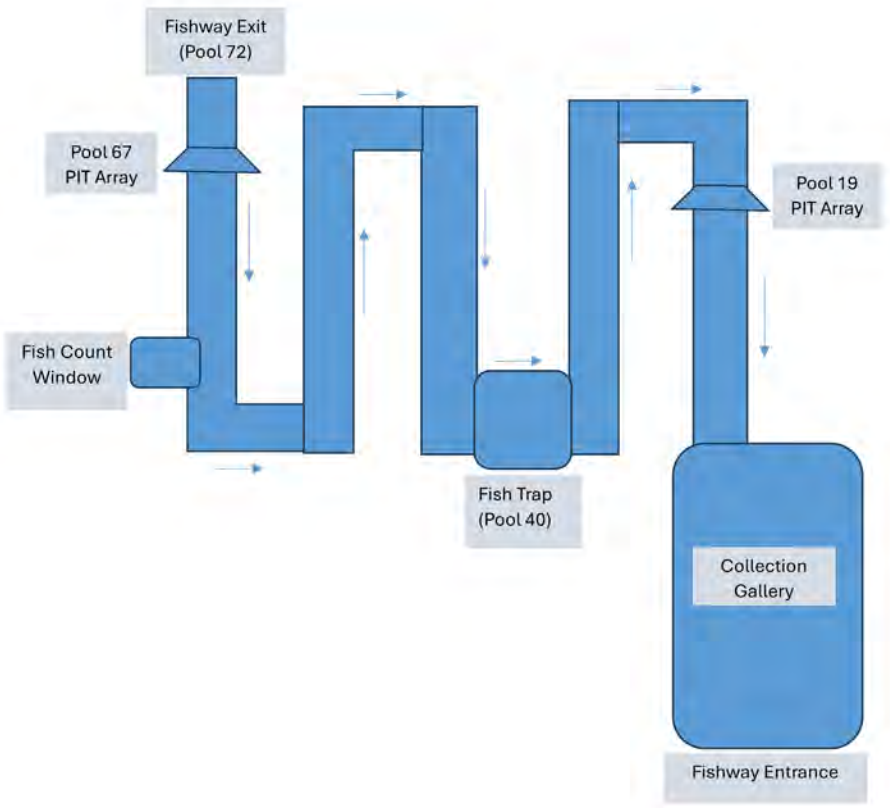


Figure 3. **Diagram of the locations of fishway count stations, PIT antenna arrays, and adult fish traps within the Wells Project fishways. Arrows indicate flow direction. Diagram shows one fishway (East and West fishways are similar in design). Diagram not drawn to scale.**

3.1.1 Hydrologic Conditions

Compared to the ten-year (2013 to 2023) average discharge at Wells Dam, discharge and associated spill was approximately 80% greater during June and July 2022 and approximately 40% greater during May 2023. Discharge was within 20% of the ten-year average in the remainder of each year. (Figure 4).

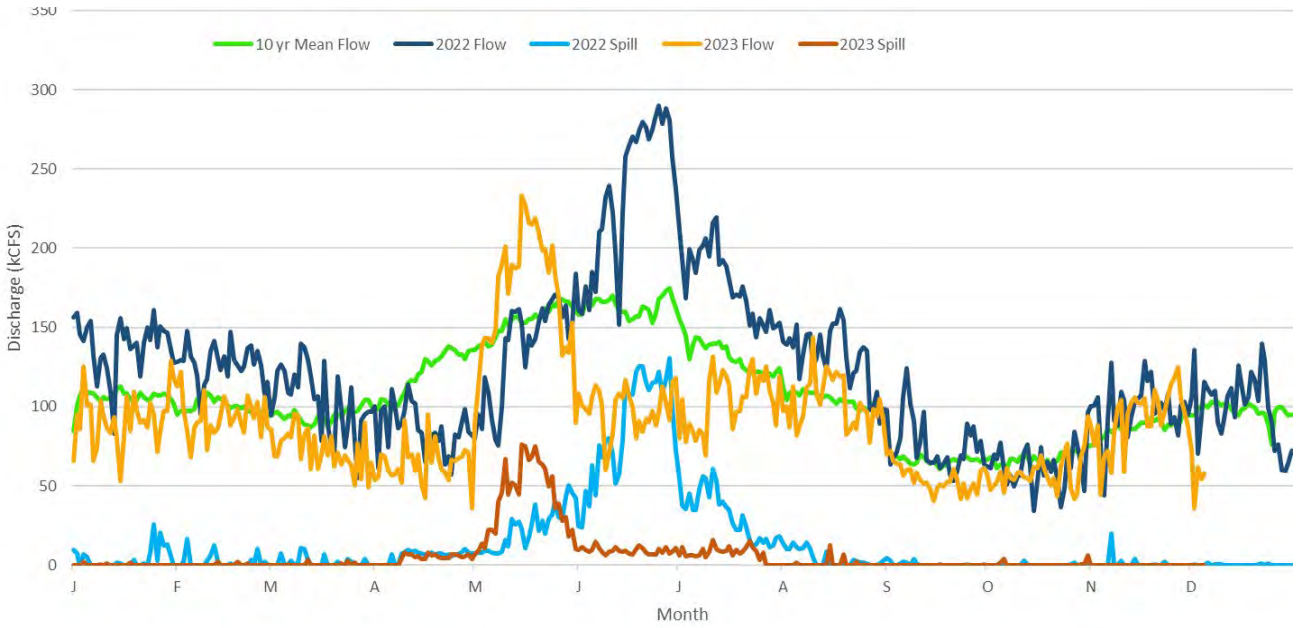


Figure 4. Discharge and spill conditions (kcfs) at the Wells Dam in 2022 and 2023.

3.2 Study Fish

Forty-one adult Bull Trout were captured and PIT tagged from February 2022 to July 2023 in the Wells Project Fishway traps, Methow River, and Twisp River Weir (Table 1). The Twisp River Weir was not operated in 2022 since Spring Chinook broodstock collection goals were met during trapping at the Wells Project earlier in the season[1]. One additional Bull Trout tagged in 2021 in the Methow River was also included in the analysis since it satisfied the criteria for inclusion of existing PIT tagged fish at large in the study area. These criteria were:

1. The fish was tagged at adult size (or tagged as a juvenile or sub adult and subsequently recaptured at an adult size). Pursuant to the BTMP, 400 mm fork length was considered a minimum tagging or study fish size.
2. The fish had been detected on the Wells Project Fishways PIT arrays, on in-stream PIT arrays in the Methow or Twisp River, or captured at the Twisp River Weir in the previous year and tagged as an adult.
3. The fish arrived at Wells Project or Twisp River Weir during the study period and was tagged as an adult by an agency or tribal partner.

[1] Bull Trout trapping typically coincides with Spring Chinook broodstock trapping operations. In addition to no Spring Chinook broodstock trapping occurring in 2022, a mechanical failure prevented the use of the Twisp Weir for targeting Bull Trout specifically.

Table 1. Capture location of Bull Trout PIT tagged and tracked in 2022 and 2023.

Location		Wells Project	Methow River	Twisp Weir	Total
Year	2022	5	6*	--	11
	2023	7	19	5	31
Total		12	25	5	42

*Includes one fish captured and PIT tagged in the Methow River in 2021 and detected in 2022.

Median length of Bull Trout tagged in 2022 and 2023 across all locations was 560 mm (range 360 mm-680 mm). Median length of Bull Trout tagged at the Wells Project was 585 mm, larger than the median of those tagged in the Methow River and at the Twisp Weir (509 mm and 520 mm, respectively; Figure 5). Two fish tagged in the Methow River that were slightly below the 400 mm size threshold (390 mm and 360 mm) were included as they were expected to exceed that size during the study period.

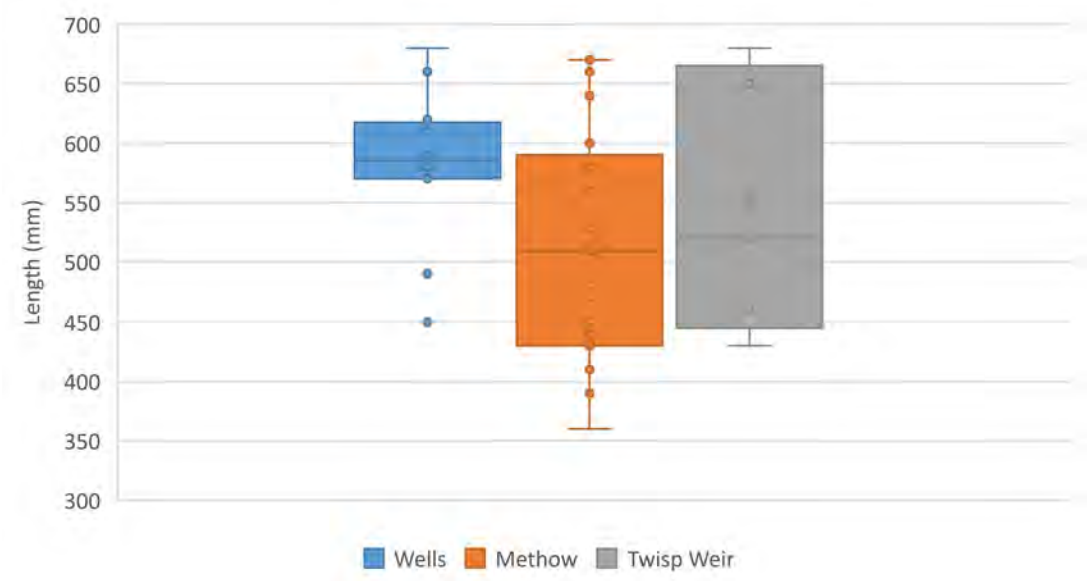


Figure 5. Fork length (mm) of Bull Trout captured and PIT tagged at the Wells Project, the Methow River, and Twisp River Weir in 2022-2023.

In 2022, Bull Trout were tagged and released at the Wells Project Fishway traps and in the Methow River downstream of the Twisp River confluence. In 2023, Bull Trout were tagged and released at the Wells Project Fishway traps, Twisp Weir trap, and in the Methow River, including areas upstream of the Twisp River confluence. (Figure 6).

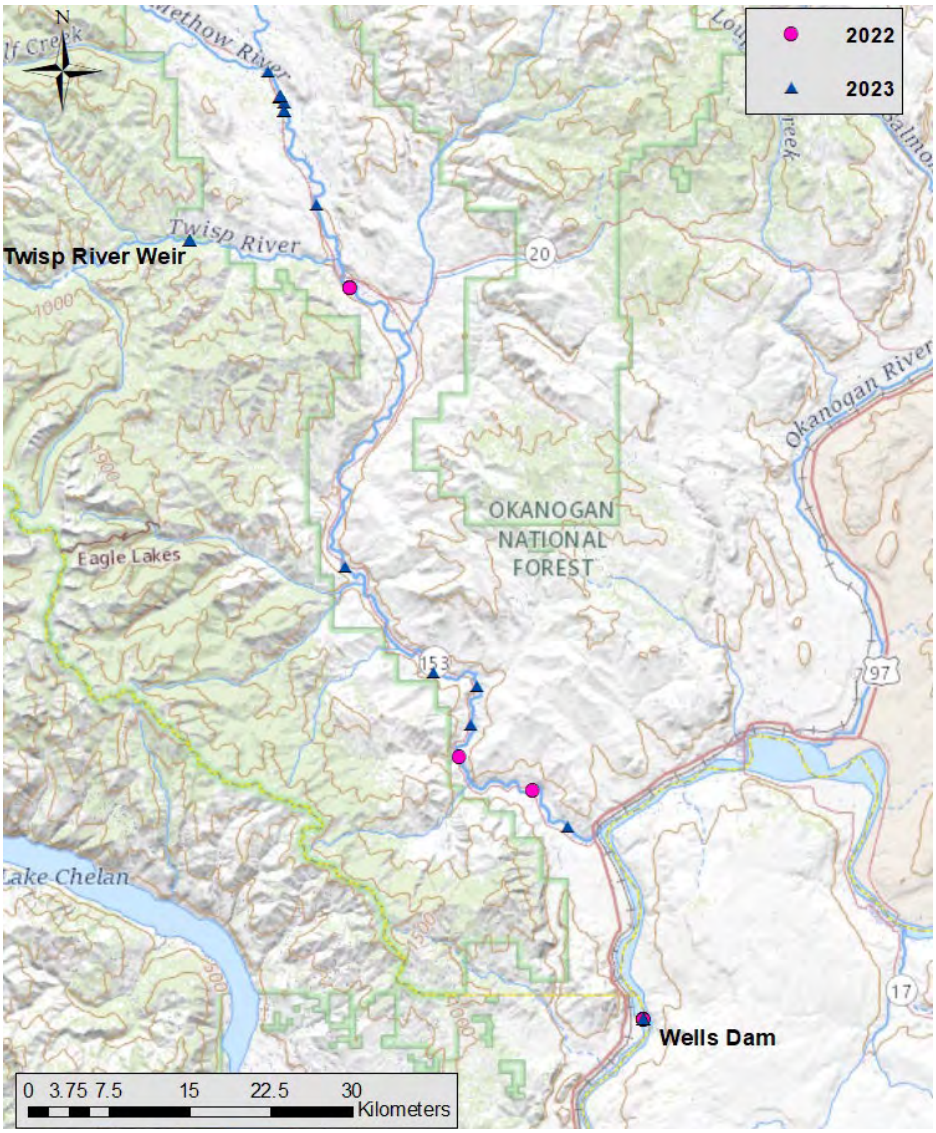


Figure 6. Release locations of Bull Trout captured and PIT tagged in 2022 and 2023. Multiple fish were released at some sites.

3.3 Fish Handling and PIT-Tagging

Bull Trout that were captured using the Wells Project Fishways traps were held in a holding tank (east fishway) or concrete holding pond (west fishway) that received a constant supply of river water to maintain safe temperature and oxygen levels. Fish captured at the Twisp River Weir were held in a trap box consisting of aluminum pickets submerged in the river. Bull Trout captured incidentally during other activities were held in knotless nets, knotless net live pens in-river, or in a 700L holding tank with a constant supply of river water provided via a live well pump.

If fish were held in a holding tank, temperature and dissolved oxygen were monitored to ensure parameters were within safe levels for Bull Trout. Bull Trout were removed from holding areas for PIT-tagging, biological data collection, and tissue sampling. In situations where handling and tagging could result in injury or excess handling time, fish were anesthetized with MS-222 or by electronarcosis.

Each Bull Trout was scanned for an existing PIT-tag. If no tag was present, a 12mm full duplex PIT-tag was implanted into the pelvic girdle of the fish using a hypodermic needle. A small tissue sample (fin clip) was taken from the caudal fin of the fish and stored on chromatography paper. All fish handling, tagging, and data collection were performed by Douglas PUD staff or contractors/agencies possessing experience and training in safe fish handling and tagging procedures.

Data collected on each fish included:

- PIT tag code (existing or new)
- Fork length (mm)
- Date/time of capture
- DNA sample taken and vial ID recorded
- Location captured (Fishway trap, Weir, other location with GPS coordinates)
- Release location
- Release date/time

Anesthetized fish were allowed to recover (regain equilibrium, normal respiration, and rheotaxis) before release. Fish captured in the Wells Project Fishway traps were released into the fishways above pool 40 (see Figure 2). Fish captured at the Twisp Weir were released 100 m upstream. Fish that were captured and tagged incidentally during other activities were released at the location of capture.

3.3.1 Genetic Analysis

Douglas PUD provided 29 Bull Trout tissue samples to the Washington State Department of Fish and Wildlife's genetics laboratory. These samples were collected from fish captured in the Methow River and at Wells Dam between February 2022 and April 2023. Genetic samples were analyzed using similar methods as described in DeHaan et al. (2014) and Robichaud and Gingerich (2017) and were analyzed and compared against baseline local population genotypes determined in DeHaan and Neibauer (2012). Fish assigned to sub-basin and local population and confidence in assignment were reported on a probability scale of 0 – 1, where "1" represented complete assignment.

3.4 Tracking Movements and Interactions

PIT tag data from all Bull Trout tagged during the study were uploaded to the PTAGIS database, available at https://www.ptagis.org. Individual detection histories for each study fish were developed using queries of the PTAGIS database, information from fishway count station video

footage, and Twisp River Weir trap observations. The detection histories were then used to summarize metrics associated with study objectives, such as fish movement, passage, and timing.

4.0 RESULTS

4.1 Wells Dam Fishway Passage

4.1.1 Fishway Count Window

Wells Project Fishway viewing window counts of Bull Trout totaled 46 in 2022 and 22 in 2023. Bull Trout passage was heavily skewed to the East fishway with greater than 90% and greater than 80% of fish passing via the East Fishway in 2022 and 2023, respectively.

The greatest number of Bull Trout were observed passing the fishway count windows in the months of May and June in both 2022 and 2023. Over 95% of Bull Trout were observed between May 15 and July 30 each year (Figure 7). This observation is highly consistent with data at the Wells Dam where 97% of Bull Trout are observed in May, June and July each year at the Wells Project (Table 2, Figure 8).

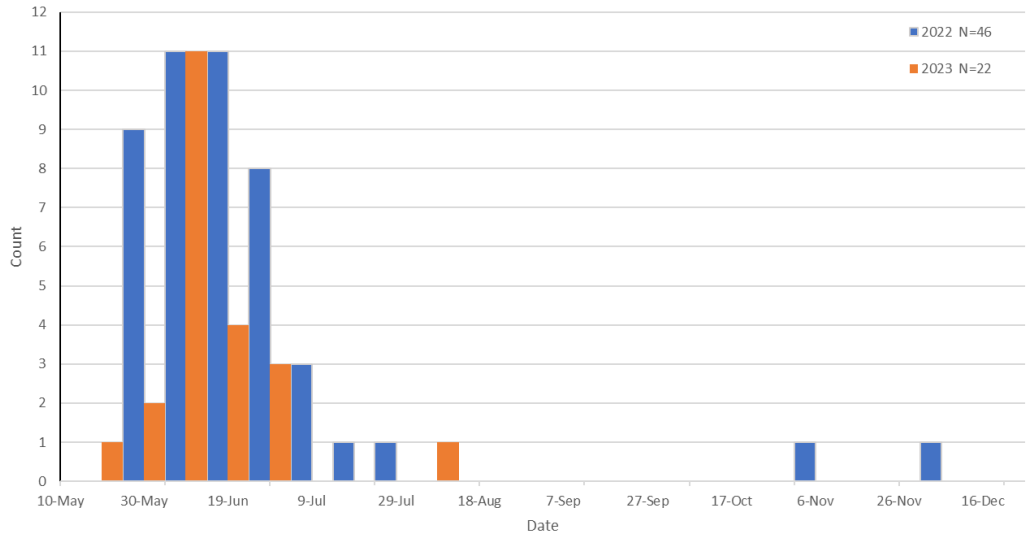


Figure 7. Seasonal timing of Bull Trout passage in the fishway count windows in 2022 and 2023.

Table 2. Monthly Bull Trout passage in the Wells Project Fishways 1998 to 2023.

Month	Count	Percent of Total Annual Bull Trout Passage
Jan	0	0.0%
Feb	0	0.0%
Mar	0	0.0%
Apr	0	0.0%
May	245	29.8%
Jun	480	58.5%
Jul	72	8.8%
Aug	4	0.5%
Sep	1	0.1%
Oct	5	0.6%
Nov	10	1.2%
Dec	4	0.5%
Total	821	--

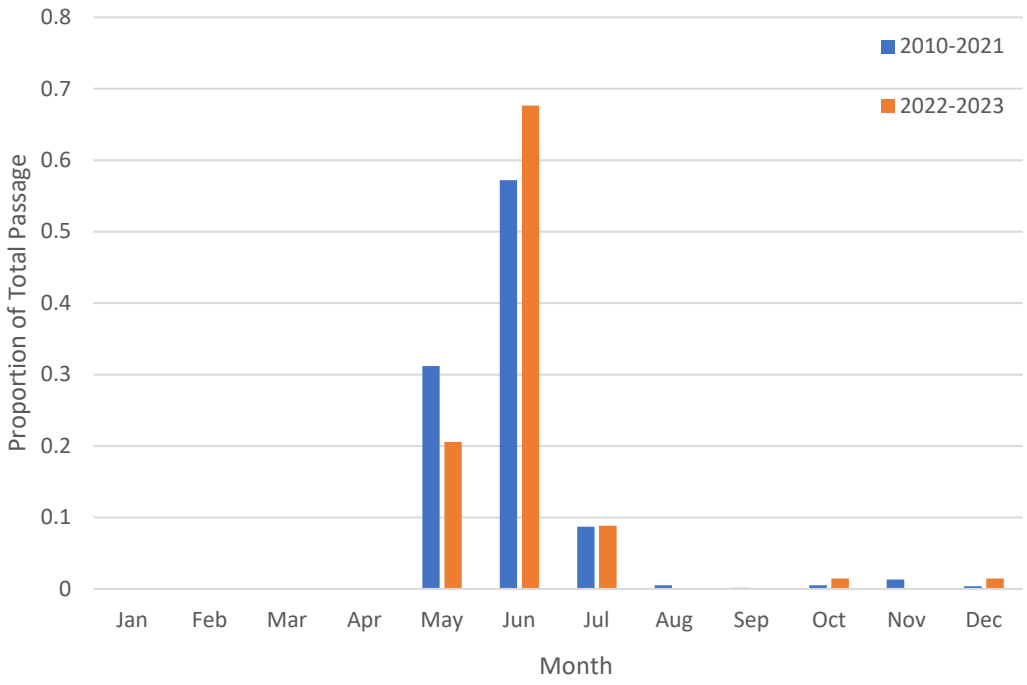


Figure 8. Comparison of monthly proportion of total Bull Trout passage in the Wells Project fishways 2010-2021 and 2022-2023.

Bull Trout passed through the fishway counts windows primarily during the day; over 75% passed through the count windows between 10:00 and 19:00 in 2022 and 2023 (Figure 9)

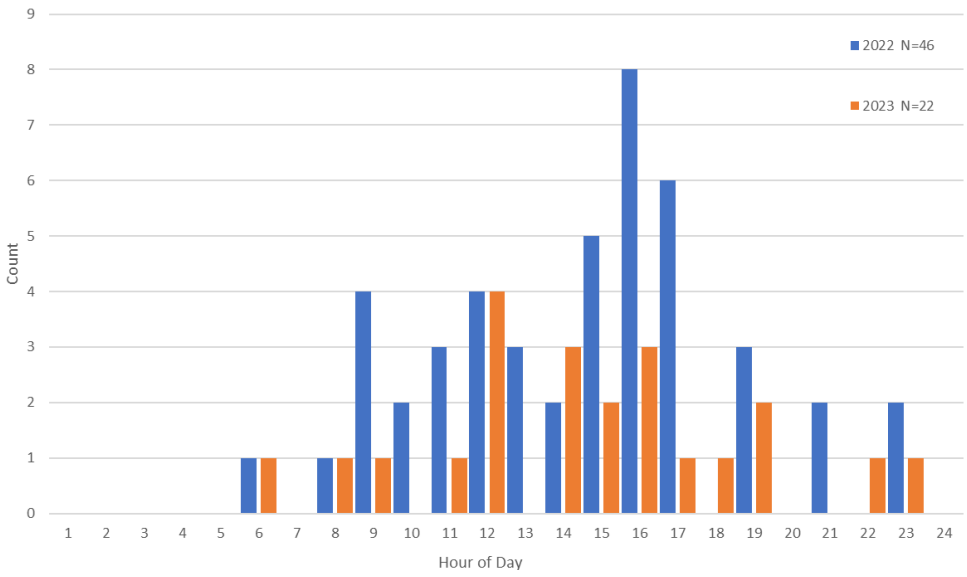


Figure 9. Daily timing of Bull Trout passage in the Wells Project Fishway count windows in 2022 and 2023.Fishway Trapping and PIT Detections

4.1.2 Fishway Trapping and PIT Detections

Twelve PIT tagged Bull Trout were detected on the Wells Project fishway antenna arrays in 2022 and 2023 combined. All of the fish were captured and tagged in the fishway traps in the same year in which they were detected. No Bull Trout that had been PIT tagged at other locations or in previous years were detected in the Wells Project fishway antenna arrays in 2022 or 2023.

Of the 12 Bull Trout captured, PIT tagged, and released into the Wells Project fishways (pool 40):

- 8 moved upstream and were detected at the fishway exit antenna array within 24 hours.
  - 5 were subsequently detected on an in-stream array in the Methow River basin.
  - 3 were not detected again after exiting the fishways.

- 2 moved downstream and exited the fishways and later reascended and were then detected at the fishway exit antenna arrays.
  - Both were subsequently detected on in-stream arrays in the Methow River basin.

- 2 moved downstream and were last detected on a Wells Hatchery antenna array.
  - 1 was last detected in the hatchery volunteer channel.
  - 1 was recaptured in the adult fish handling facility and returned to the river.

The seven Bull Trout that were detected after exiting the fishways were all detected on instream PIT arrays in the Methow River Basin.

4.2 Twisp River

4.2.1 Twisp River Weir

The Twisp River Weir trap was in operation from June 1, 2023 to July 24, 2023. Five Bull Trout were captured at the Twisp River Weir between June 20 and June 30, 2023. One fish had been previously tagged in the Twisp River in 2016 as a juvenile. The remaining four fish were new captures.

Of the five fish released upstream of the Twisp River Weir:

- 3 were not detected again (as of November 6, 2023)
- 2 were last detected at the lower Twisp River antenna array (TWR).
    - Detected on September 22 and September 29, 2023 with antenna detection patterns suggesting downstream movement.

4.2.2 Lower Twisp River PIT Array

Seven unique PIT tagged Bull Trout were detected on the Lower Twisp River antenna array (TWR): 2 in 2022, and 5 in 2023. Of these fish:

- 4 had been tagged at the Wells Project in the same year
    - 2 were last detected moving upstream (July 11, 2022 and June 30, 2023)
    - 1 was detected moving upstream on June 18, 2023 and then moving downstream on November 5, 2023
    - 1 was detected moving downstream on September 28, 2023
        - Upstream detection had been missed
        - Previously detected at the Methow River Carlton antenna array June 9, 2023
- 1 had been tagged in the Methow River in 2021
    - Detected moving upstream on July 9, 2022
    - Detected moving downstream on September 16, 2022
- 1 was captured and tagged at the Twisp River Weir on June 27, 2023
    - Detected moving downstream on September 29, 2023
- 1 had been previously tagged in the Twisp River as a juvenile in 2016
    - Detected moving upstream on June 15, 2023
    - Recaptured at the Twisp River Weir on June 20, 2023
    - Detected moving downstream on September 22, 2023

Three fish had complete detection histories that allowed calculation of residency time in the Twisp River (time between detection entering moving upstream and exiting moving downstream of TWR). Twisp River residency times for these fish were 69, 99, and 139 days.

4.3 Tributary Use

4.3.1 Migration Extent

Twenty-five PIT tagged Bull Trout were detected on 11 in-stream antenna arrays in tributaries which included the Methow River, Twisp River, Chewuch River, Gold Creek, and the Entiat River.

The seven Bull Trout captured and released in the Wells Project Fishways that were later detected on in-stream PIT arrays were all detected in the Methow River and Twisp River. Four of the fish had furthest upstream detections at TWR, the remaining three fish had furthest upstream detections at the MRC and Methow River at Winthrop (MRW) (Table 3). Similarly, these fish were also last detected (as of November 6, 2023) at the TWR and MRC antenna arrays (Table 4).

The two Bull Trout released at the Twisp Weir that were later detected both had the most upstream detection at TWR, this was also where they were last detected (Table 3 and Table 4).

Bull Trout captured and released in the Methow River had the most diverse and widely distributed furthest upstream and last detection locations. Fish released in the Methow River were the only study fish that were detected in the Chewuch River and in Gold Creek (Table 3 and Table 4). One fish left the Methow River Basin and was detected in the Entiat River approximately 120km downstream of where it was released.

Detection history plots of individual study fish can be found in Appendix B.

Table 3. Most upstream detection locations of PIT tagged Bull Trout in tributaries. Tan shaded rows are fish last seen at their release locations.

Most Upstream Detection	Release Location		
	Methow River	Wells Dam Fishways	Twisp River Weir
Entiat River Lower (ENL)	1	0	0
Wells Dam Hatchery (WEH)	0	2	0
Wells Dam Fishways	0	3	0
Methow Release (Below Twisp)	6	--	--
Gold Creek (GLC)	1	0	0
Methow River at Carlton (MRC)	1	2	0
Lower Twisp River (TWR)	2	4	2*
Twisp River Weir Release	--	--	3
Methow Release (Above Twisp)	9	--	--
Methow River at Winthrop (MRW)	2	1	0
Chewuch River Middle (CML)	2	0	0
Eightmile Acclimation Pond (EMU)	1	0	0

*Fish released upstream of Twisp River Weir and detected downstream at TWR

Table 4. Locations of last detection as of November 6, 2023 of PIT tagged Bull Trout by release location.

Location			
Release Location	**Wells**	**Methow**	**Twisp Weir**
Wells Project Fishways	12	-	-
Methow River	-	25	-
Twisp Weir	-	-	5
Last Seen Location			
Never Detected	-	13	3
Lower Entiat River - ENL	-	1	-
Wells Dam Hatchery - WEH	2	-	-
Wells Dam Fishways - WEA	3	-	-
Gold Creek, Methow River - GLC	-	1	-
Methow River at Carlton - MRC	4	3	-
Lower Twisp River - TWR	3	2	2
Methow River at Winthrop - MRW	-	2	-
Chewuch River above Winthrop - CRW	-	1	-
Chewuch River Middle Lower - CML	-	1	-
Eightmile Acclimation Pond - MEM	-	1	-

4.3.2 Migration Timing

There were 15 detection events of PIT tagged Bull Trout in which movement direction could be determined from PIT antenna configuration and detection timing. In the Twisp River, eight study fish were detected moving in the upstream direction between June 18 and July 11 in 2022 and 2023 combined. In the Chewuch River, three study fish were detected moving upstream on April 10, May 21, and June 6, 2023. One fish was also detected moving upstream in Gold Creek on June 22, 2023. A single fish moved upstream in the Entiat River on March 21, 2022.

Six downstream movements were observed in the Twisp River in 2022 and 2023 combined. All of the downstream movements occurred between September 10 and September 28 of each year. In the Chewuch River, a single study fish was detected moving downstream on October 8, 2023. A single study fish was also detected moving downstream in the Methow River at the MRW array on September 3, 2023.

Due to antenna configuration or lack of complete data for individual study fish detection history, it was not possible to determine movement directionality in the Methow River at the Lower Methow River (LMR) and MRC interrogation sites. However, the timing of detections at MRC had a bimodal pattern similar to that observed at TWR, with all detections occurring between May 28 and July 24 or September 20 and October 24 each year. In addition, of the 12 detection events that occurred May through July of each year, 4 of those fish were later detected at interrogation sites upstream indicating upstream movement. Of the three detections observed in

September and October, all of those fish had been previously detected at interrogation sites upstream, indicating downstream movement.

Detection history plots of individual study fish are found in Appendix B.

4.4 Genetic Assignment

Of the 29 Bull Trout from which tissue samples were analyzed, 24 were successfully assigned to local population groups. One fish was identified as a Bull/Brook trout hybrid and was not included. Study fish assigned to five different local populations within the Methow River Basin with nearly half of the fish assigned to the Twisp River population (Table 5).

Table 5. Local population assignment of Bull Trout captured at Wells Dam and the Methow River.

Population Assignment	Chewuch River	Early Winters Creek	Lake Creek	Twisp River	WF Methow River	Unassigned	Total
Tagging Location							
Methow River	1	4	2	6	6	4	23
Wells Dam	-	1	-	4	-	-	5
Total	1	5	2	10	6	4	28

Of the five Bull Trout captured at the Wells Project for which genetic assignment were possible, four were assigned to the Twisp River population; one fish assigned to the Early Winters Creek population. Two fish that were captured and tagged in the Methow River and were detected at Twisp River Weir both assigned to the Twisp River population. A single fish that was tagged in the Methow River and was later detected entering Gold Creek also assigned to the Twisp River population. Three fish captured in the Methow River also assigned to the Twisp River population but had not been detected on tributary in-stream PIT arrays. One fish that was tagged in the Methow River migrated downstream and was detected entering the Entiat River; this fish partially assigned to the Goat Creek (Methow Basin) populations at a probability of 0.57. The remainder of fish captured and tagged in the Methow River assigned to populations in the upper Methow River Basin or Chewuch River Basin. These results are consistent with pervious genetic work of Bull Trout captured at the Wells Project where fish predominately assign to the Methow Basin, with particularly high assignment to the Twisp River population (Robichuad and Gingerich 2017).

Detailed results of genetic analysis are found in Appendix C.

4.5 Discussion

During this investigation, data were collected on the behavior and life history patterns of Bull Trout in the upper Columbia River, Methow River and tributaries as well as their interaction with the Wells Project and the Twisp River Weir. In addition, tissue samples were collected from 28 Bull Trout and those fish were assigned to local population groups by genetic analysis. Insights provided by these data met the stated study objectives of: 1. Describe interactions of Bull Trout with the Wells Project fishways, 2. Describe movement patterns of Bull Trout in the Twisp River and interactions with the Twisp River Weir, 3. Describe movement patterns of Bull Trout in the Mid-Columbia River Basin and tributaries, and 4. Collect tissue samples from Bull Trout for genetic assignment to local population groups.

Bull Trout were shown to interact with the Wells Project during upstream migration primarily from late May to July, with similar proportions of fish passing in those months in 2022-2023 as the previous eleven years 2010-2021. Study fish that were detected after exiting the Wells Project Fishways were detected in the Methow River with the majority entering the Twisp River and interacting with the Twisp River Weir in July. Downstream migrations of study fish out of tributaries were observed in September and October. These findings were highly consistent to the results of the 2016 Bull Trout Passage and Survival Study (Robichuad and Gingerich 2017).

Unlike in previous studies, Bull Trout captured and PIT tagged in the Methow River were included in this investigation. Many of these fish had detections at interrogation sites in the Chewuch River and upper Methow River, in contrast to study fish captured in the Wells Project Fishways and Twisp River Weir, which had detections almost exclusively in the lower Methow River and Twisp River. A higher proportion of these fish were also genetically assigned to local populations in the Chewuch and upper Methow rivers.

While PIT-tags can provide useful information about the seasonal movement patterns of Bull Trout, limitations inherent to the technology hinder the ability to assess passage and survival at the Wells Project and the Twisp River Weir. These limitations include: the small number of interrogation sites where fish may be detected, the seasonal variability in detection probability of tagged fish at interrogation sites (Robichuad and Gingerich 2017), and the inability to determine the disposition of fish after they are last detected. In addition, there is no PIT-tag detection capability at or upstream of the Twisp River Weir and no downstream detection capability at, or immediately downstream of, the Wells Project which are detection points crucial for calculating passage and survival rates at those locations.

Acknowledging the shortcomings of PIT-tag technology, the Aquatic SWG developed this study as an alternative to more invasive radio-telemetry methodology which has a higher potential of tagging and handling mortality. Given the current low abundance of Bull Trout in the study area, the Aquatic SWG and the FERC deemed appropriate the use of PIT-tags to track fish movements and interactions with the Wells Project and the Twisp River Weir to fulfill the requirement of a Year-10 Bull Trout Passage and Survival Study under Section 4.2 of the BTMP.

While the results of the 2022-2023 study cannot be used to reassess passage and survival metrics directly, based on visual interpretation of the distribution of passage dates at Wells Dam (Figure 6), the patterns of movements and behaviors observed in Bull Trout at Wells Dam in 2022-2023 were similar to observations in previous studies. However, future studies should employ active tag technology (i.e., radio telemetry) to verify that Bull Trout passage and survival success continues to exceed the standards identified in the BTMP.

5.0 REFERENCES

DeHaan, P., B. Adams, and M. Nelson. 2014. Fine-scale population structure analysis and genetic population assignments of Wenatchee River sub-basin bull trout. U.S. Fish and Wildlife Service. Abernathy Fish Technology Center. Longview, WA.

DeHaan, P., and J. Neibauer. 2012. Analysis of genetic variation within and among upper Columbia River Bull Trout populations. U.S. Fish and Wildlife Service. Abernathy Fish Technology Center. Longview, WA.

LGL and Douglas PUD. 2008. Wells Bull Trout monitoring and management plan 2005-2008 final report. Report to Public Utility District No. 1 of Douglas County, East Wenatchee, WA.

Robichaud D. and A. Gingerich. 2017. Bull Trout Passage and Take Monitoring at Wells Dam and the Twisp River Weir FINAL REPORT. Public Utility District No. 1 of Douglas County, East Wenatchee, WA

APPENDIX A

FERC ORDER GRANTING VARIANCE FROM RADIO TELEMETRY STUDY PURSUANT TO BULL TROUT STRANDING, ENTRAPMENT, AND TAKE STUDY PLAN AND ARTICLE 402 ISSUED OCTOBER 12, 2021

177 FERC ¶ 62,020
UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Public Utility District No. 1 of Douglas County Project No. 2149-152

ORDER GRANTING VARIANCE FROM RADIO TELEMETRY STUDY PURSUANT TO BULL TROUT STRANDING, ENTRAPMENT, AND TAKE STUDY PLAN AND ARTICLE 402

(Issued October 12, 2021)

1. On June 22, 2021, Public Utility District No. 1 of Douglas County, Washington, licensee for the Wells Hydroelectric Project No. 2149, filed a request for a variance of the Bull Trout Stranding, Entrapment, and Take Study Plan (Plan) [1] for Federal Energy Regulatory Commission (Commission) approval, pursuant to Article 402 of the project license.[2] The project is located on the Columbia River in Chelan, Douglas, and Okanogan counties, Washington, and partially occupies federal lands administered by the U.S. Department of the Interior and U.S. Army Corps of Engineers.

License Requirements

2. Article 402 of the project license requires the licensee to implement the Plan, which includes stranding evaluations and incidental take studies as described in sections 4.4, 4.5.1, and 4.6.1 of the Aquatic Settlement Agreement's Bull Trout Management Plan.[3] The Plan was developed in consultation with the National Marine Fisheries Service (NMFS), U.S. Fish and Wildlife Service (FWS), Confederated Tribes of the Colville Reservation (Colville), Confederated Tribes and Bands of the Yakama Nation (Yakama Nation), U.S. Bureau of Indian Affairs, and U.S. Bureau of Land Management (BLM).

[1] Order Approving Bull Trout Stranding, Entrapment, and Take Study Plan Pursuant to License Article 402 (145 FERC ¶ 62,070), issued October 29, 2013.

[2] Order Issuing New License (141 FERC ¶ 62,104), issued November 9, 2012.

[3] See Attachment C of the May 27, 2010 filing with the Commission.

3. Pursuant to the Plan, the Aquatic Settlement Agreement's Bull Trout Management Plan, the Section 18 Fishway Prescriptions, the terms and conditions of the FWS' 2012 Biological Opinion (BO),[4] and the project Water Quality Certification,[5] the licensee is required to conduct various bull trout passage and survival studies over the life of the license. The numerous studies and monitoring requirements address survivorship of the federally-threatened bull trout throughout the project area and at various life stages. In relevant part to this request, the Plan requires the licensee to conduct a Bull Trout Passage and Survival Radio Telemetry Study (Study) to assess bull trout passage and survival at the Wells Dam and Twisp River Wier in years 5, 10, and every 10 years thereafter. The year 10 implementation would occur during fall 2021.

License's Request

4. On June 22, 2021, the licensee requested that the Commission suspend the Study during fall 2021. The filing indicates that the parties of the Aquatic Settlement Agreement[6] requested the suspension and includes a formal Statement of Agreement attesting to all parties' concurrence. The licensee states that prior years of implementing the Study as well as its other bull trout monitoring requirements have demonstrated that the project does not have a significant effect on bull trout populations.[7]

5. The Study would require surgical implantation of radio tags in bull trout, which involves significant handling of the fish and may result in incidental take. Initially, the justification for the Study was that the knowledge gained would improve bull trout management activities in the future. It was therefore reasoned that some take would ultimately benefit the species as a whole. During consultation associated with the fall 2021 Study, the FWS determined that the instances of bull trout interaction with Wells Dam and Twisp River Weir were too low to risk potential mortalities associated with the radio telemetry surgeries. Accordingly, the licensee requests a variance from the requirement for fall 2021. The licensee would continue to monitor bull trout populations via a passive integrated transponder (PIT) tag study[8] and through other requirements of

[4] See March 16, 2021 filing with the Commission.

[5] See Appendix A of the project license.

[6] Parties to the Settlement Agreement include: the licensee; FWS; Washington Department of Ecology; Washington Department of Fish and Wildlife; Colville; Yakama Nation; and BLM.

[7] See Bull Trout Monitoring and Management Plans filed with the Commission December 24, 2008 and November 13, 2017.

[8] PIT tags are implanted via a small needle injection. They do not require

the Plan, Aquatic Settlement Agreement, Section 18 Fishway Prescriptions, FWS' Biological Opinion, and Water Quality Certification.

Consultation

6. As stated above, the FWS requested the proposed variance during consultation regarding the fall 2021 Study. The licensee subsequently developed a Statement of Agreement in which the parties of the Aquatic Settlement Agreement approved the request on May 12, 2021. The request was also addressed at a May 12, 2021 meeting, where all agencies and tribes present reaffirmed their concurrence with the request.

7. The FWS filed additional comments with the Commission on September 17, 2021. In its filing, the FWS confirms that bull trout survival and passage efficiency has been adequate in all prior studies, and that the performance studies at the project have met the minimum requirements for all criteria related for bull trout survival and passage. The FWS states that the proposed variance would not change its effects analysis as identified in its 2012 BO, wherein the FWS concluded that the operation of the project is not likely to jeopardize the continued existence of the bull trout and will not destroy or adversely modified its designated critical habitat. The FWS indicates that it does not require any additional consultation pursuant to section 7 of the Endangered Species Act.

Discussion and Conclusion

8. The licensee's request for a variance from its Study requirements to conduct a radio telemetry study during fall 2021 would decrease the potential for take of a threatened species. The requirement was intended to increase knowledge about bull trout survival and passage; however, it appears that other related requirements and past implementation of the Study adequately supplement the knowledge, and that further knowledge would not be gained in fall 2021. The FWS requested the variance and has verified that it would have no effect to its analysis and that it would not require consultation pursuant to section 7 of the Endangered Species Act. While the FWS previously permitted the take of bull trout for Study purposes, the licensee's request would further reduce the potential for bull trout mortalities. Moreover, the NMFS' March 7, 2012 BO states that bull trout studies could result in incidental take of co-mingled, federally-endangered Chinook salmon.

9. The potential effects of the Study have already been examined and approved, and there would be no impacts to bull trout or loss of knowledge from not conducting the Study for one iteration while allowing the licensee and parties to the Settlement Agreement to determine the need to implement the Study in 10 years, based on future

---

anesthesia and involve significantly less handling than radio tags, subsequently resulting in less risk to the fish.

data collection. Therefore, the proposed variance would have no effect on federally listed species.

10. The variance was initially requested by the FWS, and the licensee obtained formal approval from all parties to the Aquatic Settlement Agreement prior to requesting Commission approval. The variance takes into consideration the best available science and adaptive management measures to update its Study implementation. The licensee would continue to monitor bull trout populations under numerous other project requirements. For these reasons, the variance should be approved.

The Director orders:

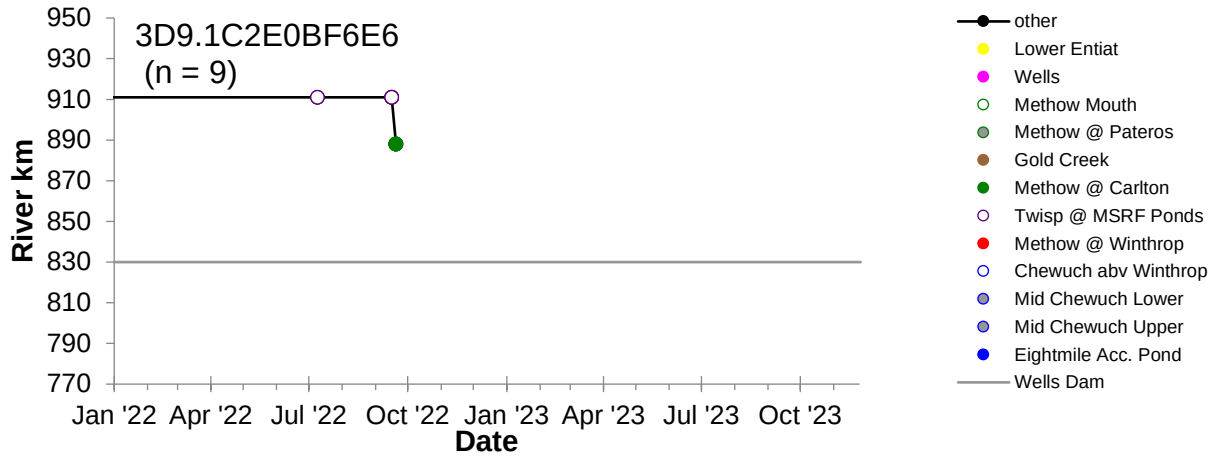
(A) Public Utility District No. 1 of Douglas County, Washington's request for a variance from the 10-year Bull Trout Passage and Survival Radio Telemetry Study pursuant to the Bull Trout Stranding, Entrapment, and Take Study Plan, filed on June 22, 2021, with the Federal Energy Regulatory Commission (Commission) for the Wells Hydroelectric Project No. 2149, is approved.

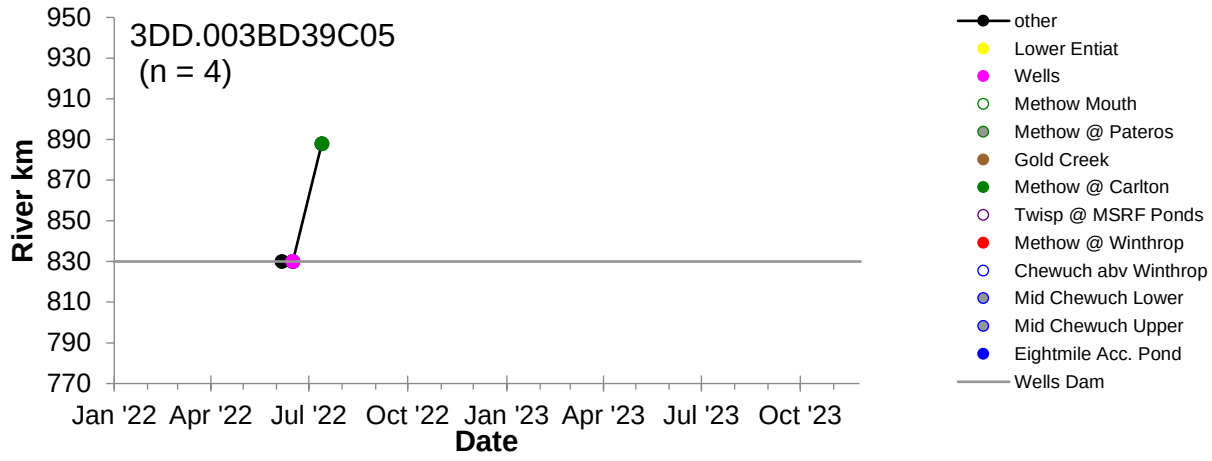
(B) This order constitutes final agency action. Any party may file a request for rehearing of this order within 30 days from the date of its issuance, as provided in section 313(a) of the Federal Power Act, 16 U.S.C. § 825*l* (2018), and the Commission's regulations at 18 CFR § 385.713 (2020). The filing of a request for hearing does not operate as a stay of the effective date of this order, or of any other date specified in this order. The licensee's failure to file a request for rehearing shall constitute acceptance of this order.

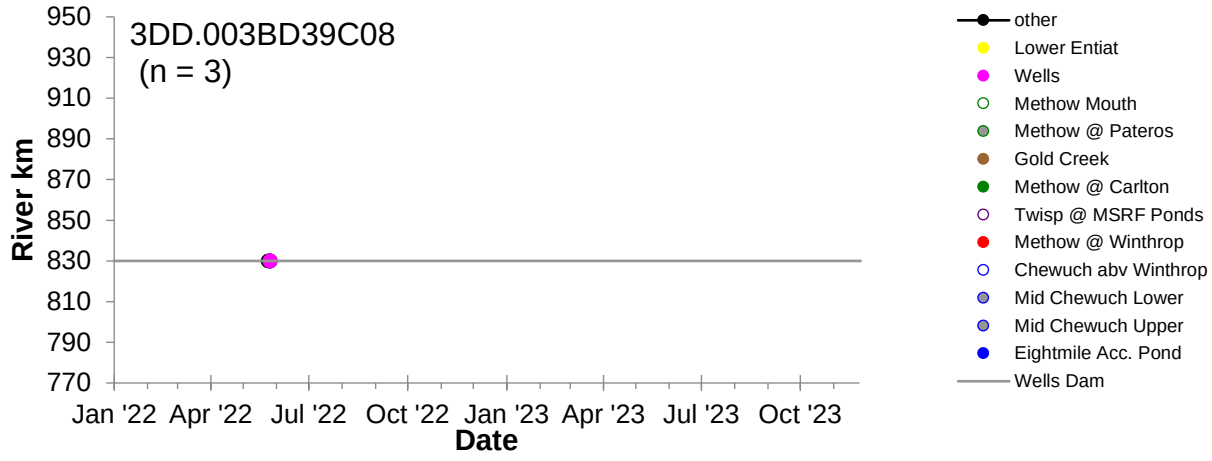
Andrea Claros
Chief, Aquatic Resources Branch
Division of Hydropower Administration
and Compliance

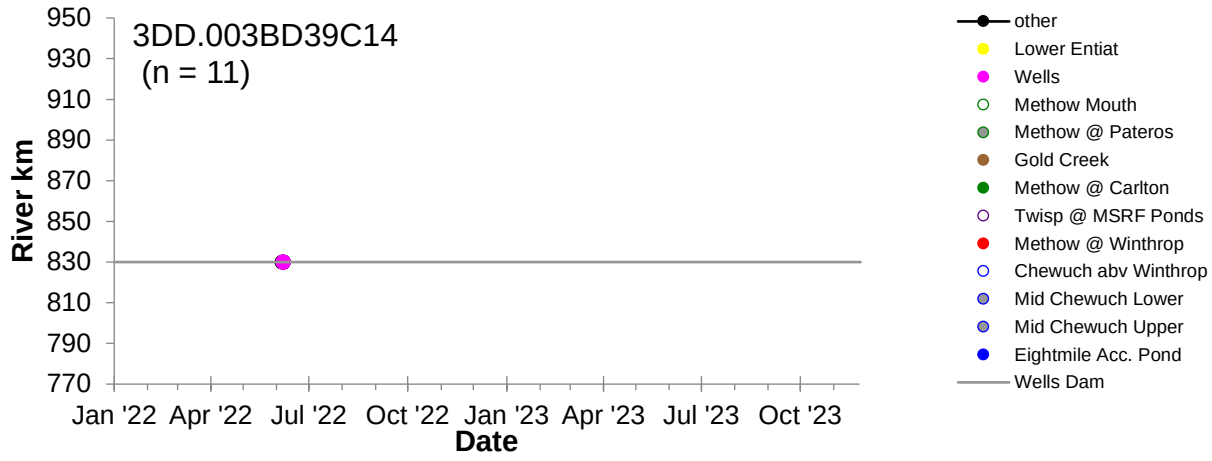
APPENDIX B

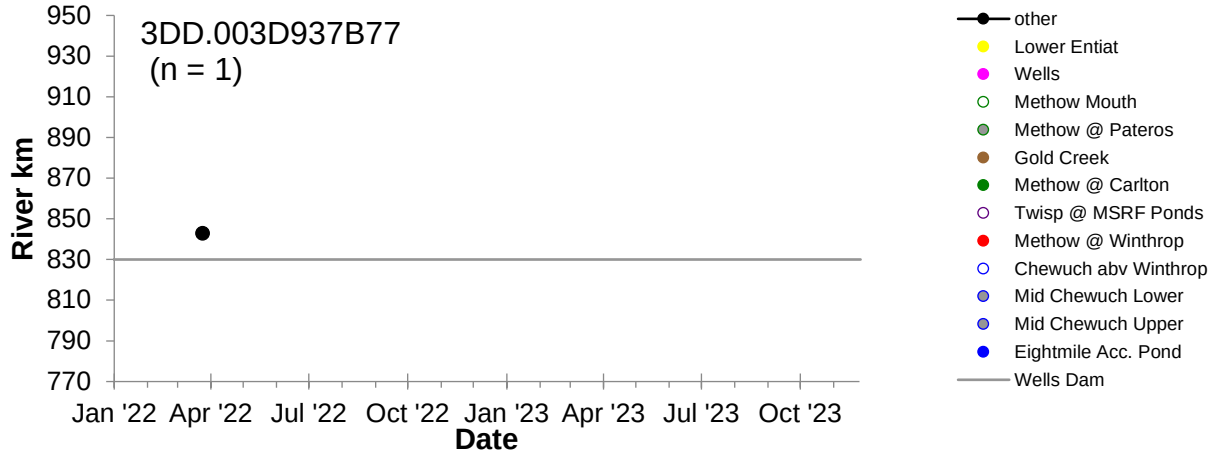
2022-2023 BULL TROUT DETECTION HISTORY PLOTS OF INDIVUAL STUDY FISH

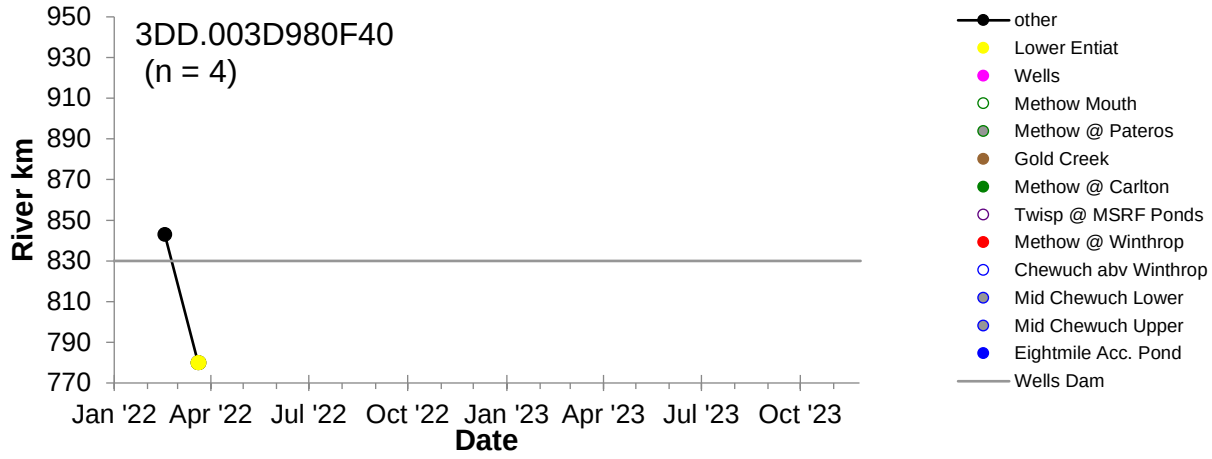

3D9.1C2E0BF6E6
(n = 9)
River km
950
930
910
890
870
850
830
810
790
770
Jan '22
Apr '22
Jul '22
Oct '22
Jan '23
Apr '23
Jul '23
Oct '23
Date
other
Lower Entiat
Wells
Methow Mouth
Methow @ Pateros
Gold Creek
Methow @ Carlton
Twisp @ MSRF Ponds
Methow @ Winthrop
Chewuch abv Winthrop
Mid Chewuch Lower
Mid Chewuch Upper
Eightmile Acc. Pond
Wells Dam

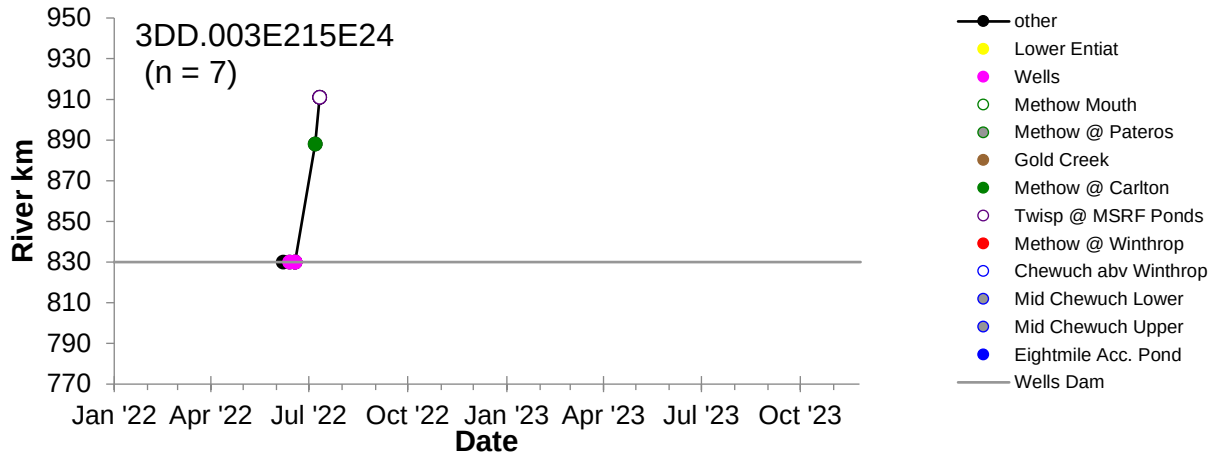

3DD.003BD39C05
(n = 4)
River km
950
930
910
890
870
850
830
810
790
770
Jan '22
Apr '22
Jul '22
Oct '22
Jan '23
Apr '23
Jul '23
Oct '23
Date
other
Lower Entiat
Wells
Methow Mouth
Methow @ Pateros
Gold Creek
Methow @ Carlton
Twisp @ MSRF Ponds
Methow @ Winthrop
Chewuch abv Winthrop
Mid Chewuch Lower
Mid Chewuch Upper
Eightmile Acc. Pond
Wells Dam

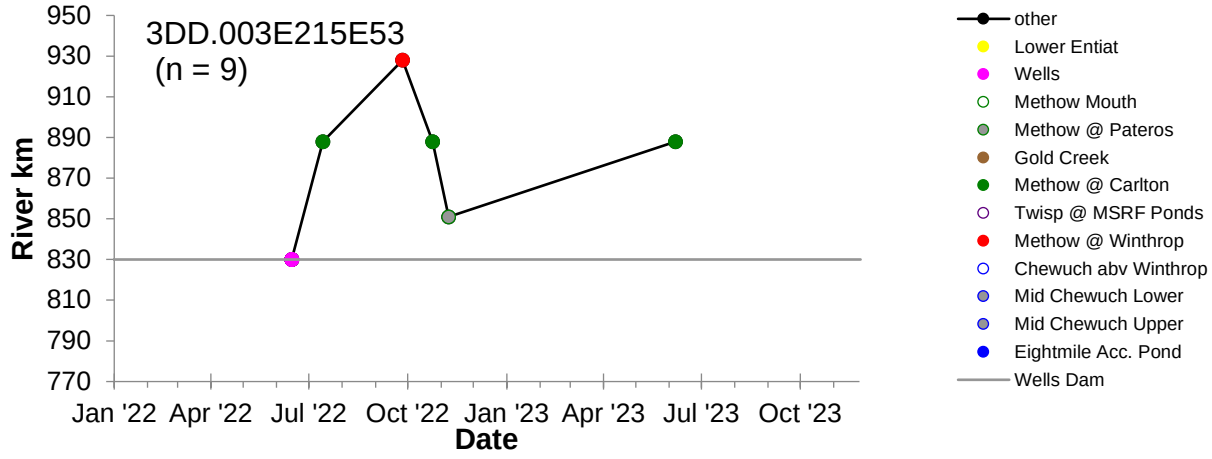

3DD.003BD39C08
(n = 3)
River km
950
930
910
890
870
850
830
810
790
770
Jan '22
Apr '22
Jul '22
Oct '22
Jan '23
Apr '23
Jul '23
Oct '23
Date
other
Lower Entiat
Wells
Methow Mouth
Methow @ Pateros
Gold Creek
Methow @ Carlton
Twisp @ MSRF Ponds
Methow @ Winthrop
Chewuch abv Winthrop
Mid Chewuch Lower
Mid Chewuch Upper
Eightmile Acc. Pond
Wells Dam

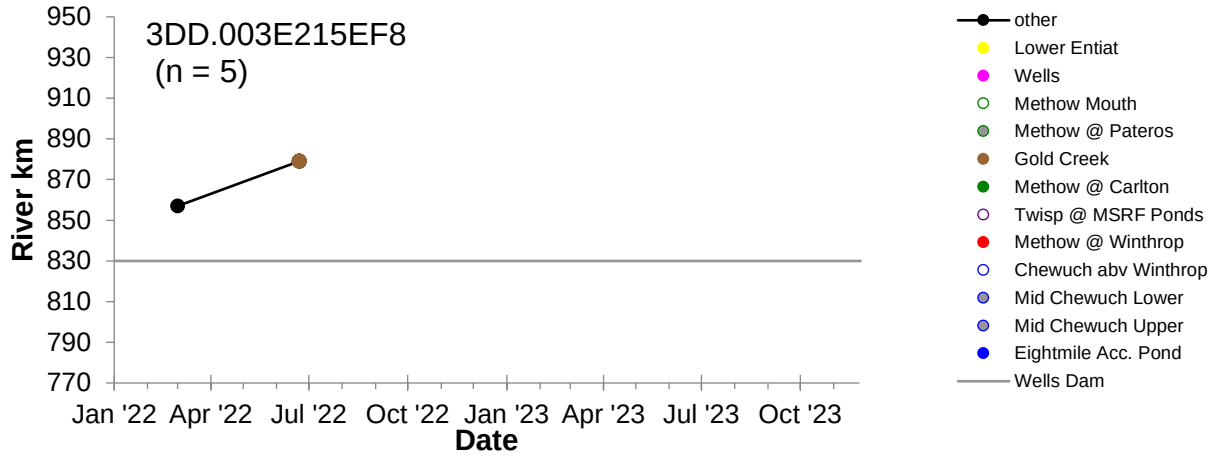

3DD.003BD39C14
(n = 11)
River km
950
930
910
890
870
850
830
810
790
770
Jan '22
Apr '22
Jul '22
Oct '22
Jan '23
Apr '23
Jul '23
Oct '23
Date
other
Lower Entiat
Wells
Methow Mouth
Methow @ Pateros
Gold Creek
Methow @ Carlton
Twisp @ MSRF Ponds
Methow @ Winthrop
Chewuch abv Winthrop
Mid Chewuch Lower
Mid Chewuch Upper
Eightmile Acc. Pond
Wells Dam

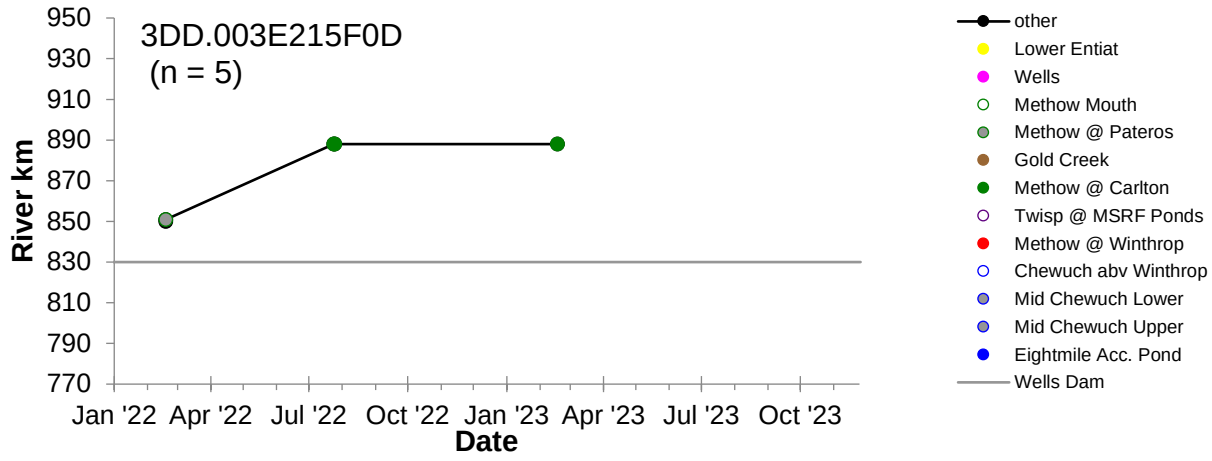

3DD.003D937B77
(n = 1)
River km
950
930
910
890
870
850
830
810
790
770
Jan '22
Apr '22
Jul '22
Oct '22
Jan '23
Apr '23
Jul '23
Oct '23
Date
other
Lower Entiat
Wells
Methow Mouth
Methow @ Pateros
Gold Creek
Methow @ Carlton
Twisp @ MSRF Ponds
Methow @ Winthrop
Chewuch abv Winthrop
Mid Chewuch Lower
Mid Chewuch Upper
Eightmile Acc. Pond
Wells Dam

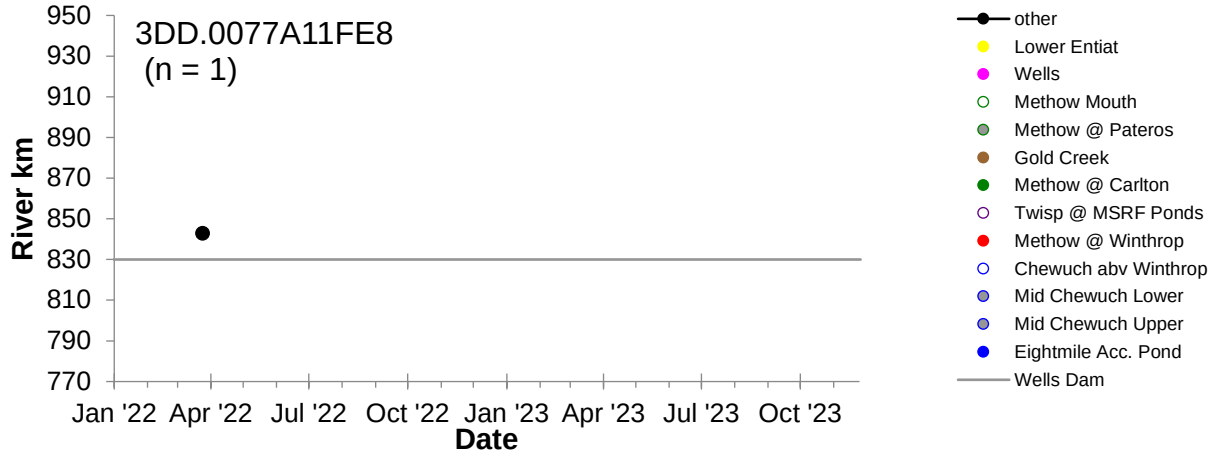

3DD.003D980F40
(n = 4)
River km
950
930
910
890
870
850
830
810
790
770
Jan '22
Apr '22
Jul '22
Oct '22
Jan '23
Apr '23
Jul '23
Oct '23
Date
other
Lower Entiat
Wells
Methow Mouth
Methow @ Pateros
Gold Creek
Methow @ Carlton
Twisp @ MSRF Ponds
Methow @ Winthrop
Chewuch abv Winthrop
Mid Chewuch Lower
Mid Chewuch Upper
Eightmile Acc. Pond
Wells Dam

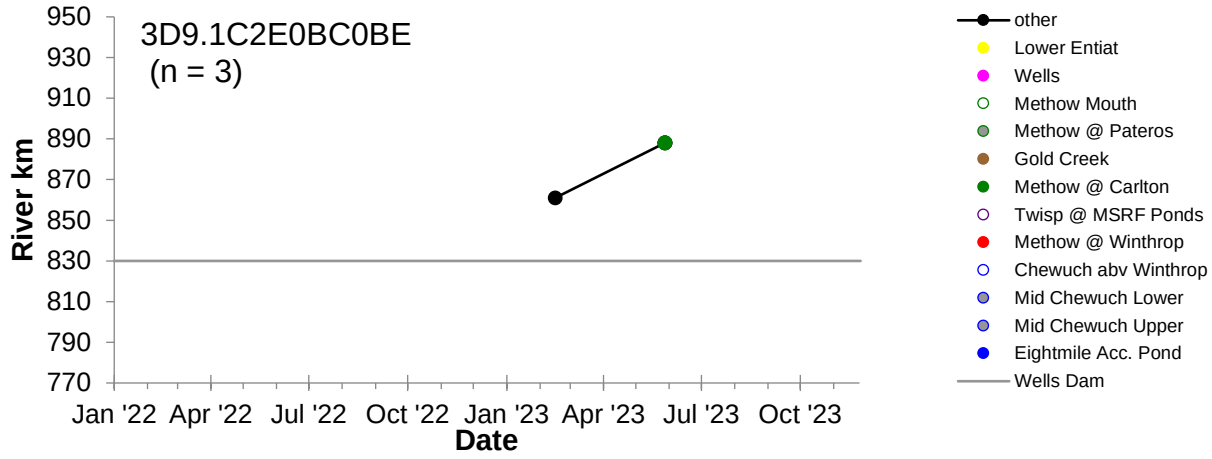

3DD.003E215E24
(n = 7)
River km
950
930
910
890
870
850
830
810
790
770
Jan '22
Apr '22
Jul '22
Oct '22
Jan '23
Apr '23
Jul '23
Oct '23
Date
other
Lower Entiat
Wells
Methow Mouth
Methow @ Pateros
Gold Creek
Methow @ Carlton
Twisp @ MSRF Ponds
Methow @ Winthrop
Chewuch abv Winthrop
Mid Chewuch Lower
Mid Chewuch Upper
Eightmile Acc. Pond
Wells Dam

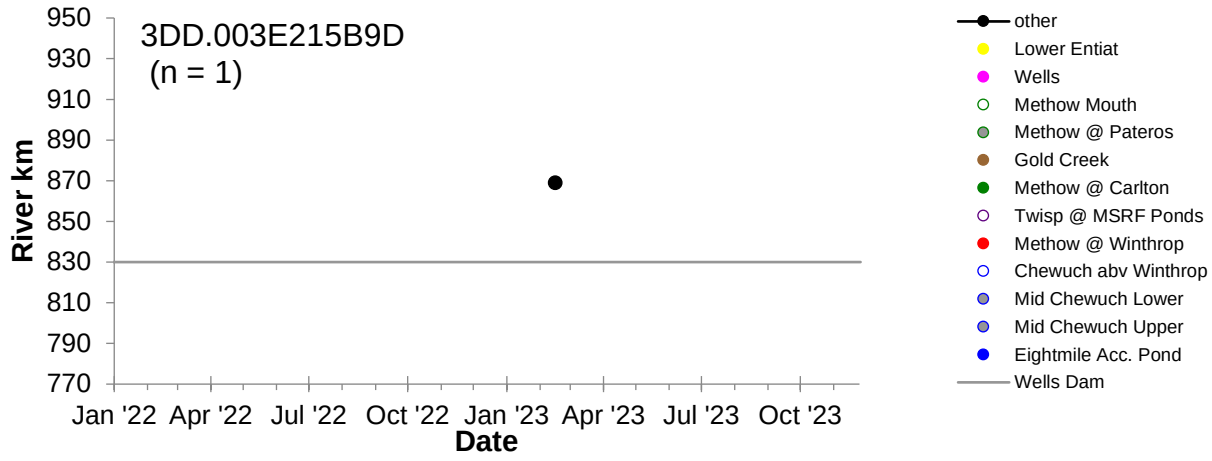

3DD.003E215E53
(n = 9)
River km
950
930
910
890
870
850
830
810
790
770
Jan '22
Apr '22
Jul '22
Oct '22
Jan '23
Apr '23
Jul '23
Oct '23
Date
other
Lower Entiat
Wells
Methow Mouth
Methow @ Pateros
Gold Creek
Methow @ Carlton
Twisp @ MSRF Ponds
Methow @ Winthrop
Chewuch abv Winthrop
Mid Chewuch Lower
Mid Chewuch Upper
Eightmile Acc. Pond
Wells Dam

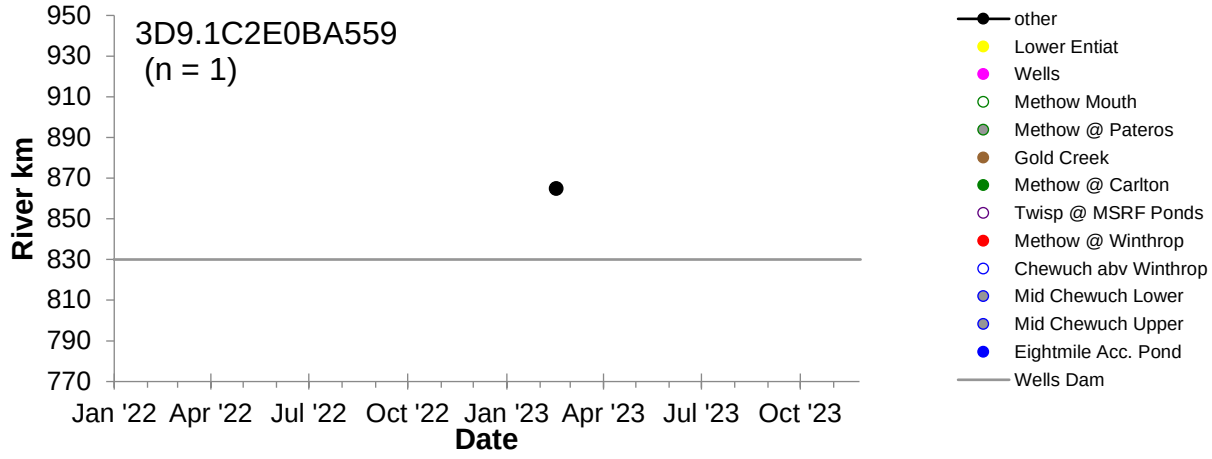

3DD.003E215EF8
(n = 5)
River km
950
930
910
890
870
850
830
810
790
770
Jan '22
Apr '22
Jul '22
Oct '22
Jan '23
Apr '23
Jul '23
Oct '23
Date
other
Lower Entiat
Wells
Methow Mouth
Methow @ Pateros
Gold Creek
Methow @ Carlton
Twisp @ MSRF Ponds
Methow @ Winthrop
Chewuch abv Winthrop
Mid Chewuch Lower
Mid Chewuch Upper
Eightmile Acc. Pond
Wells Dam

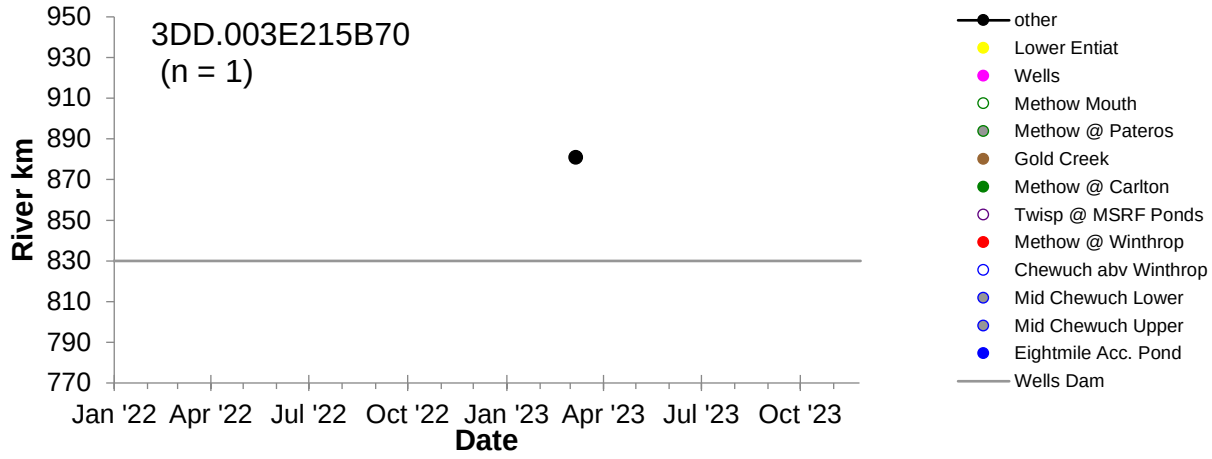

3DD.003E215F0D
(n = 5)
River km
950
930
910
890
870
850
830
810
790
770
Jan '22
Apr '22
Jul '22
Oct '22
Jan '23
Apr '23
Jul '23
Oct '23
Date
other
Lower Entiat
Wells
Methow Mouth
Methow @ Pateros
Gold Creek
Methow @ Carlton
Twisp @ MSRF Ponds
Methow @ Winthrop
Chewuch abv Winthrop
Mid Chewuch Lower
Mid Chewuch Upper
Eightmile Acc. Pond
Wells Dam

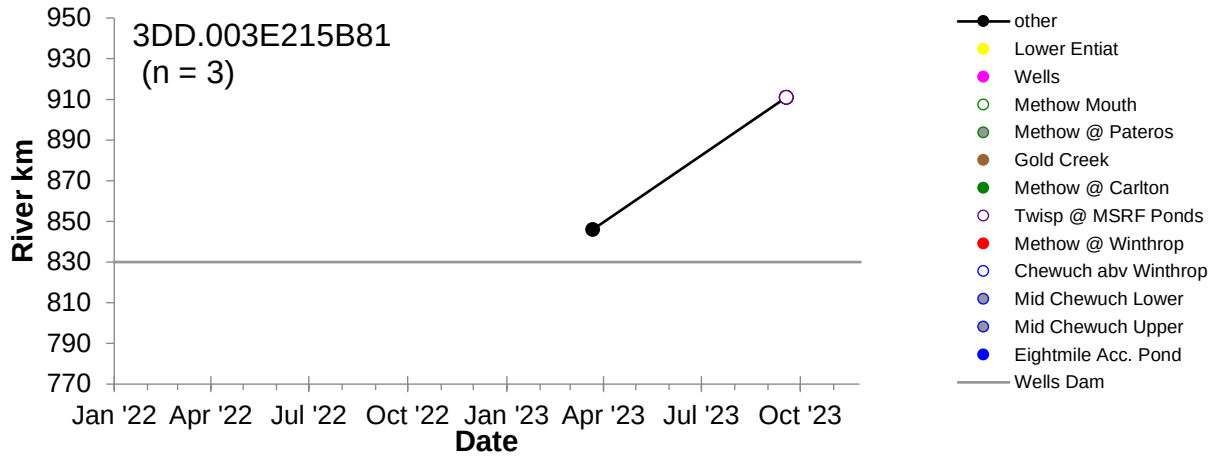

3DD.0077A11FE8
(n = 1)
River km
950
930
910
890
870
850
830
810
790
770
Jan '22
Apr '22
Jul '22
Oct '22
Jan '23
Apr '23
Jul '23
Oct '23
Date
other
Lower Entiat
Wells
Methow Mouth
Methow @ Pateros
Gold Creek
Methow @ Carlton
Twisp @ MSRF Ponds
Methow @ Winthrop
Chewuch abv Winthrop
Mid Chewuch Lower
Mid Chewuch Upper
Eightmile Acc. Pond
Wells Dam

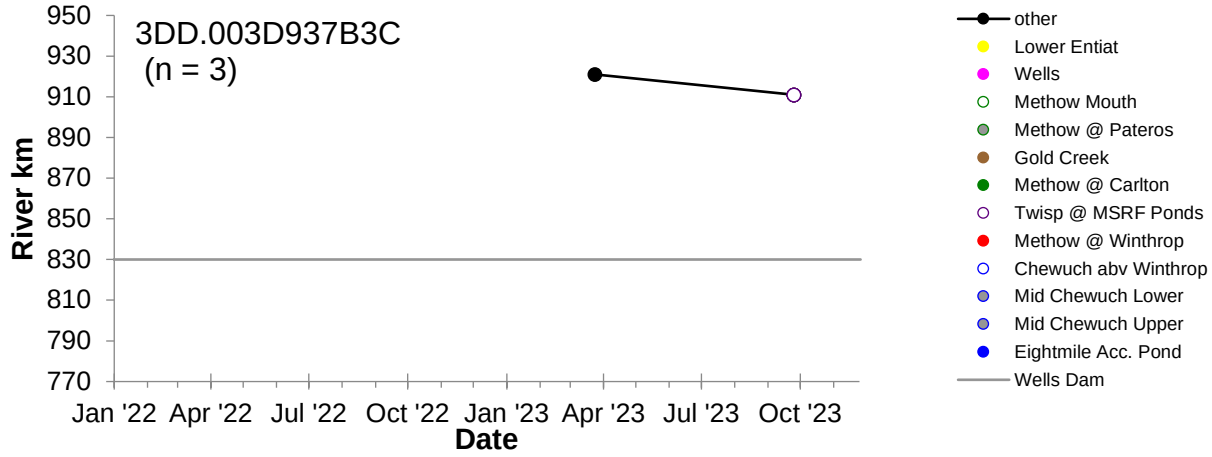

3D9.1C2E0BC0BE
(n = 3)
River km
950
930
910
890
870
850
830
810
790
770
Jan '22
Apr '22
Jul '22
Oct '22
Jan '23
Apr '23
Jul '23
Oct '23
Date
other
Lower Entiat
Wells
Methow Mouth
Methow @ Pateros
Gold Creek
Methow @ Carlton
Twisp @ MSRF Ponds
Methow @ Winthrop
Chewuch abv Winthrop
Mid Chewuch Lower
Mid Chewuch Upper
Eightmile Acc. Pond
Wells Dam

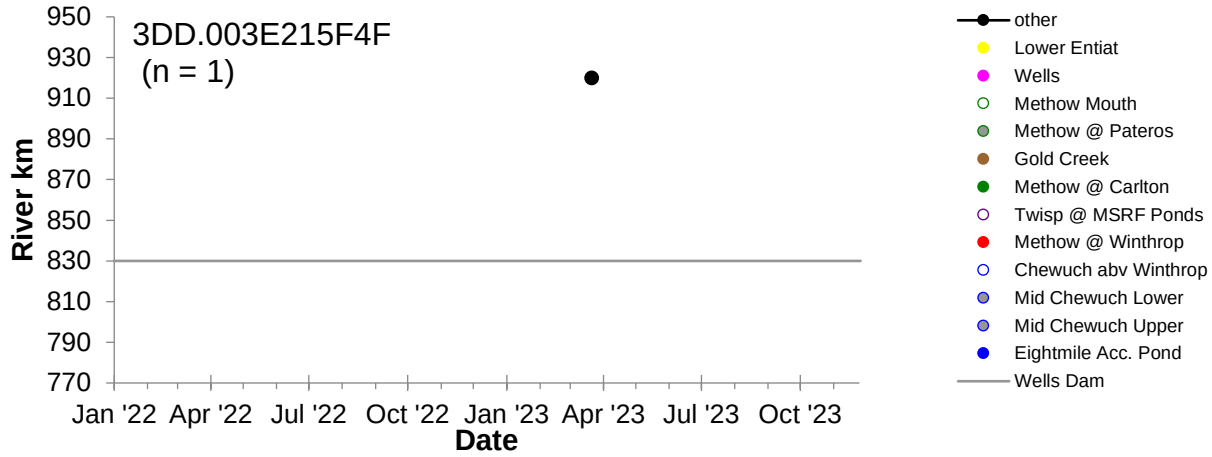

3DD.003E215B9D
(n = 1)
River km
950
930
910
890
870
850
830
810
790
770
Jan '22
Apr '22
Jul '22
Oct '22
Jan '23
Apr '23
Jul '23
Oct '23
Date
other
Lower Entiat
Wells
Methow Mouth
Methow @ Pateros
Gold Creek
Methow @ Carlton
Twisp @ MSRF Ponds
Methow @ Winthrop
Chewuch abv Winthrop
Mid Chewuch Lower
Mid Chewuch Upper
Eightmile Acc. Pond
Wells Dam

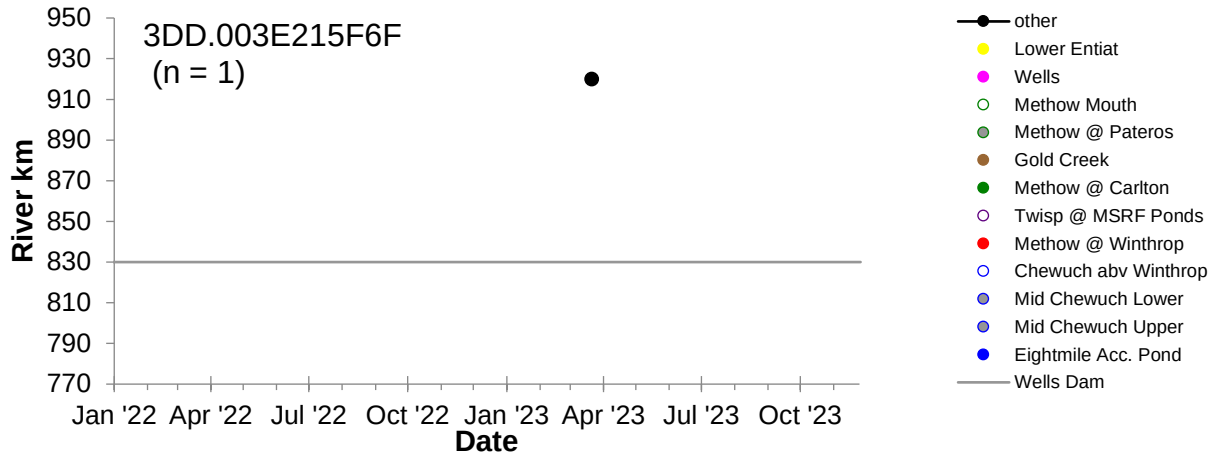

3D9.1C2E0BA559
(n = 1)
River km
950
930
910
890
870
850
830
810
790
770
Jan '22
Apr '22
Jul '22
Oct '22
Jan '23
Apr '23
Jul '23
Oct '23
Date
other
Lower Entiat
Wells
Methow Mouth
Methow @ Pateros
Gold Creek
Methow @ Carlton
Twisp @ MSRF Ponds
Methow @ Winthrop
Chewuch abv Winthrop
Mid Chewuch Lower
Mid Chewuch Upper
Eightmile Acc. Pond
Wells Dam

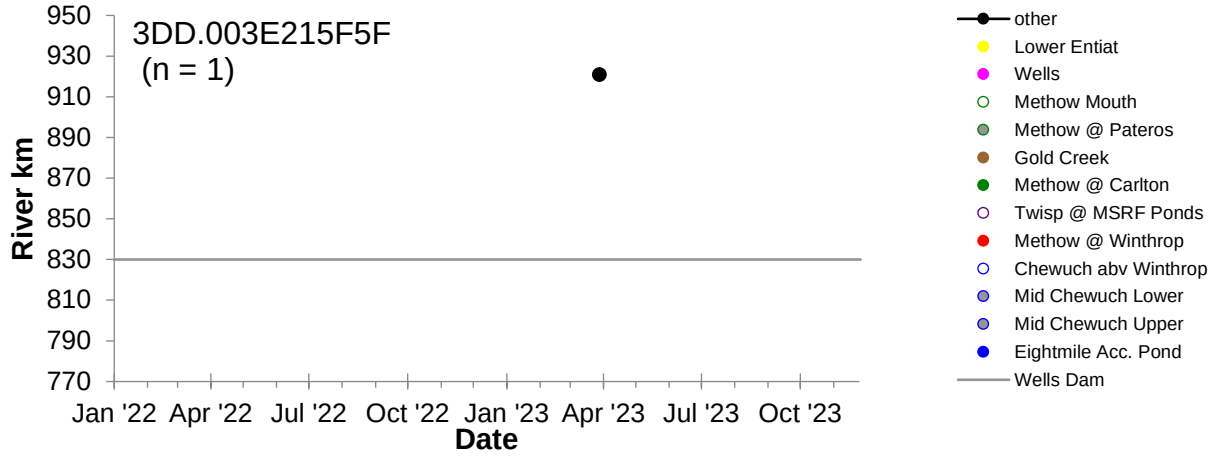

3DD.003E215B70
(n = 1)
River km
950
930
910
890
870
850
830
810
790
770
Jan '22
Apr '22
Jul '22
Oct '22
Jan '23
Apr '23
Jul '23
Oct '23
Date
other
Lower Entiat
Wells
Methow Mouth
Methow @ Pateros
Gold Creek
Methow @ Carlton
Twisp @ MSRF Ponds
Methow @ Winthrop
Chewuch abv Winthrop
Mid Chewuch Lower
Mid Chewuch Upper
Eightmile Acc. Pond
Wells Dam

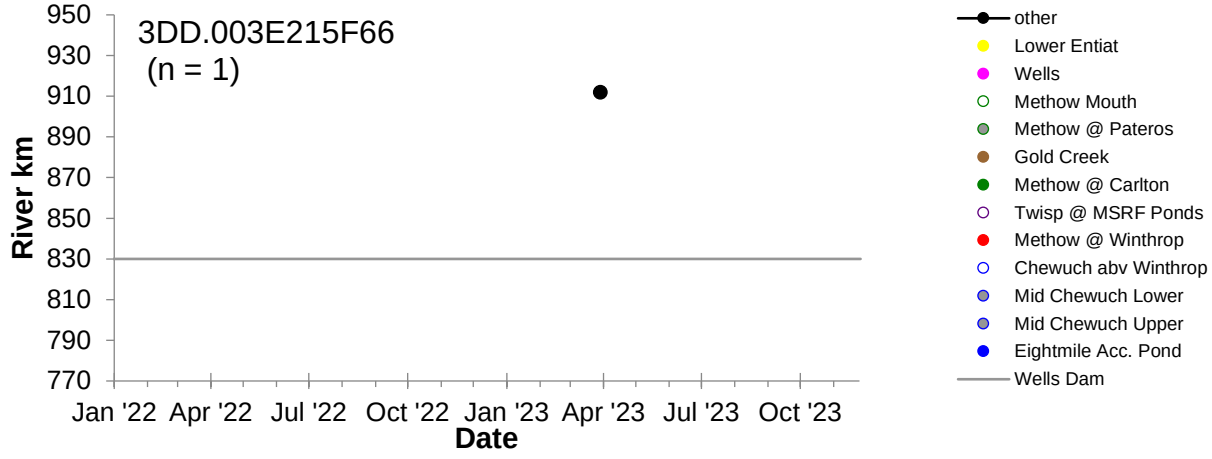

3DD.003E215B81
(n = 3)
River km
950
930
910
890
870
850
830
810
790
770
Jan '22
Apr '22
Jul '22
Oct '22
Jan '23
Apr '23
Jul '23
Oct '23
Date
other
Lower Entiat
Wells
Methow Mouth
Methow @ Pateros
Gold Creek
Methow @ Carlton
Twisp @ MSRF Ponds
Methow @ Winthrop
Chewuch abv Winthrop
Mid Chewuch Lower
Mid Chewuch Upper
Eightmile Acc. Pond
Wells Dam

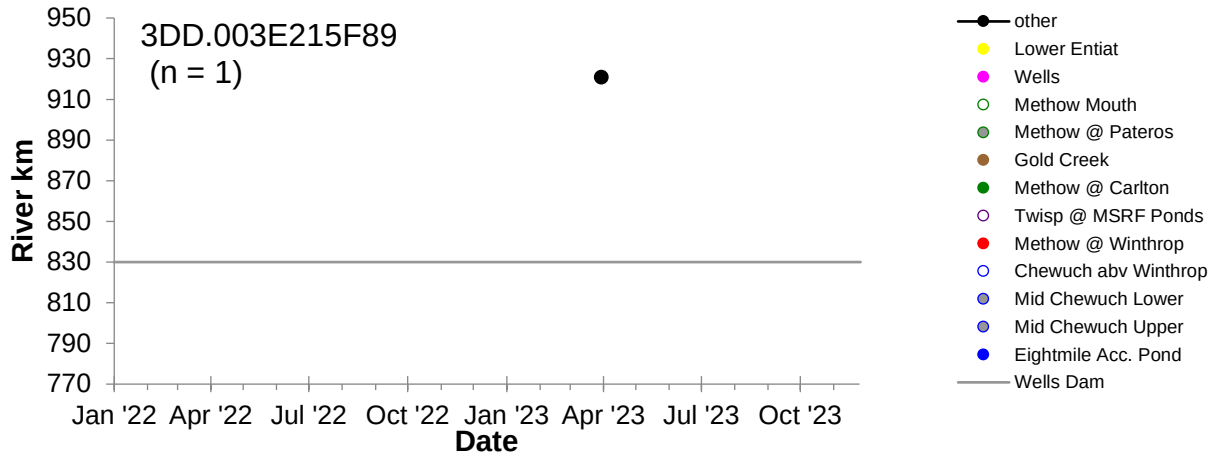

3DD.003D937B3C
(n = 3)
River km
950
930
910
890
870
850
830
810
790
770
Jan '22
Apr '22
Jul '22
Oct '22
Jan '23
Apr '23
Jul '23
Oct '23
Date
other
Lower Entiat
Wells
Methow Mouth
Methow @ Pateros
Gold Creek
Methow @ Carlton
Twisp @ MSRF Ponds
Methow @ Winthrop
Chewuch abv Winthrop
Mid Chewuch Lower
Mid Chewuch Upper
Eightmile Acc. Pond
Wells Dam

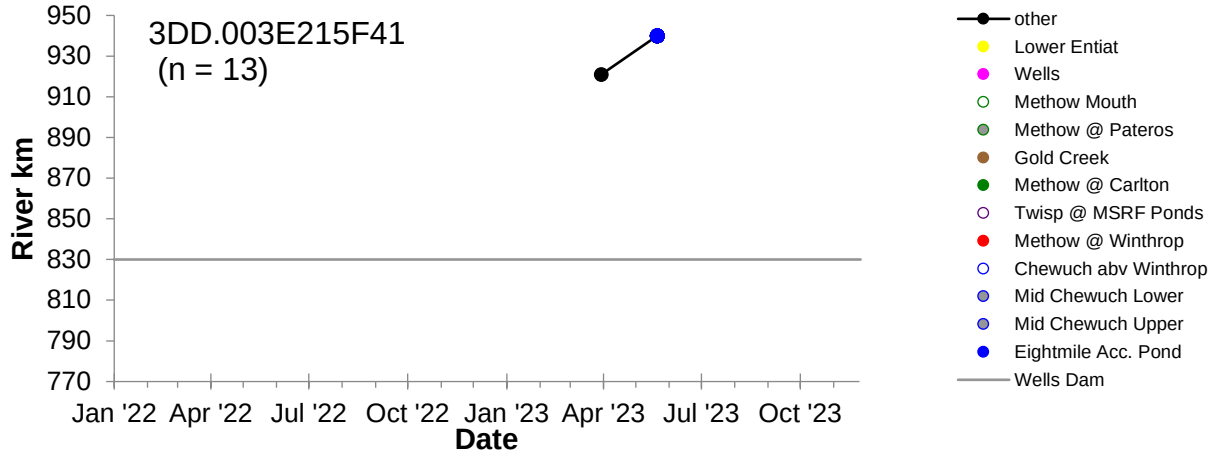

3DD.003E215F4F
(n = 1)
River km
950
930
910
890
870
850
830
810
790
770
Jan '22
Apr '22
Jul '22
Oct '22
Jan '23
Apr '23
Jul '23
Oct '23
Date
other
Lower Entiat
Wells
Methow Mouth
Methow @ Pateros
Gold Creek
Methow @ Carlton
Twisp @ MSRF Ponds
Methow @ Winthrop
Chewuch abv Winthrop
Mid Chewuch Lower
Mid Chewuch Upper
Eightmile Acc. Pond
Wells Dam

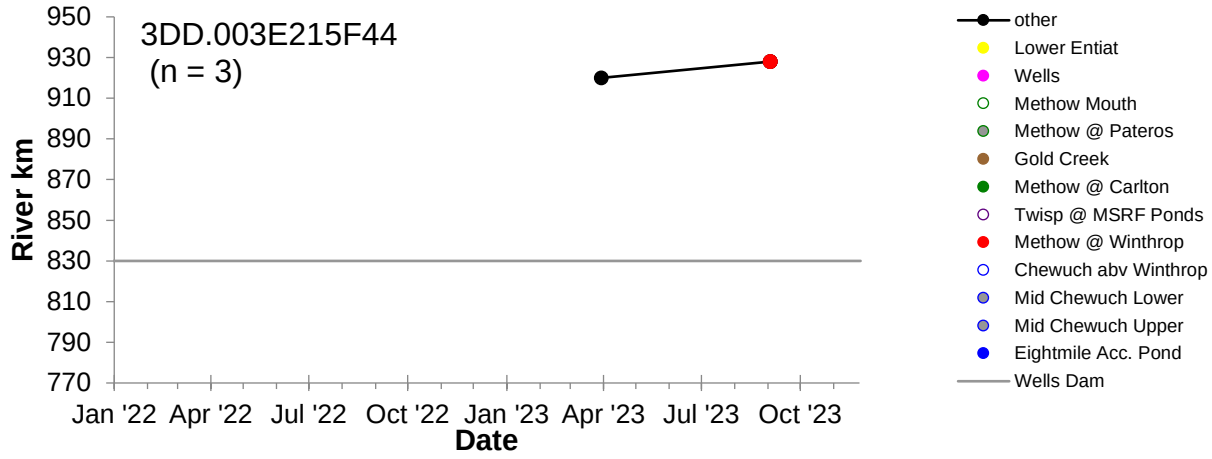

3DD.003E215F6F
(n = 1)
River km
950
930
910
890
870
850
830
810
790
770
Jan '22
Apr '22
Jul '22
Oct '22
Jan '23
Apr '23
Jul '23
Oct '23
Date
other
Lower Entiat
Wells
Methow Mouth
Methow @ Pateros
Gold Creek
Methow @ Carlton
Twisp @ MSRF Ponds
Methow @ Winthrop
Chewuch abv Winthrop
Mid Chewuch Lower
Mid Chewuch Upper
Eightmile Acc. Pond
Wells Dam

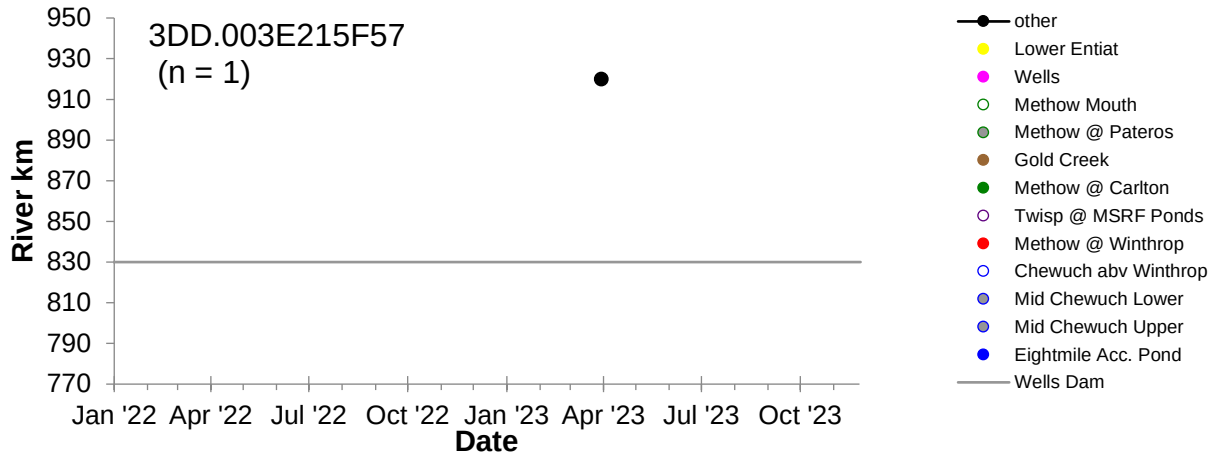

3DD.003E215F5F
(n = 1)
River km
950
930
910
890
870
850
830
810
790
770
Jan '22
Apr '22
Jul '22
Oct '22
Jan '23
Apr '23
Jul '23
Oct '23
Date
other
Lower Entiat
Wells
Methow Mouth
Methow @ Pateros
Gold Creek
Methow @ Carlton
Twisp @ MSRF Ponds
Methow @ Winthrop
Chewuch abv Winthrop
Mid Chewuch Lower
Mid Chewuch Upper
Eightmile Acc. Pond
Wells Dam

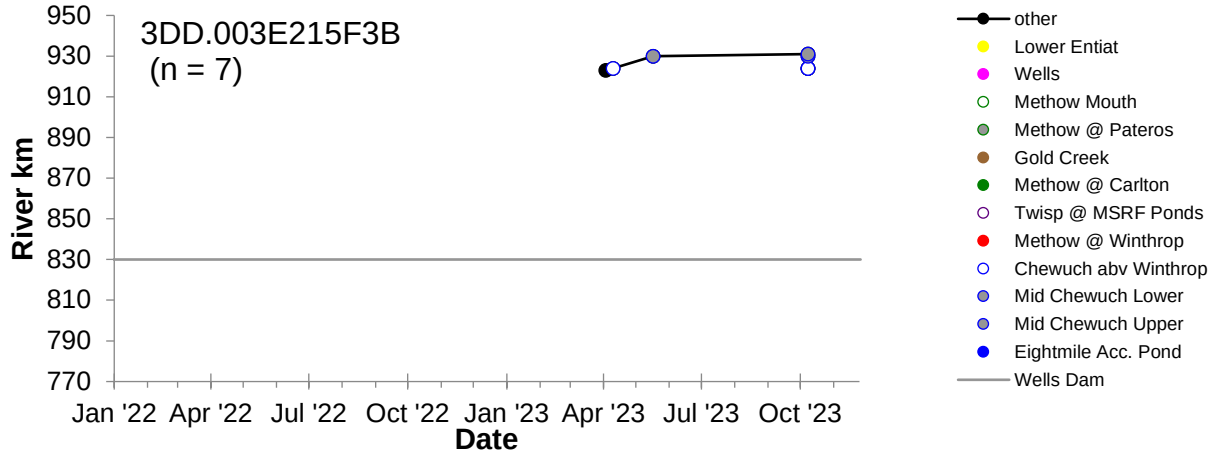

3DD.003E215F66
(n = 1)
River km
950
930
910
890
870
850
830
810
790
770
Jan '22
Apr '22
Jul '22
Oct '22
Jan '23
Apr '23
Jul '23
Oct '23
Date
other
Lower Entiat
Wells
Methow Mouth
Methow @ Pateros
Gold Creek
Methow @ Carlton
Twisp @ MSRF Ponds
Methow @ Winthrop
Chewuch abv Winthrop
Mid Chewuch Lower
Mid Chewuch Upper
Eightmile Acc. Pond
Wells Dam

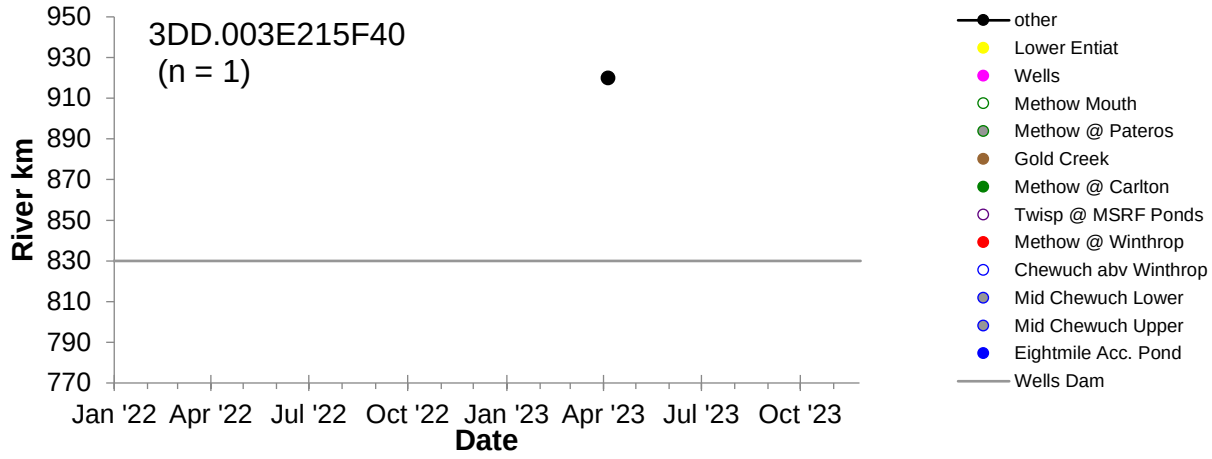

3DD.003E215F89
(n = 1)
River km
950
930
910
890
870
850
830
810
790
770
Jan '22
Apr '22
Jul '22
Oct '22
Jan '23
Apr '23
Jul '23
Oct '23
Date
other
Lower Entiat
Wells
Methow Mouth
Methow @ Pateros
Gold Creek
Methow @ Carlton
Twisp @ MSRF Ponds
Methow @ Winthrop
Chewuch abv Winthrop
Mid Chewuch Lower
Mid Chewuch Upper
Eightmile Acc. Pond
Wells Dam

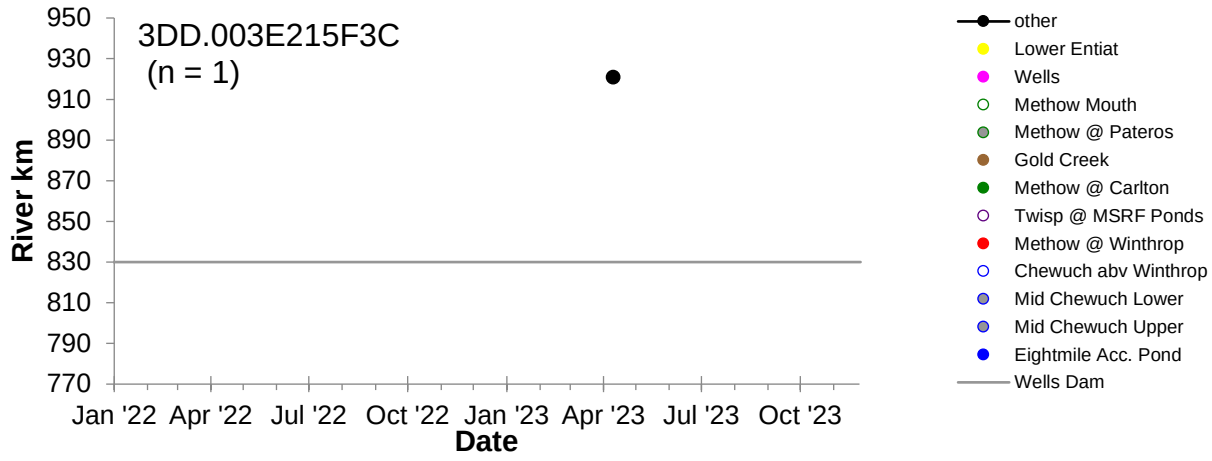

3DD.003E215F41
(n = 13)
River km
950
930
910
890
870
850
830
810
790
770
Jan '22
Apr '22
Jul '22
Oct '22
Jan '23
Apr '23
Jul '23
Oct '23
Date
other
Lower Entiat
Wells
Methow Mouth
Methow @ Pateros
Gold Creek
Methow @ Carlton
Twisp @ MSRF Ponds
Methow @ Winthrop
Chewuch abv Winthrop
Mid Chewuch Lower
Mid Chewuch Upper
Eightmile Acc. Pond
Wells Dam

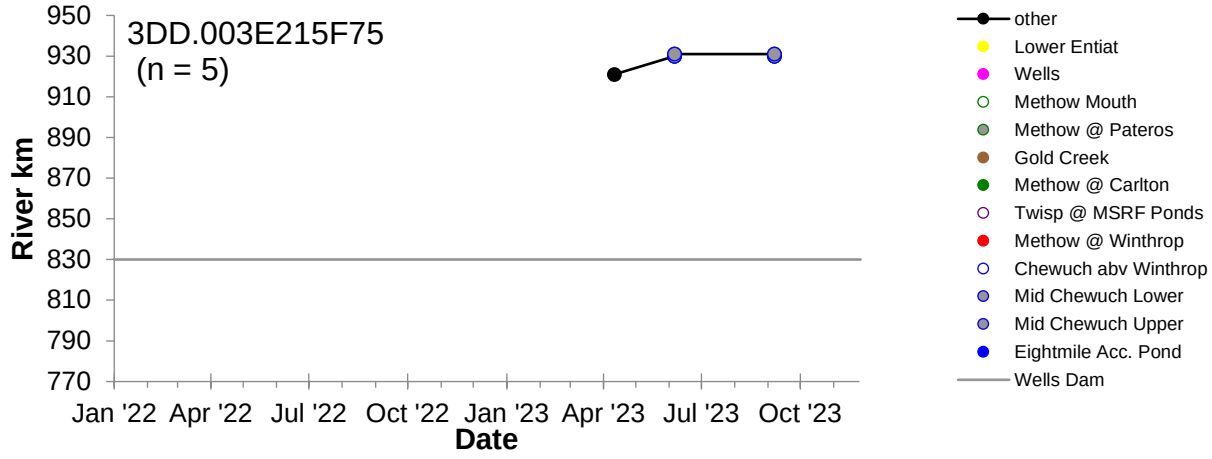

3DD.003E215F44
(n = 3)
River km
950
930
910
890
870
850
830
810
790
770
Jan '22
Apr '22
Jul '22
Oct '22
Jan '23
Apr '23
Jul '23
Oct '23
Date
other
Lower Entiat
Wells
Methow Mouth
Methow @ Pateros
Gold Creek
Methow @ Carlton
Twisp @ MSRF Ponds
Methow @ Winthrop
Chewuch abv Winthrop
Mid Chewuch Lower
Mid Chewuch Upper
Eightmile Acc. Pond
Wells Dam

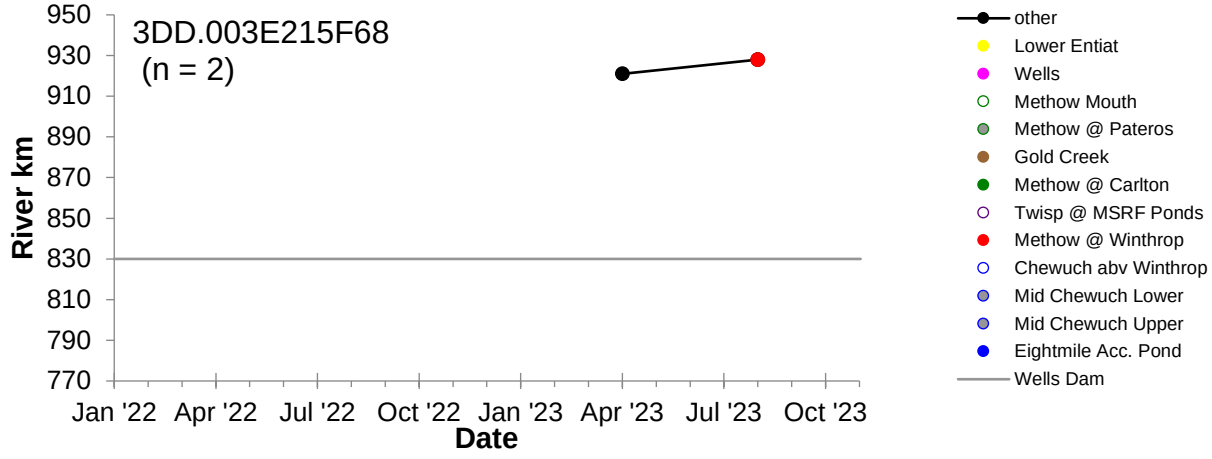

3DD.003E215F57
(n = 1)
River km
950
930
910
890
870
850
830
810
790
770
Jan '22
Apr '22
Jul '22
Oct '22
Jan '23
Apr '23
Jul '23
Oct '23
Date
other
Lower Entiat
Wells
Methow Mouth
Methow @ Pateros
Gold Creek
Methow @ Carlton
Twisp @ MSRF Ponds
Methow @ Winthrop
Chewuch abv Winthrop
Mid Chewuch Lower
Mid Chewuch Upper
Eightmile Acc. Pond
Wells Dam

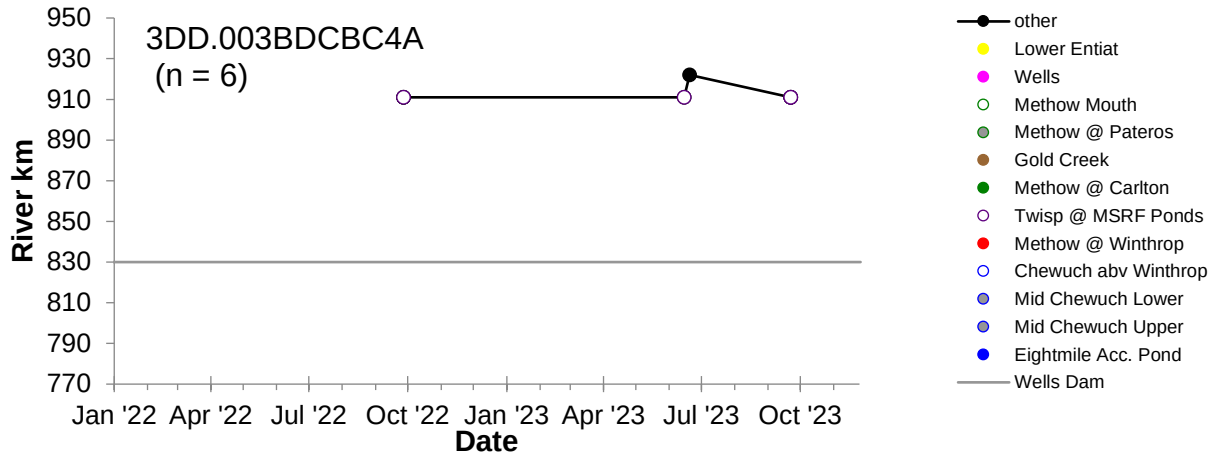

3DD.003E215F3B
(n = 7)
River km
950
930
910
890
870
850
830
810
790
770
Jan '22
Apr '22
Jul '22
Oct '22
Jan '23
Apr '23
Jul '23
Oct '23
Date
other
Lower Entiat
Wells
Methow Mouth
Methow @ Pateros
Gold Creek
Methow @ Carlton
Twisp @ MSRF Ponds
Methow @ Winthrop
Chewuch abv Winthrop
Mid Chewuch Lower
Mid Chewuch Upper
Eightmile Acc. Pond
Wells Dam

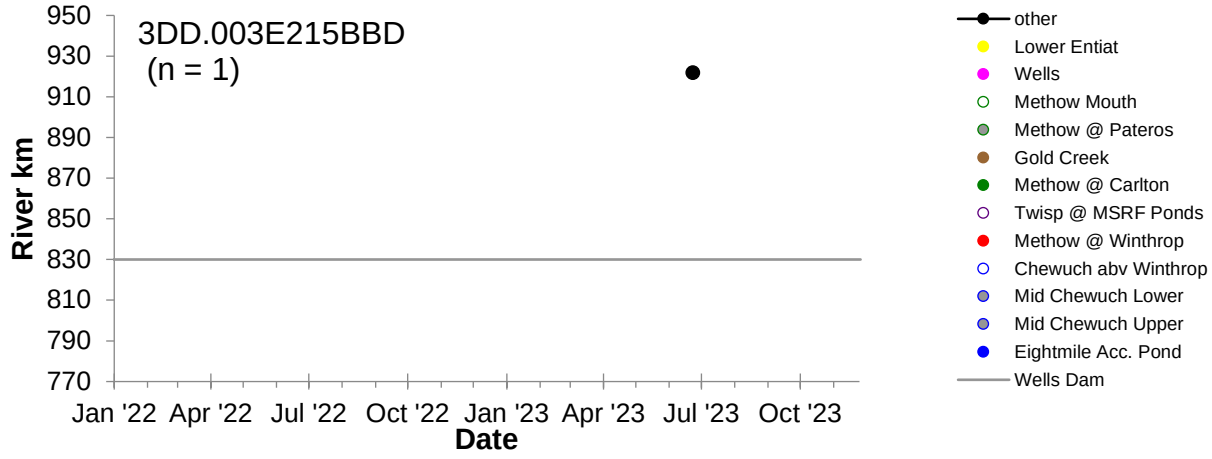

3DD.003E215F40
(n = 1)
River km
950
930
910
890
870
850
830
810
790
770
Jan '22
Apr '22
Jul '22
Oct '22
Jan '23
Apr '23
Jul '23
Oct '23
Date
other
Lower Entiat
Wells
Methow Mouth
Methow @ Pateros
Gold Creek
Methow @ Carlton
Twisp @ MSRF Ponds
Methow @ Winthrop
Chewuch abv Winthrop
Mid Chewuch Lower
Mid Chewuch Upper
Eightmile Acc. Pond
Wells Dam

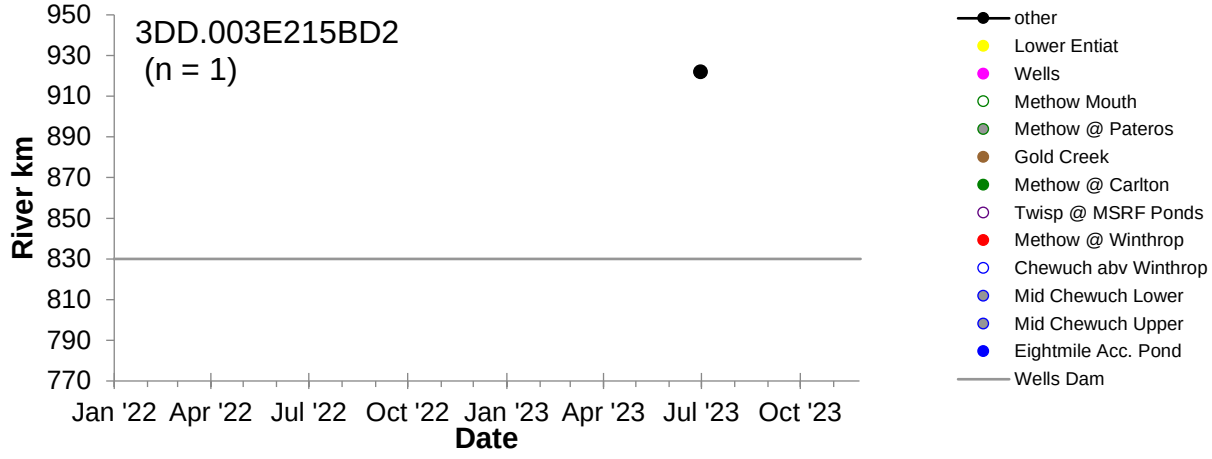

3DD.003E215F3C
(n = 1)
River km
950
930
910
890
870
850
830
810
790
770
Jan '22
Apr '22
Jul '22
Oct '22
Jan '23
Apr '23
Jul '23
Oct '23
Date
other
Lower Entiat
Wells
Methow Mouth
Methow @ Pateros
Gold Creek
Methow @ Carlton
Twisp @ MSRF Ponds
Methow @ Winthrop
Chewuch abv Winthrop
Mid Chewuch Lower
Mid Chewuch Upper
Eightmile Acc. Pond
Wells Dam

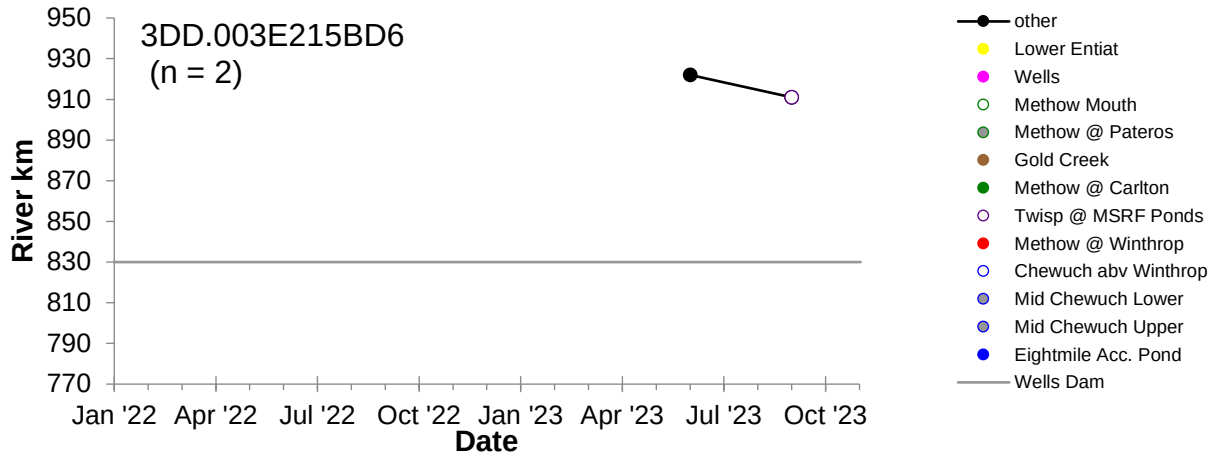

3DD.003E215F75
(n = 5)
River km
950
930
910
890
870
850
830
810
790
770
Jan '22
Apr '22
Jul '22
Oct '22
Jan '23
Apr '23
Jul '23
Oct '23
Date
other
Lower Entiat
Wells
Methow Mouth
Methow @ Pateros
Gold Creek
Methow @ Carlton
Twisp @ MSRF Ponds
Methow @ Winthrop
Chewuch abv Winthrop
Mid Chewuch Lower
Mid Chewuch Upper
Eightmile Acc. Pond
Wells Dam

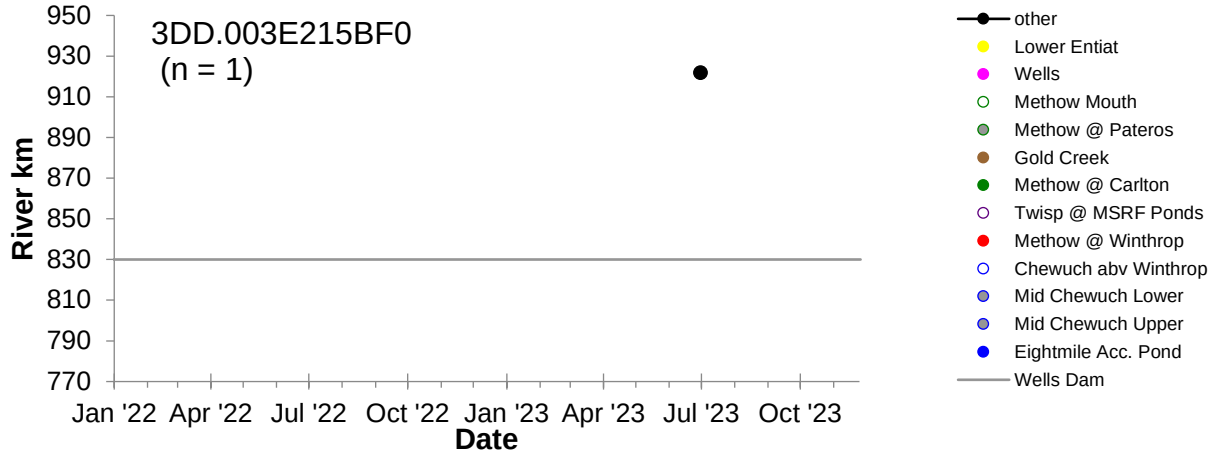

3DD.003E215F68
(n = 2)
River km
950
930
910
890
870
850
830
810
790
770
Jan '22
Apr '22
Jul '22
Oct '22
Jan '23
Apr '23
Jul '23
Oct '23
Date
other
Lower Entiat
Wells
Methow Mouth
Methow @ Pateros
Gold Creek
Methow @ Carlton
Twisp @ MSRF Ponds
Methow @ Winthrop
Chewuch abv Winthrop
Mid Chewuch Lower
Mid Chewuch Upper
Eightmile Acc. Pond
Wells Dam

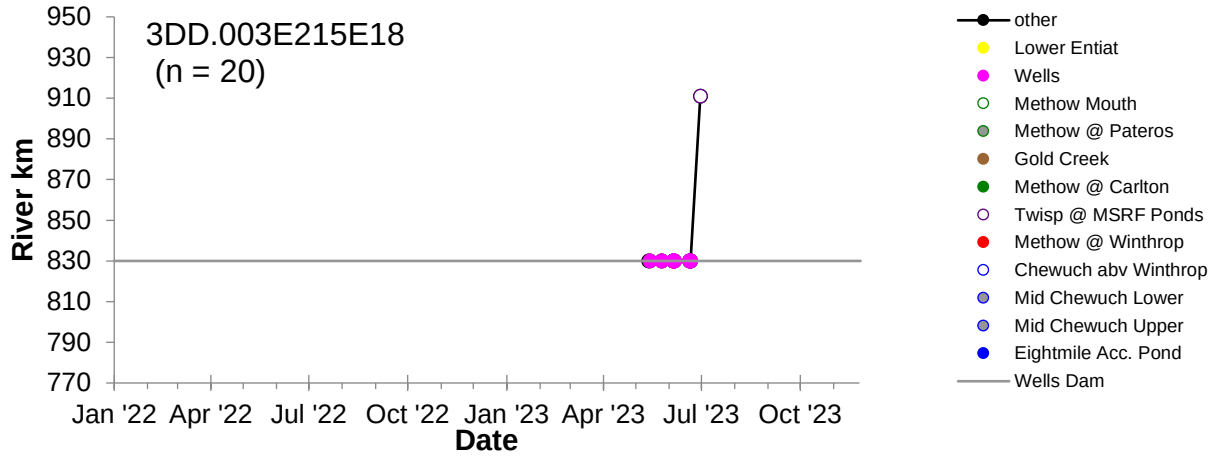

3DD.003BDCBC4A
(n = 6)
River km
950
930
910
890
870
850
830
810
790
770
Jan '22
Apr '22
Jul '22
Oct '22
Jan '23
Apr '23
Jul '23
Oct '23
Date
other
Lower Entiat
Wells
Methow Mouth
Methow @ Pateros
Gold Creek
Methow @ Carlton
Twisp @ MSRF Ponds
Methow @ Winthrop
Chewuch abv Winthrop
Mid Chewuch Lower
Mid Chewuch Upper
Eightmile Acc. Pond
Wells Dam

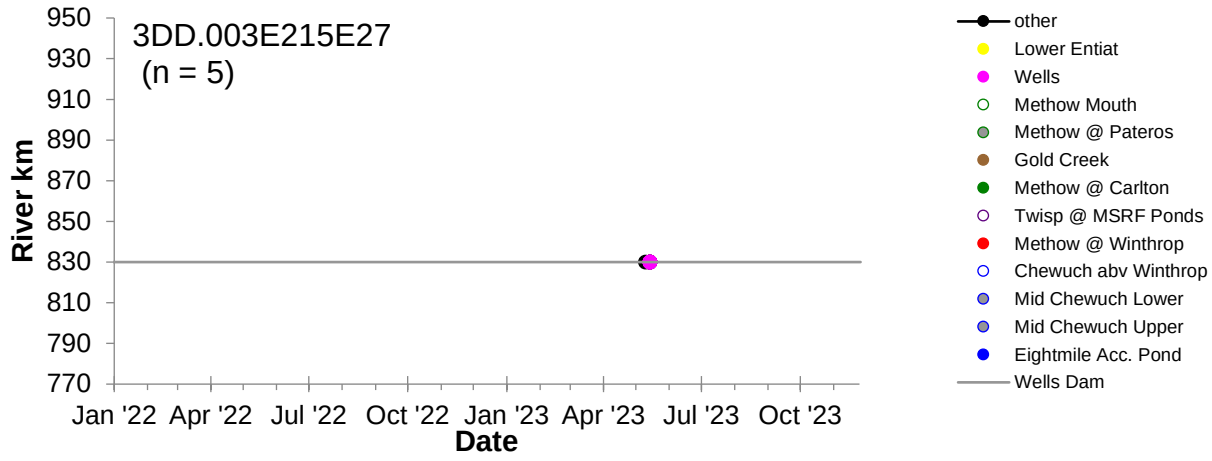

3DD.003E215BBD
(n = 1)
River km
950
930
910
890
870
850
830
810
790
770
Jan '22
Apr '22
Jul '22
Oct '22
Jan '23
Apr '23
Jul '23
Oct '23
Date
other
Lower Entiat
Wells
Methow Mouth
Methow @ Pateros
Gold Creek
Methow @ Carlton
Twisp @ MSRF Ponds
Methow @ Winthrop
Chewuch abv Winthrop
Mid Chewuch Lower
Mid Chewuch Upper
Eightmile Acc. Pond
Wells Dam

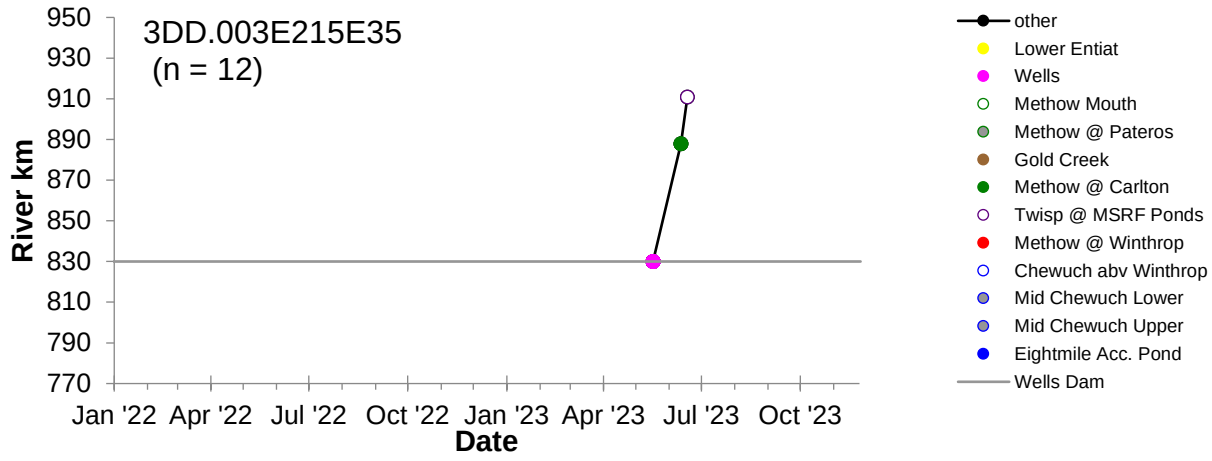

3DD.003E215BD2
(n = 1)
River km
950
930
910
890
870
850
830
810
790
770
Jan '22
Apr '22
Jul '22
Oct '22
Jan '23
Apr '23
Jul '23
Oct '23
Date
other
Lower Entiat
Wells
Methow Mouth
Methow @ Pateros
Gold Creek
Methow @ Carlton
Twisp @ MSRF Ponds
Methow @ Winthrop
Chewuch abv Winthrop
Mid Chewuch Lower
Mid Chewuch Upper
Eightmile Acc. Pond
Wells Dam

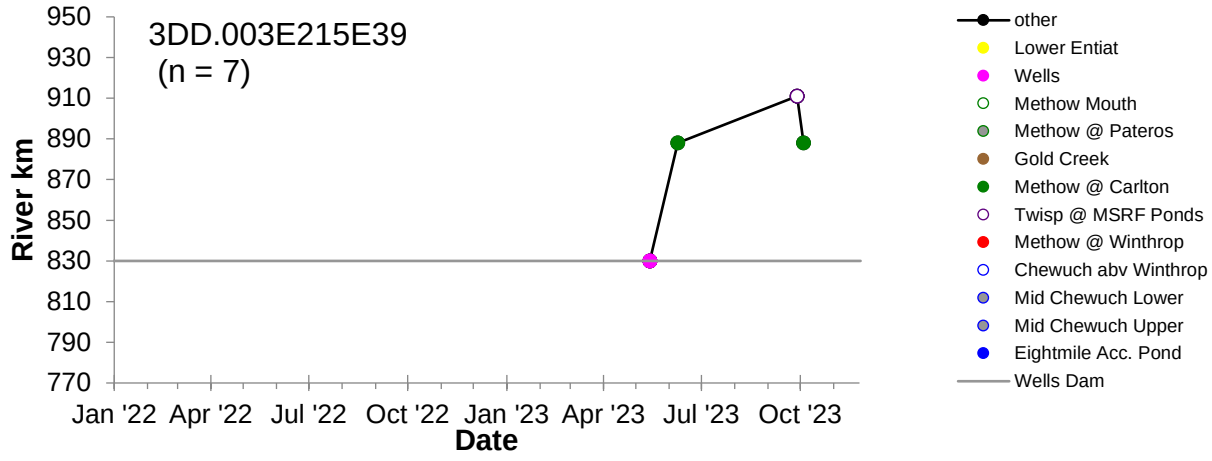

3DD.003E215BD6
(n = 2)
River km
950
930
910
890
870
850
830
810
790
770
Jan '22
Apr '22
Jul '22
Oct '22
Jan '23
Apr '23
Jul '23
Oct '23
Date
other
Lower Entiat
Wells
Methow Mouth
Methow @ Pateros
Gold Creek
Methow @ Carlton
Twisp @ MSRF Ponds
Methow @ Winthrop
Chewuch abv Winthrop
Mid Chewuch Lower
Mid Chewuch Upper
Eightmile Acc. Pond
Wells Dam

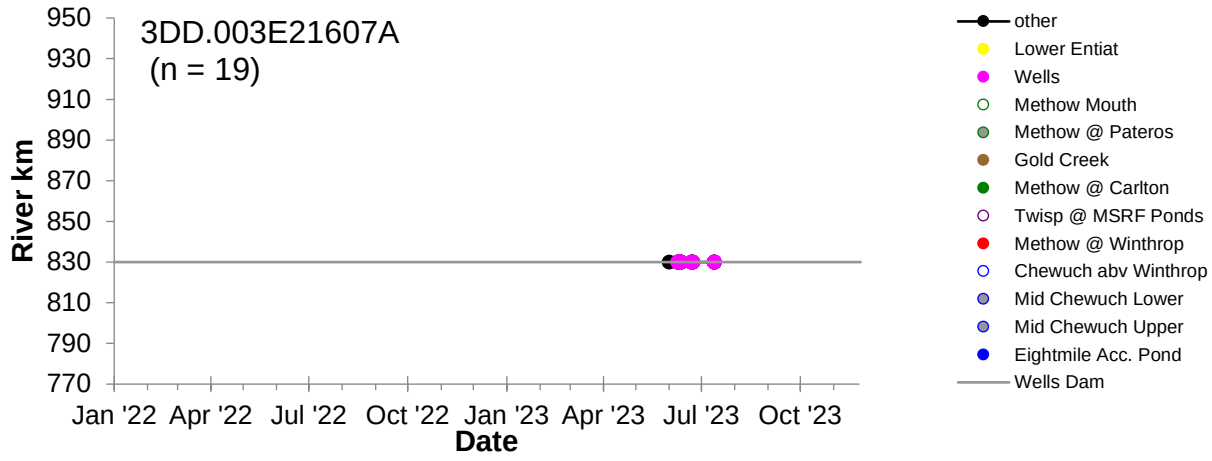

3DD.003E215BF0
(n = 1)
River km
950
930
910
890
870
850
830
810
790
770
Jan '22
Apr '22
Jul '22
Oct '22
Jan '23
Apr '23
Jul '23
Oct '23
Date
other
Lower Entiat
Wells
Methow Mouth
Methow @ Pateros
Gold Creek
Methow @ Carlton
Twisp @ MSRF Ponds
Methow @ Winthrop
Chewuch abv Winthrop
Mid Chewuch Lower
Mid Chewuch Upper
Eightmile Acc. Pond
Wells Dam

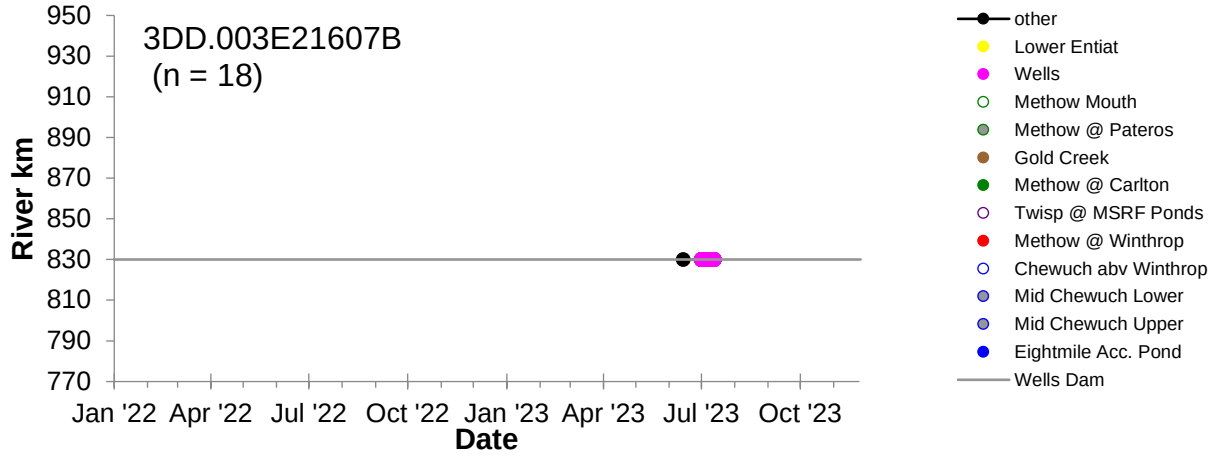

3DD.003E215E18
(n = 20)
River km
950
930
910
890
870
850
830
810
790
770
Jan '22
Apr '22
Jul '22
Oct '22
Jan '23
Apr '23
Jul '23
Oct '23
Date
other
Lower Entiat
Wells
Methow Mouth
Methow @ Pateros
Gold Creek
Methow @ Carlton
Twisp @ MSRF Ponds
Methow @ Winthrop
Chewuch abv Winthrop
Mid Chewuch Lower
Mid Chewuch Upper
Eightmile Acc. Pond
Wells Dam

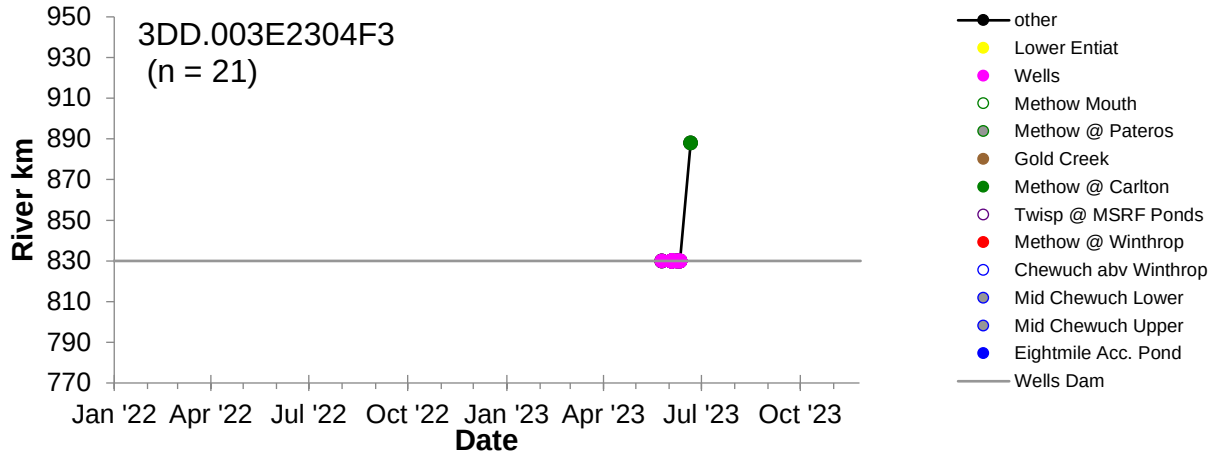

3DD.003E215E27
(n = 5)
River km
950
930
910
890
870
850
830
810
790
770
Jan '22
Apr '22
Jul '22
Oct '22
Jan '23
Apr '23
Jul '23
Oct '23
Date
other
Lower Entiat
Wells
Methow Mouth
Methow @ Pateros
Gold Creek
Methow @ Carlton
Twisp @ MSRF Ponds
Methow @ Winthrop
Chewuch abv Winthrop
Mid Chewuch Lower
Mid Chewuch Upper
Eightmile Acc. Pond
Wells Dam


3DD.003E215E35
(n = 12)
River km
950
930
910
890
870
850
830
810
790
770
Jan '22
Apr '22
Jul '22
Oct '22
Jan '23
Apr '23
Jul '23
Oct '23
Date
other
Lower Entiat
Wells
Methow Mouth
Methow @ Pateros
Gold Creek
Methow @ Carlton
Twisp @ MSRF Ponds
Methow @ Winthrop
Chewuch abv Winthrop
Mid Chewuch Lower
Mid Chewuch Upper
Eightmile Acc. Pond
Wells Dam


3DD.003E215E39
(n = 7)
River km
950
930
910
890
870
850
830
810
790
770
Jan '22
Apr '22
Jul '22
Oct '22
Jan '23
Apr '23
Jul '23
Oct '23
Date
other
Lower Entiat
Wells
Methow Mouth
Methow @ Pateros
Gold Creek
Methow @ Carlton
Twisp @ MSRF Ponds
Methow @ Winthrop
Chewuch abv Winthrop
Mid Chewuch Lower
Mid Chewuch Upper
Eightmile Acc. Pond
Wells Dam


3DD.003E21607A
(n = 19)
River km
950
930
910
890
870
850
830
810
790
770
Jan '22
Apr '22
Jul '22
Oct '22
Jan '23
Apr '23
Jul '23
Oct '23
Date
other
Lower Entiat
Wells
Methow Mouth
Methow @ Pateros
Gold Creek
Methow @ Carlton
Twisp @ MSRF Ponds
Methow @ Winthrop
Chewuch abv Winthrop
Mid Chewuch Lower
Mid Chewuch Upper
Eightmile Acc. Pond
Wells Dam


3DD.003E21607B
(n = 18)
River km
950
930
910
890
870
850
830
810
790
770
Jan '22
Apr '22
Jul '22
Oct '22
Jan '23
Apr '23
Jul '23
Oct '23
Date
other
Lower Entiat
Wells
Methow Mouth
Methow @ Pateros
Gold Creek
Methow @ Carlton
Twisp @ MSRF Ponds
Methow @ Winthrop
Chewuch abv Winthrop
Mid Chewuch Lower
Mid Chewuch Upper
Eightmile Acc. Pond
Wells Dam


3DD.003E2304F3
(n = 21)
River km
950
930
910
890
870
850
830
810
790
770
Jan '22
Apr '22
Jul '22
Oct '22
Jan '23
Apr '23
Jul '23
Oct '23
Date
other
Lower Entiat
Wells
Methow Mouth
Methow @ Pateros
Gold Creek
Methow @ Carlton
Twisp @ MSRF Ponds
Methow @ Winthrop
Chewuch abv Winthrop
Mid Chewuch Lower
Mid Chewuch Upper
Eightmile Acc. Pond
Wells Dam

APPENDIX C

GENETIC ANALYSIS FOR BULL TROUT PREPARED BY WASHINGTON DEPARTMENT OF FISH AND WILDLIFE DATED JUNE 2023

Genetic Assignment for Bull Trout Collected throughout the Methow Basin

Amelia Louden[1], Pushpa Sharma Koirala[1], Lorne Curran[1], Chas Kyger[2]

[1]Washington Department of Fish and Wildlife
[2]Douglas County PUD

Draft, June 2023

Introduction

Bull trout, *Salvelinus confluentus*, are a native and highly migratory species of trout inhabiting cold water tributaries including three sub-basins in the Upper Columbia River: the Wenatchee River, the Entiat River, and the Methow River (DeHaan and Neibauer 2012). Over the past century, bull trout populations have declined, and the species is currently listed as threatened in the contiguous United States (U.S. Fish and Wildlife Service [USFWS] 1999). Bull trout in the Wenatchee, Entiat, and Methow Rivers are managed within one critical habitat unit each as their own core area (USFWS 2010). There are 19 recognized local populations within the critical habitat unit with populations broadly distributed within the three core areas: seven in the Wenatchee River (Peshastin Creek, Icicle Creek, Chiwaukum Creek, Nason Creek, Chiwawa River, Little Wenatchee River, White River), two in the Entiat River (Entiat River, Mad River), and ten in the Methow River (Gold Creek, Beaver Creek, Wolf Creek, Goat Creek, Early Winters Creek, Lake Creek, Twisp River, Chewuch River, Lost River, West Fork Methow River) (Figure 1). Bull trout from these populations exhibit three life history types: residents that live out their life in their natal tributary, fluvials that migrate to larger tributaries for feeding and maturation, and adfluvials that migrate to lakes (or reservoirs) for feeding and maturation, then return to natal tributaries to spawn. Telemetry and tagging studies describe movement of bull trout between the three sub-basins and the mainstem Columbia River (DCPUD 2008, Nelson et al. 2009, Nelson and Johnson 2012). Genetic population assignments are an additional tool that can be useful for inferring the movement patterns of bull trout. In this study, we assigned the population of origin for migratory bull trout collected in the Methow River and at Wells Dam in 2022 and 2023. Genetic assignments were made using a representative baseline of the 19

recognized local populations within the Upper Columbia Critical Unit (provided by Abernathy Fish Technology Center, USFWS).

Methods

Adult bull trout samples were collected in 2022 and 2023 by staff from Douglas County PUD, Washington Department of Fish and Wildlife (WDFW) and U.S. Fish and Wildlife Service (USFWS). For every adult bull trout sampled, a pit tag was inserted, length data, date and release location were collected (Table 1). DNA was extracted for the 29 tissue samples using Machery-Nagel spin columns, following manufacturer recommendations. Samples were genotyped using a 201 SNP GTseq panel (Bohling et al. 2021) and GT-seq protocol (Campbell et al. 2015). Briefly, the target SNPs were pooled and amplified with unique identifiers, sequenced, and demultiplexed by individual and locus using perl and R scripts. We performed a series of quality control checks on individuals and loci. Four to eight samples from each set of 96 samples were re-genotyped to confirm genotype identity and quality. In addition, we checked for duplicate genotypes using part of the GTseq pipeline and with the package *rubias* (Moran and Anderson 2018). Samples were reduced to the subset of 186 loci that overlapped with the baseline dataset. Samples were excluded from further analysis if they had more than 30% missing data across the dataset. Loci used for species identification were evaluated and removed for the population assignment analysis. Samples that were identified as hybrid or species other than bull trout using the species identification loci were removed from further analysis.

We used a bull trout baseline consisting of the 19 recognized local populations within the Upper Columbia Critical Unit genotyped at the GTseq SNP panel (provided by Abernathy Fish Technology Center, USFWS; Figure 1 and Table 2). We first assessed the resolving power of the baseline using the R package rubias (Moran and Anderson 2019). Previous work examining bull trout collected in the Methow River used a microsatellite baseline (Small et al. 2017) and although the same collections were used, it was important to evaluate how well the SNP baseline could distinguish among populations. Power was assessed using a leave-one-out procedure where individuals are removed from the baseline reference population and then assigned to their inferred population using the reference baseline. We required an 80% posterior assignment

probability to consider an individual assigned to a population. Any individual with a posterior probability less than 80% was considered "unassigned".

Bull trout samples collected in the Methow River and at Wells Dam (Table 1) were then assigned to the most likely source population using the baseline (Figure 1, Table 2). Assignments were conducted using Bayesian inferences from the conditional genetic stock identification model in the R package Rubias (Moran and Anderson 2018). We required an 80% posterior assignment probability to consider an individual assigned to a population. Any individual with a posterior probability less than 80% was considered "unassigned". Assignment testing assumes that all possible source populations are in the baseline dataset, an assumption that may not be met. To assess the likelihood of the actual source population being absent from the baseline dataset, we conducted an exclusion test by comparing the distribution of assignment *z*-scores of sampled bull trout samples against a distribution of simulated normal random variables (Moran and Anderson 2018). A *z*-score outside of the normal distribution would be an indication that the true source population is not in the baseline dataset.

Results

Out of the initial 29 samples genotyped, zero samples were excluded from assignment testing because of poor amplification and there were no duplicate samples detected (Appendix 1). One sample (23FL0020) had genotypes consistent with a hybridized bull trout/brook trout at 5 of the 8 species identification loci. The sample did not amplify at two of the other three loci used for species identification and was consistent with a bull trout genotype at the third. This sample was not included in population assignment analysis.

Overall, self-assignment accuracy of the Upper Columbia basin bull trout baseline was high for the majority of populations. All but three populations had an assignment accuracy of 91% or greater (Figure 2). There were ten individuals from across reference populations that were below the 80% posterior probability and considered unassigned, but this ranged from 1 to 10% of each populations total number of individuals (Figures 2 and 3). When incorrect assignments occurred, they were to nearby populations within the same sub-basin (Figure 2). Icicle Creek had a lower assignment power of 82% and the majority of incorrect individual assignments were to Ingalls

and Etienne Creek. Ingalls Creek had a low assignment power of 59% and Ingalls Creek individuals most often incorrectly assigned to Icicle Creek (40%). This suggests that with the current baseline, the assignment accuracy for bull trout from Ingalls Creek is low though assignment to the Wenatchee sub-basin as a whole has high accuracy. The assignment accuracy of the Beaver Creek population was also low (56%) and most incorrect assignments were made to the Twisp River population (25%, Figure 2). This may be correlated to the low number of samples included in the Beaver Creek reference baseline population relative to other populations (Figure 3). However, with the current baseline, it is important to note that the power to accurately assign unknown bull trout to Beaver Creek is low and may produce incorrect assignments to the Twisp River population.

Of the 28 samples included in the assignment analysis, four samples did not meet the 80% posterior probability assignment threshold and were considered unassigned (Appendix 1). For the 24 samples that were above the 80% assignment threshold, bull trout assigned to the Twisp River the most followed by the West Fork Methow River (Table 3 and Figure 4). Bull trout collected in the Methow River assigned to Twisp River, West Fork Methow River, Early Winters Creek, Lake Creek, and the Chewuch River reference populations (Table 3 and Figure 4). Bull trout collected at Wells Dam all assigned to Twisp River, apart from one sample that assigned to Early Winters Creek (Table 3 and Figure 4). Results from the exclusion test indicated no sign of a missing source population in the reference baseline dataset (data not shown). Overall, these results suggest strong assignment accuracy between each of the three sub-basins and the majority of populations across the three sub-basins. Bull trout collected in the Methow River and at Wells Dam all assigned to populations within the Methow sub-basin. Assignments to the Twisp River reference baseline population may be inflated by incorrect assignments of Beaver Creek bull trout. In the future, the resolving power of the reference baseline may be improved with a larger sample size for the Beaver Creek reference population.

Acknowledgements

Samples were collected by Douglas County PUD, WDFW, and USFWS staff. This project was funded by Douglas County PUD. Todd Kassler administered the contract for the Molecular Genetics Lab.

References

Bohling J, Von Bargen J, Piteo M, Louden A, Small M, Delamos T, Kovach R. 2021. Developing a standardized single nucleotide polymorphism panel for rangewide genetic monitoring of bull trout. NAJFM 4: 1920-1931.

Campbell NR, Harmon SA, Narum SR. 2015. Genotyping-in-Thousands by sequencing (GT-seq): A cost effective SNP genotyping method based on custom amplicon sequencing. Mol Ecol Resour 15: 855-867.

DeHaan PW, Adams B, Nelson MC. 2014. Fine-scale population structure analysis and genetic population assignments of Wenatchee River sub-basin bull trout. U.S. Fish and Wildlife Service, Longview, WA.

DeHaan PW, Neibauer J. 2012. Analysis of genetic variation within and among upper Columbia River bull trout populations. U.S. Fish and Wildlife Service, Longview, WA.

Douglas County Public Utility District. 2008. Bull trout management plan wells hydroelectric project. FERC Project No. 2149.

Nelson, M. C. and A. Johnsen. 2012. Migration patterns of adult fluvial bull trout in the Methow and Columbia Rivers during 2007. U.S. Fish and Wildlife Service, Leavenworth, WA.

Nelson MC, Johnsen A, Nelle RD. 2009. Seasonal movements of adult fluvial bull trout and redd surveys in Icicle Creek, 2009 annual report. U.S. Fish and Wildlife Service, Leavenworth, WA.

Moran BM, Anderson EC. 2018. Bayesian inference from the conditional genetic stock identification model. CJFAS 76(4):551-560.

USFWS. 1999. Endangered and threatened wildlife and plants; determination of threatened status for bull trout in the coterminous United States. Federal Register 64:(1November1999):58910-58933.

USFWS. 2010. Revised designation of critical habitat for bull trout in the coterminous Unites States, Final Rule. Federal Register 75: (18 October2010):63898-64070.

Map ID	Population
1	Peshastin Creek
2	Icicle Creek
3	Chiwaukum Creek
4	Nason Creek
5	White River
6	Chiwawa River
7	Entiat River
8	Mad River
9	Gold Creek
10	Twisp River
11	Wolf Creek
12	Early Winters Creek
13	WF methow River
14	Chewuch River
15	Goat Creek
16	Lost River
17	Lake Creek
18	Beaver Creek

Figure 1. Map of the Upper Columbia River basin showing the locations of the bull trout baseline samples. Note that Peshastin Creek represents Ingalls and Etienne Creek baseline populations.

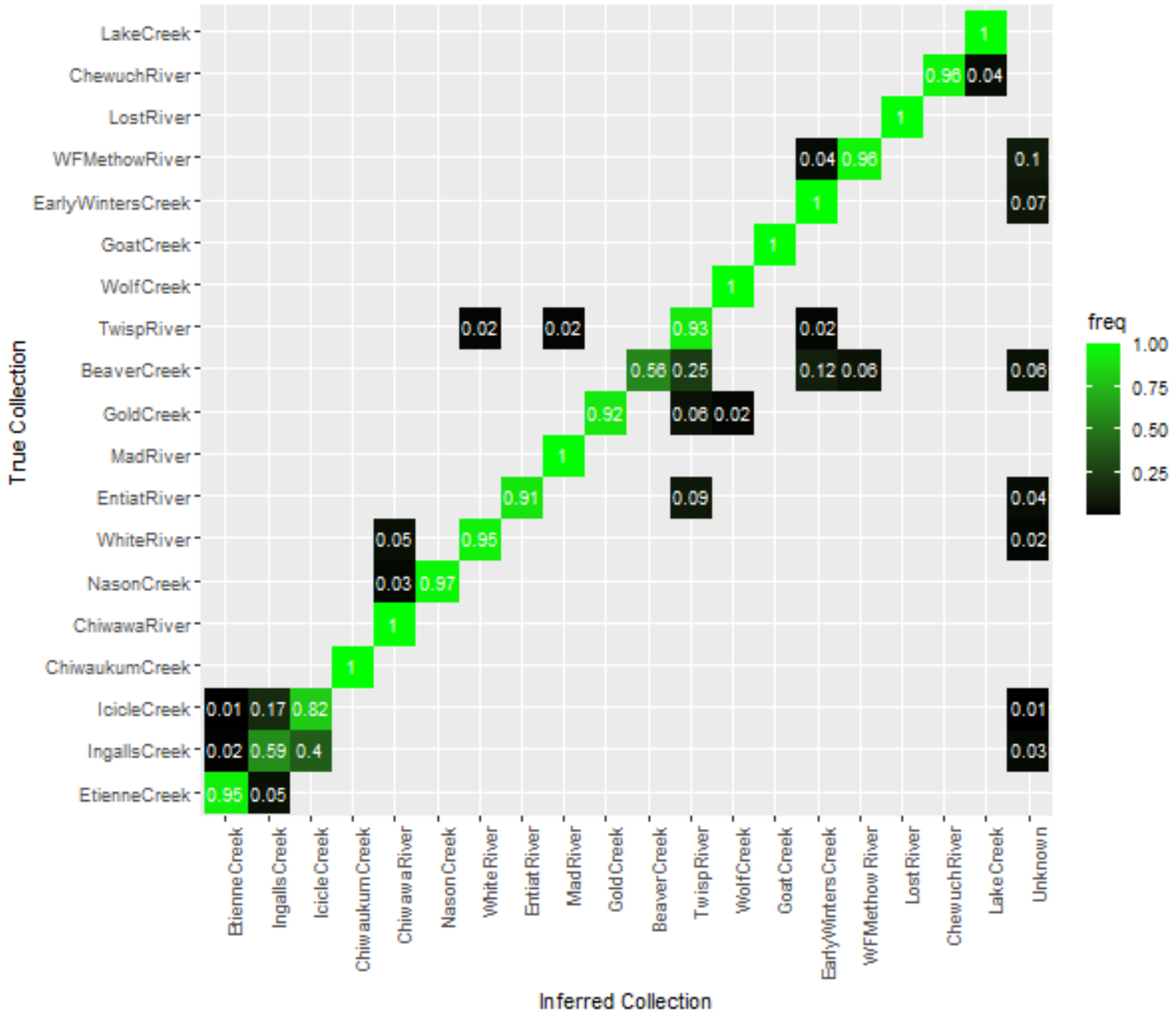


Figure 2. Reporting group assignment results from the leave-one-out assessment of Upper Columbia Basin bull trout baseline. True reporting groups are rows while inferred reporting groups are columns. The proportion of samples from a given reporting group assigned to a reporting group are in the cells, color coded from black (0) to green (1). The unknown inferred collection group are those samples that did not meet the 80% assignment probability threshold.

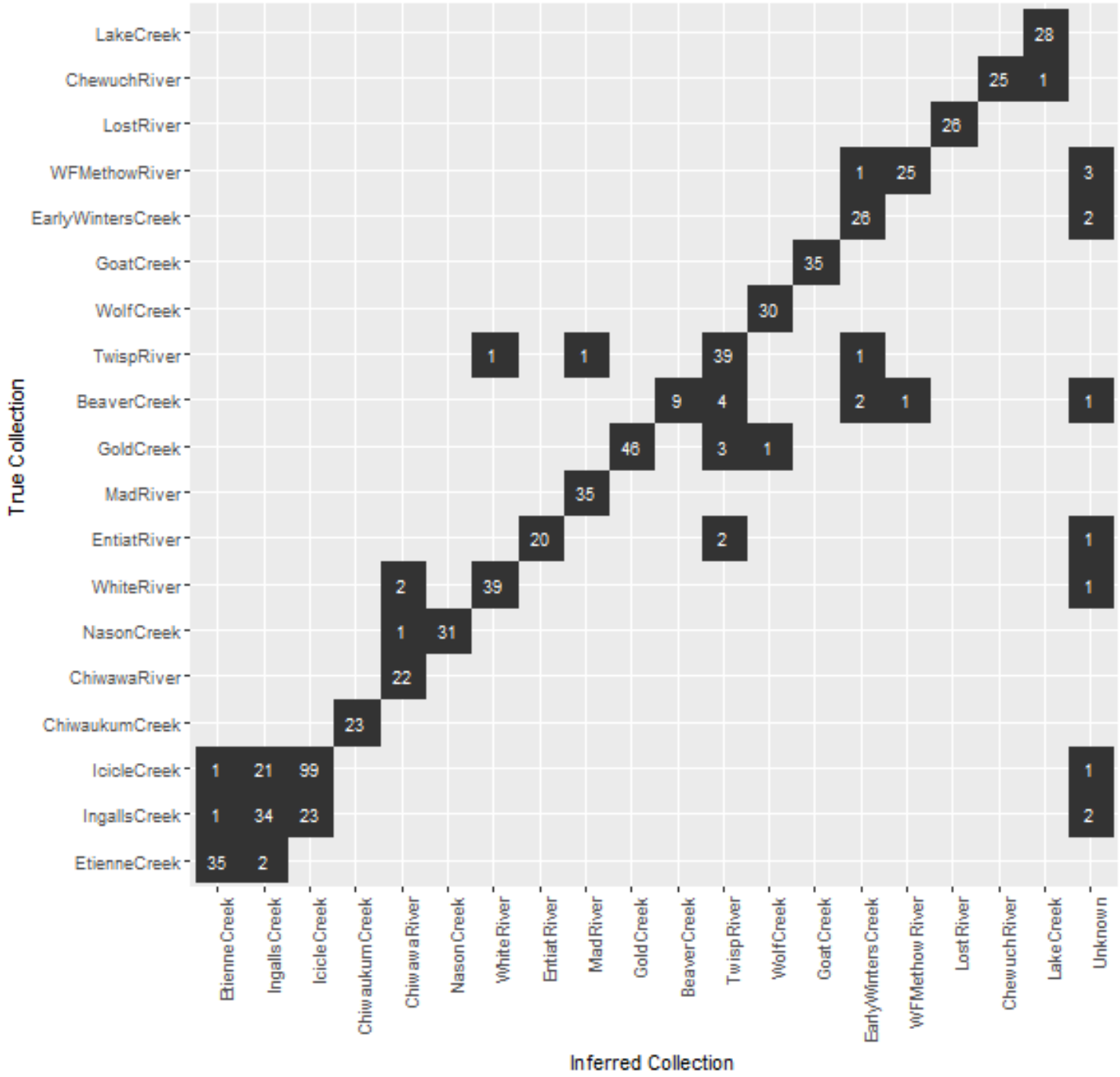


Figure 3. Reporting group assignment results from the leave-one-out assessment of Upper Columbia Basin bull trout baseline. True reporting groups are rows while inferred reporting groups are columns. The count of samples from a true reporting group assigned to an inferred reporting group are in the cells. The unknown inferred collection group are those samples that did not meet the 80% assignment probability threshold.

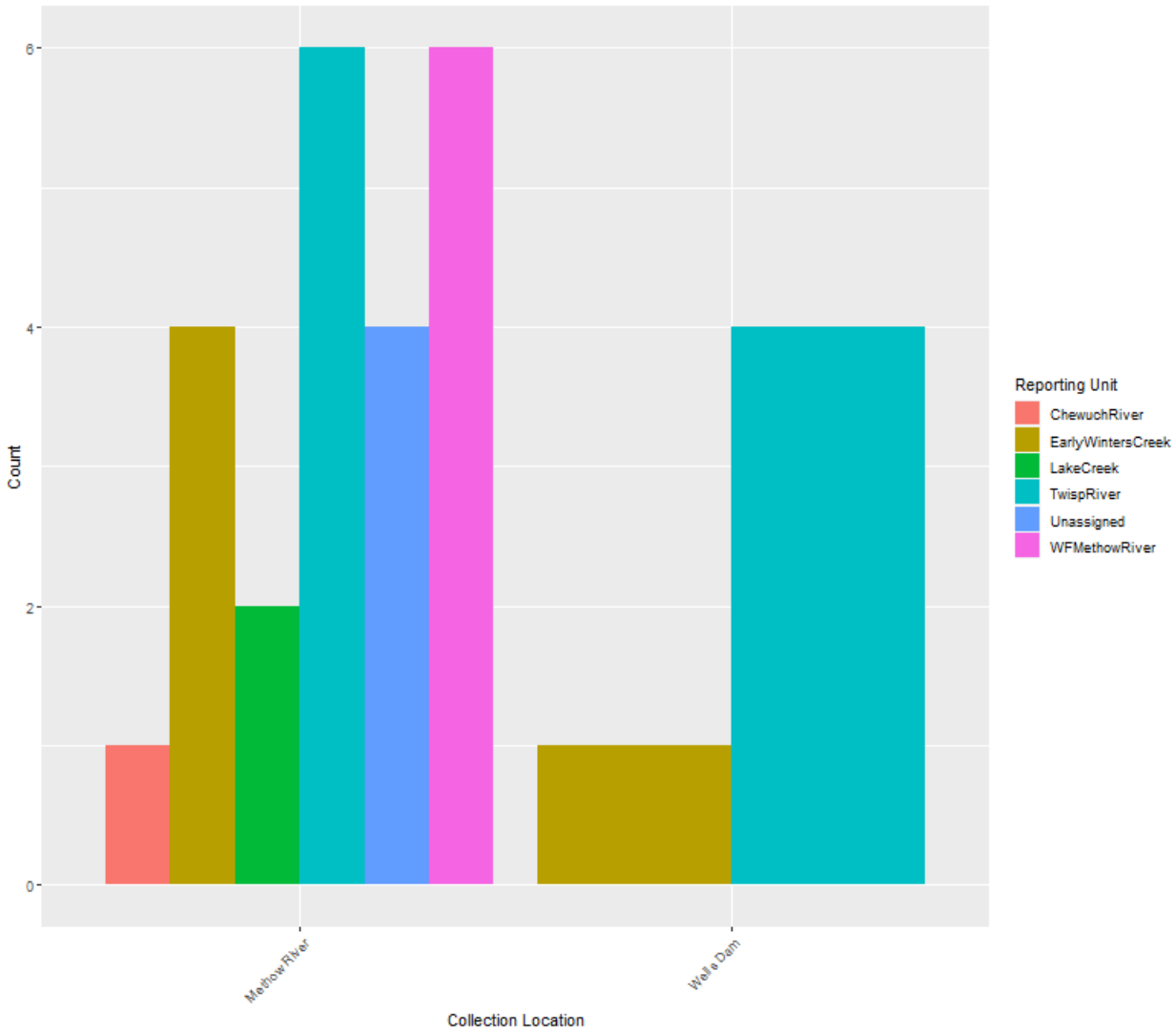


Figure 4. Plot of the number of genetically assinged (posterior probabilities) migrant bull trout from each collectin location.

Table 1. Number and collection location of bull trout genetically assigned for each collection code.

Collection Code	Number Samples	Collection Location
23FL	21	Methow River
22FR	3	Methow River
22FR	5	Wells Dam
Total	29	

Table 2. Collections in the Upper Columbia River basin genetic baseline.

Population	Sub-basin
EntiatRiver	Entiat
MadRiver	Entiat
BeaverCreek	Methow
ChewuchRiver	Methow
EarlyWintersCreek	Methow
GoatCreek	Methow
GoldCreek	Methow
LakeCreek	Methow
LostRiver	Methow
TwispRiver	Methow
WFMethowRiver	Methow
WolfCreek	Methow
ChiwaukumCreek	Wenatchee
ChiwawaRiver	Wenatchee
EtienneCreek	Wenatchee
IcicleCreek	Wenatchee
IngallsCreek	Wenatchee
NasonCreek	Wenatchee
WhiteRiver	Wenatchee

Table 3. Count of the genetically assinged (posterior probabilities) migrant bull trout from each collectin location.

	Wenatchee River Sub-basin						Entiat River Sub-basin		Methow River Sub-basin						
Collection Location	IngallsCreek	IcicleCreek	NasonCreek	ChiwaukumCreek	WhiteRiver	ChiwawaRiver	MadRiver	EntiatRiver	ChewuchRiver	EarlyWintersCreek	LakeCreek	TwispRiver	WFMethowRiver	Unassigned	Total
Methow River									1	4	2	6	6	4	23
Wells Dam										1		4			5
Total									1	5	2	10	6	4	28

Appendix K
2023 Annual Report Total Dissolved Gas Abatement Plan

From:	eFiling@ferc.gov
To:	Amber Nealy; efilingacceptance@ferc.gov
Subject:	FERC Acceptance for Filing in P-2149-156
Date:	Thursday, February 22, 2024 12:35:39 PM

Acceptance for Filing

The FERC Office of the Secretary has accepted the following electronic submission for filing (Acceptance for filing does not constitute approval of any application or self-certifying notice):

-Accession No.: 202402225125
-Docket(s) No.: P-2149-156
-Filed By: Public Utility District No. 1 of Douglas County, Washington
-Signed By: Amber Nealy
-Filing Type: Environmental and Recreational Compliance Report
-Filing Desc: Public Utility District No. 1 of Douglas County, Washington submits 2023 Annual Total Dissolved Gas Abatement Plan Report for the Wells Hydroelectric Project under P-2149.
-Submission Date/Time: 2/22/2024 2:17:52 PM
-Filed Date: 2/22/2024 2:17:52 PM

Your submission is now part of the record for the above Docket(s) and available in FERC's eLibrary system at:

https://elibrary.ferc.gov/eLibrary/docinfo?accession_num=20240222-5125

If you would like to receive e-mail notification when additional documents are added to the above docket(s), you can eSubscribe by docket at:

https://ferconline.ferc.gov/eSubscription.aspx

Thank you again for using the FERC Electronic Filing System. If you need to contact us for any reason:

E-Mail: ferconlinesupport@ferc.gov mailto:ferconlinesupport@ferc.gov (do not send filings to this address)
Voice Mail: 866-208-3676.

Commissioners:
RONALD E. SKAGEN
MOLLY SIMPSON
AARON J. VIEBROCK

General Manager:
GARY R. IVORY

Public Utility District No. 1 of Douglas County

1151 Valley Mall Parkway · East Wenatchee, Washington 98802-4497 · 509/884-7191 · FAX 509/884-0553 · www.douglaspud.org

Via Electronic Filing

Honorable Kimberly D. Bose
Secretary
Federal Energy Regulatory Commission
888 1st Street N.E.
Washington, D.C. 20426

February 22, 2024

Subject: 2023 Annual Report - Total Dissolved Gas Abatement Plan
Wells Hydroelectric Project – FERC License Article 401 (b)

Dear Secretary Bose:

Pursuant to Article 401(b) of the Federal Energy Regulatory Commission (FERC) license for the Wells Hydroelectric Project (Wells Project), the Public Utility District No. 1 of Douglas County (Douglas PUD) hereby submits the final Total Dissolved Gas Abatement Plan Annual Report (TDG Report) for calendar year 2023. Article 401(b) requires Douglas PUD to file an annual TDG Report with the FERC by February 28th during each year of the license.

The final 2023 TDG Report is attached as Appendix A to this letter. A draft version of this 2023 TDG report was distributed on January 9, 2024 to the Washington State Department of Ecology (Ecology) and all of the other parties to the Aquatic Settlement Agreement (ASA) including the United States Fish and Wildlife Service (USFWS), Washington State Department of Fish and Wildlife (WDFW), the Confederated Tribes of the Colville Reservation (CTCR) and the Confederated Tribes and the Bands of the Yakama Nation (Yakama Nation). No comments were received during the 30 day comment period. Following review, all parties present during the February 14, 2024 Aquatic Settlement Work Group (Aquatic SWG) meeting approved the 2023 TDG Report. The CTCR approved the 2023 TDG Report on February 14, 2024 by email, having missed the February 14, 2024 conference call. The pre-filing consultation record supporting the review and approval of the 2023 TDG Report can be found in Appendix B.

The enclosed 2023 TDG Report is consistent with (1) the Water Quality Management Plan that is contained within the ASA, (2) Condition 6.7(2)(c)(iii) of Ecology's Clean Water Act Section 401 Water Quality Certification (401 Certification), and (3) the National Marine Fisheries Service Endangered Species Act Incidental Take Statement (ITS) Reasonable and Prudent Measure No. 2 for the Wells Project.

If you have any questions or require further information regarding the enclosed report, please feel free to contact me at (509) 881-2323, andrewg@dcpud.org or Mariah Mayfield at (509) 881-2326, mariah.mayfield@dcpud.org.

Sincerely,

Andrew Gingerich
Natural Resources Supervisor

Appendix A – 2023 Annual Report - Total Dissolved Gas Abatement Plan - Wells Hydroelectric Project

Appendix B – Pre-filing Consultation Record for the 2023 Annual Report – Total Dissolved Gas Abatement Plan - Wells Hydroelectric Project

Cc: Breean Zimmerman – Ecology, Union Gap
Chad Brown – Ecology, Lacey
Scott Carlon – NMFS, Portland
Wells Aquatic Settlement Work Group
Mariah Mayfield – Douglas PUD
Shane Bickford – Douglas PUD

APPENDIX A

2023 ANNUAL REPORT TOTAL DISSOLVED GAS ABATEMENT PLAN FOR THE WELLS HYDROELECTRIC PROJECT

2023 Annual Report
Total Dissolved Gas Abatement Plan

Wells Hydroelectric Project

Public Utility District No. 1 of Douglas County
1151 Valley Mall Parkway
East Wenatchee, WA 98802-4331

Prepared for:

Washington Department of Ecology
1250 Alder St, Union Gap, WA 98903

And

Aquatic Settlement Work Group

February 2024

© Copyright 2024. Public Utility District No. 1 of Douglas County. All Rights Reserved.

TABLE OF CONTENTS

1 INTRODUCTION 1

1.1 Project Description 1

1.2 Fixed Monitoring Site Locations 1

1.3 Regulatory Framework 2

1.4 Gas Abatement Plan Approach 4

1.4.1 Structural 4

1.4.2 Consultation 4

2 OPERATIONS 5

2.1 Description of Fish-Passage Season Flow 5

2.2 Fish Bypass Program 7

2.3 Fish Bypass Spill Quantities and Duration 7

3 IMPLEMENTATION RESULTS 9

3.1 Fisheries Management 9

3.1.1 Fish Passage Efficiencies 9

3.1.1 Survival Studies 9

3.1.2 Run-Timing Evaluation 9

3.2 Biological Monitoring 10

3.3 Water Quality Forums 12

3.4 Physical Monitoring 12

3.4.1 Overview 12

3.4.2 Data Evaluation and Analyses 13

3.5 TDG Compliance 13

3.5.1 Non-Fish Passage Season Compliance (Wells Tailrace 110%) 13

3.5.2 Spring Fish Passage Season (April through June) Compliance 15

3.5.3 Summer Fish Passage Season (July and August) Compliance 17

4 DISCUSSION OF GAS ABATEMENT MEASURES 22

4.1 Water Quality Attainment Plan Activities 22

4.2 Operational 22
4.2.1 Structural 23
5 CONCLUSIONS 23
6 REFERENCES 24

LIST OF FIGURES

Figure 1. TDG and temperature fixed monitoring stations above and below Wells Dam. 2

Figure 2. 2023 daily discharge and daily spill, compared to 10-year mean daily discharge. Dark red reference line indicates the 7Q-10 values of 246 kcfs. 6

Figure 3. Methow River hydrograph in spring and summer of 2023. The rapid increase in flows above 9 ft in early May facilitated a Methow River flush opportunity (waterdata.us.gov). 7

Figure 4. Hourly TDG data for the Wells Tailrace during the non-fish bypass season in 2023. Values colored red and appearing above the reference line represent exceedances of the standard. 14

Figure 5. Mean highest 12-hour TDG measures in the Wells Tailrace from April through June 2023. Reference line indicates the compliance standard of 125%. 15

Figure 6. Two-hour consecutive average TDG values for the Wells Tailrace, April through June 2023. Reference line indicates the compliance level of 126%. 16

Figure 7. Mean highest 2-hour TDG measures in the Wells tailrace from July to August 2023. Reference line indicates the compliance standard of 125%. 17

Figure 8. Mean highest 12-hour TDG measures in the Wells Tailrace from July to August 2023. Reference line indicates the compliance standard of 120%. 18

Figure 9. Mean highest 12-hour TDG measures in the Rocky Reach Forebay from July to August 2023. Reference line indicates the compliance standard of 115%. 19

Figure 10. Wells Forebay TDG from January to October 2023. The reference line at 110% represents the EPA and Tribal Waters compliance threshold. 20

LIST OF TABLES

Table 1. Monthly average river discharge (kcfs) from the Wells Project, 1969-2023. New historic (since 1969) minimum values were set in September and October of 2023 (bolded values). 5

Table 2. Summary of fish sampled at the Rocky Reach Juvenile Bypass System for GBT in 2023. None of the fish examined had signs of GBT. 10

Table 3. Summary of fish collected for GBT examination via electrofishing in the Wells Tailrace, 2023. None of the fish examined had signs of GBT. 11

Table 4 TDG compliance at the Wells Project for the entire 2023 season. 21

1 INTRODUCTION

The 2023 Wells Hydroelectric Project (Wells Project) Gas Abatement Plan (GAP) was approved by the Washington State Department of Ecology (Ecology) via conference call on February 8, 2023 and subsequently submitted to the Federal Energy Regulatory Commission (FERC) on February 16, 2023. The FERC approved the GAP on May 23, 2023. The GAP and its associated measures represent a long-term strategy to achieve compliance with the Washington State Water Quality Standard (WQS) criteria for total dissolved gas (TDG) downstream of the Wells Project while continuing to provide safe passage for downstream migrating juvenile salmonids. This annual report summarizes the results from the 2023 monitoring season and describes the background, operations, and results of GAP implementation at the Wells Project in 2023. In addition, this report contains TDG performance for the Wells Project during the 2023 fish passage season, and TDG performance outside of the fish passage season. Data summarized in this report includes monitoring from January 1, 2023 to December 31, 2023.

1.1 Project Description

The Wells Project is owned and operated by Public Utility District No. 1 of Douglas County (Douglas PUD) and is located at river mile (RM) 515.6 on the Columbia River in the State of Washington (Figure 1). Wells Dam is located approximately 30 river miles downstream from the Chief Joseph Hydroelectric Project, owned and operated by the United States Army Corps of Engineers (USACE), and 42 miles upstream from the Rocky Reach Hydroelectric Project, owned and operated by Public Utility District No. 1 of Chelan County. The nearest town is Pateros, Washington, which is located approximately 8 miles upstream of Wells Dam.

The Wells Project is the chief generating resource for Douglas PUD. It includes ten generating units with a nameplate rating of 832,320 kW and a peaking capacity of approximately 840,000 kW. The design of the Wells Project is unique in that the generating units, spillways, switchyard, and fish passage facilities were combined into a single structure referred to as the hydrocombine. The hydrocombine is 1,130 feet long, 168 feet wide and has a top-of-dam elevation of 795 feet above mean sea level (msl). Upstream fish passage facilities are located on both sides of the hydrocombine.

The Methow and Okanogan rivers are tributaries to the Columbia River, which drain into the Wells Reservoir. The Wells Project boundary extends 1.5 miles up the Methow River and 15.5 miles up the Okanogan River. The surface area of the reservoir is 9,740 acres with a gross storage capacity of 331,200 acre-feet and usable storage of 97,985 acre-feet at the normal maximum water surface elevation of 781 feet msl.

1.2 Fixed Monitoring Site Locations

Fixed monitoring stations (FMS) for TDG are located above and below Wells Dam (Figure 1). All FMS are Hach® or Hydrotech HYDROLAB MiniSonde (MS5) instruments equipped with TDG and temperature

probes, are deployed approximately 15 feet below normal surface water elevation and are calibrated monthly. The forebay station is located midway across the deck of Wells Dam (47° 56’ 50.28” N, 119° 51’ 54.78” W). The tailrace station is located on the left bank of the Columbia River 2.6 miles downstream of Wells Dam (47° 54’ 46.86” N, 119° 53’ 45.66” W). In the spring of 2014, Douglas PUD installed a third FMS at Washburn Island (WSBW; 48° 5' 17.15" N, 119°40' 33.82" W), located approximately 7 miles downstream of Chief Joseph Dam. Data from the three stations are automatically transmitted by radio to Wells Dam, stored, forwarded to the USACE, and posted to the Douglas PUD’s public webpage (www.douglaspud.org). Weather data are recorded by Global Water, Inc. instrumentation, including an electronic barometer located on the deck of Wells Dam at 810 feet elevation.

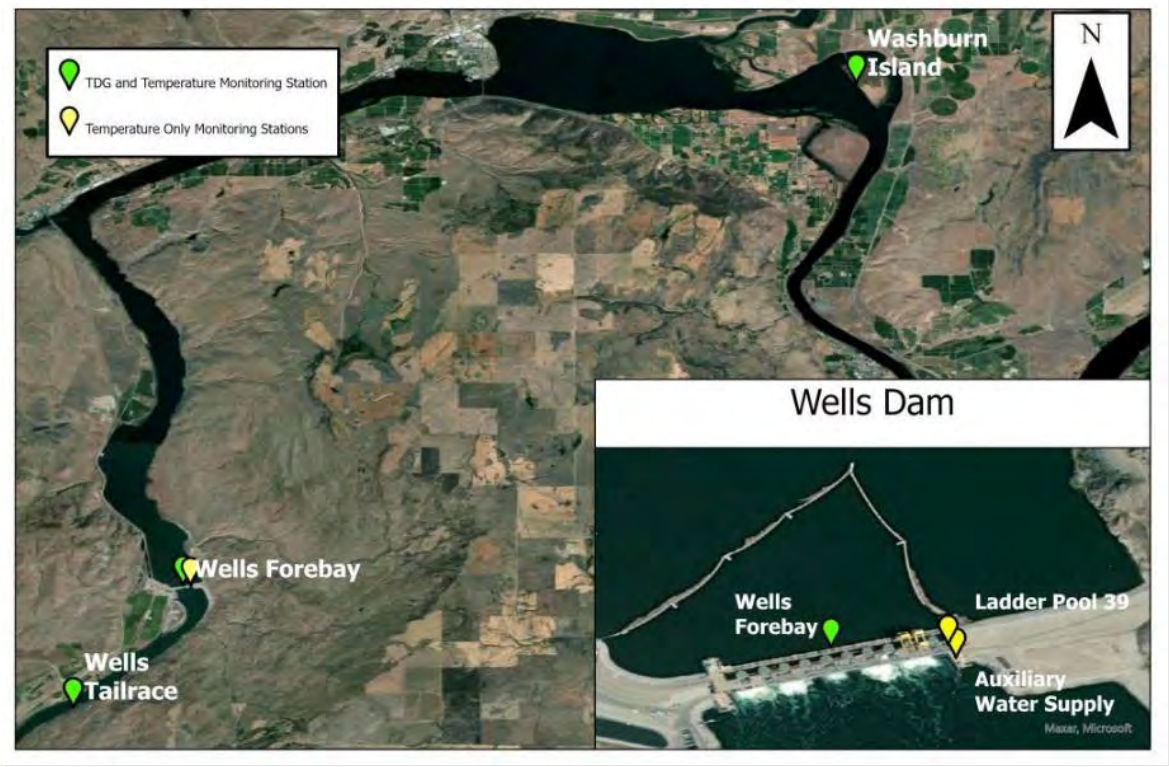


Figure 1. TDG and temperature fixed monitoring stations above and below Wells Dam.

1.3 Regulatory Framework

Washington Administrative Code (WAC) Chapter 173-201A identifies the WQS for surface waters in Washington State. Per the WQS, TDG measurements shall not exceed 110% saturation at any point of measurement in any state water body. The WQS provides for two exceptions to this rule: (1) for spill over dams to increase survival of downstream migrating juvenile salmon; and (2) during natural flood flows. Further, in 2019 the WAC was revised to allow for increased spill during the spring smolt migration period generally recognized by Ecology to be occurring between April and June. The revised WAC is written as follows:

(i) The water quality criteria established in this chapter for TDG shall not apply when the stream flow exceeds the seven-day, ten-year frequency flood (7Q-10 flow). The 7Q-10 flow for the Wells Project is 246,000 cubic feet per second (cfs), based on the hydrologic records from 1930 to 1998 and the USGS Bulletin 17B, "Guidelines for Determining Flood Flow Frequency" (Pickett et al. 2004). When river flow volume exceeds 7Q-10 flows, the WQS established in the WAC do not apply.

(ii) The TDG criteria may be adjusted to aid fish passage over hydroelectric dams that spill for anadromous juvenile fish as of the 2020 spill season. The elevated TDG levels are intended to allow increased fish passage via spill without causing more harm to fish populations than caused by turbine fish passage. The following special fish-passage exemptions for the Snake and Columbia rivers apply when spilling water at dams is necessary to aid fish passage:

(A) TDG must not exceed:

- *An average of 115% as measured in the forebays of the next downstream dams and must not exceed an average of 120% as measured in the tailraces of each dam (these averages are calculated as an average of the twelve highest hourly readings in a calendar day, relative to atmospheric pressure); and*

- *A maximum TDG saturation level of 125% calculated as an average of the two highest hourly TDG measures in a calendar day during spillage for fish passage.*

(B) To further aid fish passage during the spring spill season (generally from April through June), spill may be increased up to the following levels as measured at the tailrace fixed-site monitoring location:

- *A maximum TDG saturation level of 125% calculated as an average of the twelve highest hourly TDG measures in a calendar day; and*

- *A maximum TDG saturation level of 126% calculated as an average of any two consecutive hourly TDG measures.*

These TDG criteria may be applied in place of (A) of this subsection (above; see WAC 173-201A-200) during spring spill operations when applied in accordance with the following conditions:

- *In addition to complying with the requirements of WAC Chapter 173-201A, the tailrace maximum TDG criteria at hydropower dams shall be applied in accordance with Endangered Species Act consultation documents associated with spill operations on the Snake and Columbia rivers, including operations for fish passage. The Endangered Species Act consultation documents are those by which dams may legally operate during the time that the adjusted criteria in (B) of this subsection are in use.*

- *Application of the tailrace maximum TDG criteria must be accompanied by a department approved biological monitoring plan designed to measure impacts of fish exposed to increased TDG conditions throughout the spring spill season. Beginning in the year 2021, plans must include monitoring for nonsalmonid fish species and must continue for a minimum of five years, and thereafter as determined by the department.*

- *TDG must be reduced to allowances specified in (A) of this subsection if the calculated incidence of gas bubble trauma in salmonids (with a minimum sample size of 50 fish required weekly) or nonsalmonids (with a minimum sample size of 50 fish required weekly) exceeds:*

    - *Gas bubble trauma in nonpaired fins of 15%; or*

    - *Gas bubble trauma in nonpaired fins of 5% and gas bubbles occlude more than 25% of the surface area of the fin.*

If gas bubble trauma exceeds these biological thresholds, additional monitoring must demonstrate the incidence of gas bubble trauma below biological thresholds before TDG can be adjusted to allowances specified in this subsection. Gas bubble trauma monitoring data shall be excluded from comparison to biological thresholds when higher than normal river flow contributes to excess spill above the ability to meet (B) above. This monitoring data exclusion shall apply for one full calendar day after reduced river flow allows attainment of (B) above.

1.4 Gas Abatement Plan Approach

1.4.1 Structural

No permanent structural modifications were proposed or conducted in the 2023 monitoring season. Spill Gate 9 was unavailable during the 2023 bypass period but was put back into service on July 31, 2023. Spill Gate 7 returned to service for the 2023 bypass period, while turbine unit 5 was out of service during the bypass period for complete turbine rebuild. As such, Spill Gate 7 was used as the primary gate for concentrated spill when flows exceeded plant capacity.

1.4.2 Consultation

Consistent with prior consultation requirements, Douglas PUD directs all correspondence related to TDG compliance to Ecology's Hydropower Projects Manager located in the Central Region Office (Union Gap, Washington 98903). In addition, Douglas PUD annually consults with the Aquatic Settlement Work Group (Aquatic SWG) and Habitat Conservation Plan Coordinating Committee (HCP CC) for specific TDG and WQS documents pursuant to Douglas PUD's 401 Water Quality Certification (401 Certification). Final documents that have received committee and stakeholder approval are submitted to the FERC for approval and towards complying with the consultation and approval requirements contained within the FERC license for the Wells Project.

2 OPERATIONS

2.1 Description of Fish-Passage Season Flow

The Wells Anadromous Fish Agreement and HCP required Douglas PUD to provide juvenile fish bypass passage opportunities for greater than 95% of the downstream migrating juvenile fish covered by the HCP (Plan Species). The HCP-defined juvenile fish passage season starts April 1st and runs through August 31st of each year. Douglas PUD annually reviews fish passage statistics and uses that information to tune operation during subsequent years toward ensuring that greater than 95% of the juvenile outmigration is afforded a non-turbine passage route through Wells Dam. Based upon prior-year information, the juvenile fish bypass started on April 9 (0:00) and ended on July 24 (24:00). As required, TDG performance was monitored during this period and transmitted to the USACE, Northwest Division on a real-time basis (www.nwd-wc.usace.army.mil) and made available on Douglas PUD's public webpage (https://douglaspud.org/environmental-stewardship/for-regulatory-agencies/total-dissolved-gas-and-temperature-monitoring/). Historical data continues to be available for download at both websites.

Data from 1969 to 2023 show that average monthly flows at Wells Dam range from a September low of 49.3 kcfs to a May high of 171.7 kcfs (Table 1; Figure 2). The ten-year average shows higher flows in May through July compared to the historical means recorded during the same months. Flows at the run-of-river Wells Project are determined by upstream storage releases at the Grand Coulee Hydroelectric Project and Canadian storage projects, with typically less than 10% of the total river flow provided by the two rivers that flow into the Columbia River within the Wells Project (Okanogan and Methow Rivers). Tributary inputs from the Methow and Okanogan River are often referred to as "side-flows," which enter the Columbia River within the Project area.

Table 1. Monthly average river discharge (kcfs) from the Wells Project, 1969-2023. New historic (since 1969) minimum values were set in September and October of 2023 (bolded values).

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
2023	85.7	88.7	66.2	59.7	171.7	97.4	98.2	98.6	49.3	51.1	87.5	76.6	86.3
Average since 1969	109.1	108.5	105.1	115.9	153.2	163.4	133.6	105.8	73.7	73.5	88.2	101.1	110.8
Minimum since 1969	67.4	69.9	56.0	51.9	55.2	73.7	53.4	63.9	**49.3**	**51.0**	63.8	72.6	--
Maximum since 1969	159.2	180.7	193.9	203.8	266.3	348.7	253.8	181.3	123	108.9	110.0	149.0	--
10YR mean (2014-2023)	111.0	111.8	102.3	114.0	167.2	158.0	125.1	105.3	64.5	90.4	90.6	98.1	109.2

After a modest March and April where both months approached half of normal flow averages, observed May flows at Wells Dam in 2023 were above average. Spring run-off occurred slightly earlier than normal (May) and was of a shorter duration (Figure 2) leaving June and July flows that were much lower than average. Despite the high flows in May, stream flows never exceeded the 7Q-10 value of 246 kcfs. Discharge in June and July were significantly lower than the mean and, in September and October, new historic (since 1969) minimum values were observed (Table 1).

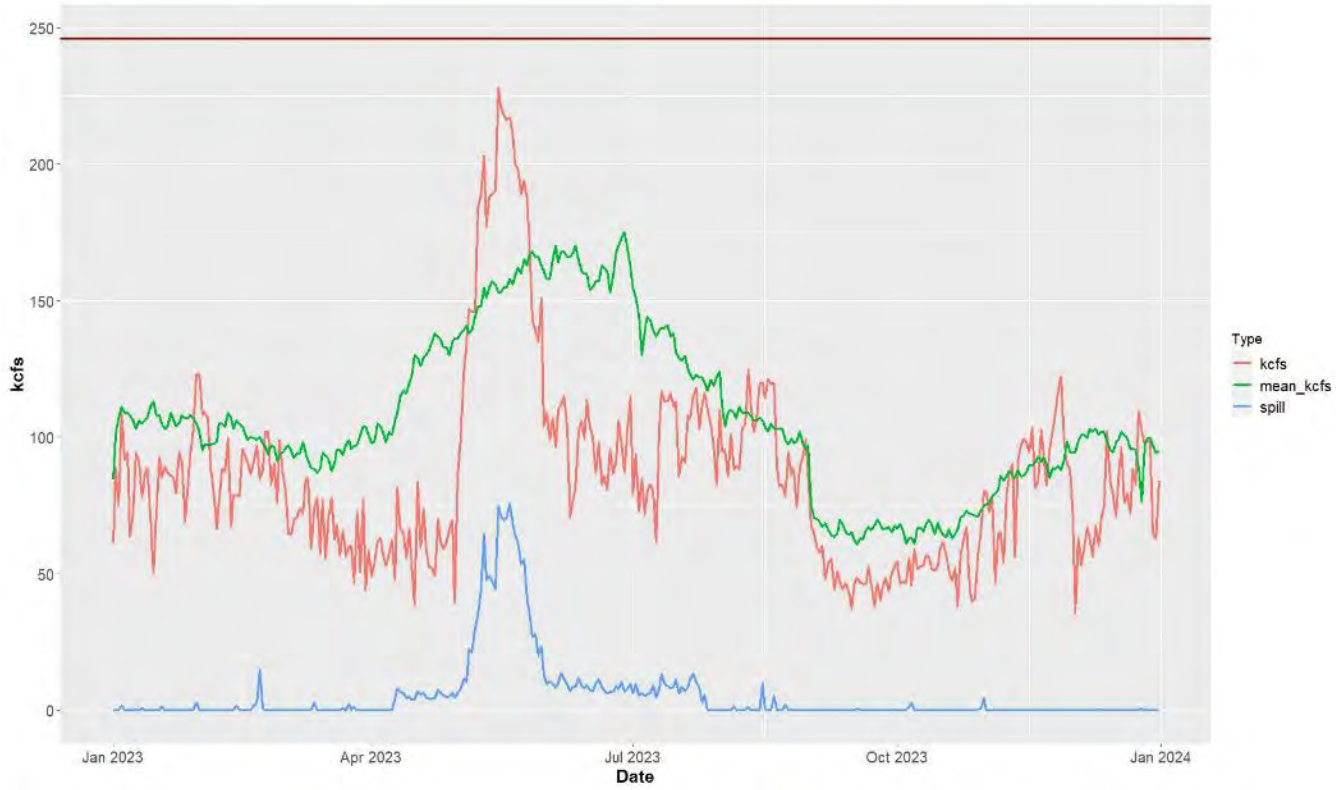


Figure 2. 2023 daily discharge and daily spill, compared to 10-year mean daily discharge. Dark red reference line indicates the 7Q-10 values of 246 kcfs.

Methow River Tributary flows were above average in May due to a generally cool spring followed by a rapid warm-up in May. The shape of this hydrograph provided conditions for Douglas PUD to complete a Methow River flush (Figure 3). Under this scenario, the Wells Pool is brought down to only a couple feet above minimum pool elevation and rock groins in the lower Methow combined with high Methow River flow transport the movement of fine sediments in the lower 1 mile of the Methow out into the Wells Reservoir. When conditions allow this action is necessary to complete to prevent future flooding in the town of Pateros, WA.

Figure 3. Methow River hydrograph in spring and summer of 2023. The rapid increase in flows above 9 ft in early May facilitated a Methow River flush opportunity (waterdata.us.gov).

2.2 Fish Bypass Program

Wells Dam is a hydrocombine, and the spillbays are located directly above the turbine intakes. Research at Wells Dam in the mid-1980s demonstrated that a modest amount of spill could effectively guide a high proportion of downstream migrating juvenile salmon away from turbines and into a surface-oriented bypass system. A Juvenile Bypass System (JBS) was subsequently developed at Wells in the late 1980s. The Wells Dam JBS was engineered based on biological research and hydraulic modeling and utilizes flow-constricting barriers deployed in five of the eleven spillbays to effectively attract and safely guide fish through the Wells Project. The JBS has since proven to be the most efficient system on the mainstem Columbia River, providing high levels of fish protection and survival that has met approval from various fisheries agencies and tribes (Skalski et al. 1996). The passage and survival performance measures contained within the FERC-approved HCP have been consistently exceeded for spring migrating plan species (Bickford et al. 2001; Gingerich et al. 2020; see Section 3.1.1 below).

2.3 Fish Bypass Spill Quantities and Duration

The Wells Dam JBS uses up to 2.2 kcfs of water for each of the five bypass/spillbays. Under normal conditions, the JBS will use roughly five to eight percent of the total river flow for fish guidance. The bypass spill has a small influence on TDG production (~0-2%) while providing a safe and highly effective,

non-turbine passage route for over 92% of the spring-migrating and 96% of the summer-migrating juvenile salmonids. The HCP-defined juvenile fish migration period runs from April 1st to August 31st of each year. The HCP CC retains annual operating oversight that includes the potential to operate the JBS as early as April 1 and as late as August 31 to ensure that at least 95% of the spring and summer migrations of juvenile salmonids are provided a safe, non-turbine passage route over Wells Dam. Any spill that occurs between April 1st and August 31st is deemed to have a beneficial effect on migrating juvenile salmonids.

From 2003 to 2011, the HCP CC directed the District to operate the JBS on a fixed schedule between April 12 and August 26 in an effort to provide a non-turbine passage route for at least 95% of the spring and summer migrations of juvenile salmonids. In 2012, Douglas PUD evaluated past performance of the Wells Dam JBS operating dates relative to observed annual run timing (at the Rocky Reach Bypass) for both spring and summer migrants. With that data, a request was made to and granted by the HCP CC to revise the bypass operating dates in 2012 to start April 9 and end August 19. These new dates were therefore used in 2012-2020 to operate the JBS for migrating juvenile salmonids. Again in 2020, after nine more years of data collection, Douglas PUD requested that the bypass window end ten days earlier on August 9 in 2021. Given the long history of data collection and analysis, the HCP CC approved the request to have the bypass period operate between April 9 and August 9 in 2021, and JBS operation within those dates readily provided JBS passage for greater than 95% of the spring and summer migrants. In 2022, a retrospective analysis of the Wells Dam smolt passage dates estimated that more than 95% of the spring migrants passing Wells Dam were afforded a bypass opportunity at Wells Dam. However, the same analysis showed that the bypass should have ran two more days to August 11th to provide 95% bypass operations coverage for summer migrant salmonids. Given the limitations of the retrospective analysis and the failure in 2022 to provide a non-turbine passage route to 95% of summer migrating salmonids, the HCP CC will consider the use of RealTime Forecasters for estimating cumulative passage of juvenile salmonids at Wells Dam in the future, and to end the JBS each year once 95% passage has been reached at Rocky Reach Dam[1], rather than on a fixed date. RealTime Forecasters is a publicly available program created by University of Washington School of Aquatic and Fishery Sciences staff associated with the Columbia Basin Research office (Beer 2022) and available online at https://www.cbr.washington.edu/analysis/rt. Juvenile anadromous salmonids that pass Wells Dam before and after the bypass system is shut down for the year benefit from spill at the Wells Project and therefore Douglas PUD annually develops a GAP and conducts biological and physical monitoring in order to obtain an Ecology approved TDG adjustment for the entire juvenile salmonid migration period (April 1st to August 31st).

[1] Using Rocky Reach Dam JBS index counts and program RealTime Forecasters is a conservative approach to ending bypass operations at Wells Dam since it does not correct for the travel date delay between Wells Dam and Rocky Reach Dam. If 95% of the run is completed at Rocky Reach, then some value greater than 95% will have passed Wells Dam given that travel times for summer Chinook between Wells and Rocky Reach dams are more than one day and had a median of 11 days in the most recent analysis (Buchanan and Townsend 2023).

3 IMPLEMENTATION RESULTS

3.1 Fisheries Management

3.1.1 Fish Passage Efficiencies

No new fish passage efficiency studies were conducted at the Wells Project in 2023. However, three years of bypass efficiency studies have shown the Wells Dam JBS to be the most efficient juvenile salmonid collection system in the Columbia River with fish passage efficiencies averaging 92% for spring migrants (steelhead, Sockeye Salmon, and spring Chinook Salmon) and averaging over 96% for summer migrants (summer/fall Chinook Salmon; Skalski et al. 1996).

3.1.1 Survival Studies

No survival studies were conducted in 2023, with the most recent survival confirmation study completed in 2020. The average project survival estimates for all five survival studies completed at Wells Dam using yearling spring migrants is 0.9604 (SE=0.0098). These results indicate that the Wells Project has the highest rate of project survival for spring migrating fish on the Columbia and Snake Rivers.

3.1.2 Run-Timing Evaluation

Based on analysis conducted by Drs. Rebecca Buchanan and Richard Townsend of Columbia Basin Research, in 2023 Douglas PUD surpassed the HCP requirement to provide bypass operations during at least 95% of the juvenile salmon and steelhead migration taking place at Wells Dam for all salmonid groups except subyearling summer Chinook (Buchanan and Townsend 2023). The onset of bypass operations at Wells Dam in 2023 continued with the schedule determined in 2021, starting at 00:00 on April 9. Unlike previous years, the end date of bypass operations in 2023 was informed by the predicted 95% passage date of subyearling Chinook Salmon at Rocky Reach Dam generated by RealTime Forecaster, as described above. In 2023, bypass operations at Wells Dam ceased at 24:00 on July 24. Buchanan and Townsend (2023) summarized the success of the 2023 juvenile bypass season:

> *"The percentage of the migration that passed Wells Dam during the Wells bypass operations in 2023 was at or near 100% for PIT-tagged yearling Chinook Salmon (combined hatchery and wild), PIT-tagged steelhead, Sockeye Salmon, and PIT-tagged Coho Salmon. An estimated 99.4% of the wild yearling Chinook migration occurred during bypass operations at Wells Dam. Additionally, the Program RealTime estimates of the percentage of the subyearling Chinook migration that passed Wells Dam within the period of bypass operations were compared with those estimated by PIT-tag detections. Program RealTime estimated that bypass operations at Wells Dam covered 98.93% of the subyearling Chinook Salmon migration in 2023. The 2023 results for all monitored Plan Species were consistent with historical trends (2012–2022) and exceeded the HCP goals of providing bypass operations for equal to or greater than 95% of the spring outmigration of juvenile Plan Species."*

3.2 Biological Monitoring

The 2023 Wells Project GAP and the biological monitoring requirement of the WAC governing TDG adjustments for juvenile fish passage call for biological monitoring. Pursuant to the 2023 GAP, weekly GBT monitoring occurred at the Rocky Reach JBS and in the Wells Dam tailrace. Further, additional monitoring occurred when observed TDG levels were above 125%, consistent with the National Marine Fisheries Service (NMFS) recommendations (NMFS 2000). GBT monitoring began on April 4 and continued through June 26, 2023 at Rocky Reach Dam consistent with the 2023 GAP. Each week, Douglas PUD endeavored to examine no fewer than 50 resident and 50 anadromous fish for GBT. However, due to low passage rates at the Rocky Reach JBS, more than 50 smolts were examined in only 6 of the 14 sample weeks. In total, 550 smolts were encountered in the Rocky Reach JBS and examined for GBT (Table 2). Within the Wells Tailrace, 956 resident fish were examined for GBT (Table 3). In 2023, no GBT was observed at the Rocky Reach JBS or in the Wells tailrace sampling.

Table 2. Summary of fish sampled at the Rocky Reach Juvenile Bypass System for GBT in 2023. None of the fish examined had signs of GBT.

	4/4	4/13	4/18	4/27	5/2	5/8	5/9	5/17	5/23	6/1	6/7	6/13	6/19	6/26	*SPECIES TOTAL*
CHINOOK YEARLING	3	2	20	34	17	15	24	13	48	27	--	--	3	3	***209***
STEELHEAD	--	--	--	4	10	23	--	--	1	2	--	--	4	5	***49***
CHINOOK SUB-YEARLING	6	4	--	8	31	--	5	--	--	3	51	63	49	1	***221***
SOCKEYE	--	1	--	--	--	1	--	22	7	24	--	--	--	--	***55***
COHO	--	1	8	3	--	1	1	1	--	1	--	--	--	--	***16***
DAILY TOTAL	***9***	***8***	***28***	***49***	***58***	***40***	***30***	***36***	***56***	***57***	***51***	***63***	***56***	***9***	***550***

Table 3. Summary of fish collected for GBT examination via electrofishing in the Wells Tailrace, 2023. None of the fish examined had signs of GBT.

	4/4	4/13	4/18	4/27	5/4	5/10	5/17	5/23	6/1	6/6	6/13	6/20	6/26	*SPECIES TOTAL*
BULLHEAD	--	--	--	--	--	--	--	--	--	--	--	--	1	***1***
BLUEGILL / PUMPKINSEED	1	--	--	--	--	--	--	--	--	--	2	--	--	***3***
BASS SPECIES	--	--	--	--	1	--	1	3	1	1	2	--	1	***10***
LARGESCALE SUCKER	6	7	3	11	6	2	28	23	12	2	11	27	15	***153***
CHISELMOUTH	--	7	2	5	15	2	2	3	--	2	10	1	3	***52***
CARP	--	--	--	--	--	--	1	1	--	1	2	1	--	***6***
CUTTHROAT TROUT	--	--	--	--	--	--	--	--	--	--	--	--	1	***1***
WHITEFISH SPECIES	--	--	--	--	--	1	--	--	1	--	--	--	6	***8***
PEAMOUTH	5	4	--	--	--	2	1	6	1	16	1	--	1	***37***
PACIFIC LAMPREY	--	--	--	--	--	--	--	1	--	--	--	--	--	***1***
REDSIDE SHINER	37	62	76	87	14	68	14	14	35	43	16	12	22	***500***
SCULPIN SPECIES	--	--	--	--	--	--	--	--	1	--	1	--	--	***2***
3 SPINE STICKLEBACK	5	3	1	--	3	3	--	--	--	--	--	--	3	***18***
NORTHERN PIKEMINNOW	2	15	3	1	17	1	2	2	3	6	5	12	14	***83***
BRIDGELIP SUCKER	2	--	--	--	--	--	--	--	1	1	--	--	1	***5***
WALLEYE	--	--	--	--	--	--	1	7	--	--	--	--	--	***8***
OTHER*	--	--	1	--	12	1	2	3	3	35	11	--	--	***68***
DAILY TOTAL	***58***	***98***	***86***	***104***	***68***	***80***	***52***	***63***	***58***	***107***	***61***	***53***	***68***	***956***

*Other species collected were as follows: 1 burbot on 4/18; 12 unknown suckers on 5/4; 1 unknown sucker on 5/10; 1 Rainbow Trout and 1 unknown sucker on 5/17; 3 unknown suckers on 5/23; 3 unknown suckers on 6/1; 35 unknown suckers on 6/6; and 11 unknown suckers on 6/13.

3.3 Water Quality Forums

Douglas PUD has actively participated in regional water quality forums with Ecology, Washington Department of Fish and Wildlife, NMFS, Tribal Agencies, the U.S. Fish and Wildlife Service, the USACE, and other Mid-Columbia PUDs (i.e., Grant and Chelan counties). Notably, in 2023, Douglas PUD participated in monthly water supply webinars provided by NOAA's Northwest River Forecast Center from January-June. Since 2020 and the onset of the Covid-19 pandemic, there has been some reduction in regional coordination of water quality issues and topics. At the end of 2020, the USACE cancelled their regional review of TDG monitoring in the Snake and Columbia Rivers normally held in Portland each year. Douglas PUD looks forward to participating in these forums again in the future.

3.4 Physical Monitoring

3.4.1 Overview

TDG monitoring at the Wells Project currently occurs year-round as required by Douglas PUD's Wells Project 401 Certification. As required by Douglas PUD's Quality Assurance Project Plan for TDG, FMS sensors are serviced and calibrated at least once per month or sooner if calibration issues are observed in the data.

In 2014, an additional reservoir monitoring station was installed at Washburn Island (RM 537.5) to collect TDG data representative of water quality entering the Wells Project from Chief Joseph Dam. The current Chief Joseph Dam tailwater station (CHQW) minisonde TDG sensor is deployed along the right bank of the Columbia River, 0.75 miles downstream from Chief Joseph Dam. The river right location of the USACE TDG sensor precludes it from collecting bulk flow data, and instead the sensor monitors spillbay water disproportionally. Under some conditions, water coming from Chief Joseph Dam spillbays has a lower TDG concentration than the powerhouse. For example, when the Chief Joseph Dam forebay has high concentrations of TDG (e.g. greater than 120%) as a result of high spill volumes from Grand Coulee Dam and limited degassing through Rufus Woods Reservoir, water sent through the spillbays at Chief Joseph Dam may actually be stripped of gas via the spill deflectors. However, powerhouse TDG concentrations are essentially identical to those in the forebay and can be missed by the CHQW sensor since powerhouse flows orient to river left rather than river right where the TDG sensor resides. As a result of the CHQW location and the orientation of spill and powerhouse flows, bulk flows leaving the federal system and entering the Wells Project are not accurately monitored. The Washburn Island location installed and operated by Douglas PUD allows water quality managers and the Aquatic SWG Parties to:

1) Better understand TDG degassing in the Wells Project and expected TDG saturation in the Wells forebay.

2) Assure data quality at the Wells forebay TDG sensor since Washburn Island TDG values should correlate predictably with Wells forebay TDG values. Based on the comparison of the sensors at these two locations, technicians can ensure reliable data collection by scheduling sensor servicing when data appears to be erroneous.

3) More accurately assess TDG production from the federal power system upstream of Wells Dam, which may support improved management towards minimizing TDG production in the Columbia River.

3.4.2 Data Evaluation and Analyses

Hourly TDG monitoring data were retrieved from the USACE, Northwest Division for three monitoring locations: the forebay of Wells Dam, tailrace of Wells Dam, and forebay of Rocky Reach Dam, or from the Douglas PUD dataset, available at https://douglaspud.org. The data were partitioned to include only readings obtained during specific time periods of non-bypass (January – March and September – December), spring bypass (April - June), and summer bypass (July and August). Data were stratified by monitoring site, ascending date, and ascending time. Data quality review included ensuring TDG sensor data was responding to each data request and not simply repeating data from the previous time interval or relaying inaccurate data as the result of a system failure (e.g., a failed membrane on the TDG sensor). Where data was perceived to be frozen or otherwise inaccurate, it was removed and, when feasible, replaced with accurate data collected by the adjacent, redundant sonde.

3.5 TDG Compliance

During the non-fish passage season, the TDG criterion in the Wells Tailrace is 110% (January–March and September–December). During the spring bypass (April–June) season, compliance was calculated using the new regulatory criteria as adopted by Ecology in 2019. Additionally, there are five compliance criteria for the 2023 fish passage adjustment that must be met in association with operation at the Wells Project as described in the 2023 GAP and reviewed in Section 1.3. These five compliance criteria apply differently between spring bypass (April–June) and summer bypass (July–August) seasons but are waived when flows exceed the 7Q-10 value for the Wells Project (246 kcfs). For more information refer to WAC 173-201A-200.

3.5.1 Non-Fish Passage Season Compliance (Wells Tailrace 110%)

Pursuant to Douglas PUD's FERC Operating License and 401 Certification, in August 2013 Douglas PUD started collecting TDG data during the non-fish passage season. Non-spill flows at Wells Dam (through the turbine units and fishways) generate little to no additional dissolved gas, and spill outside the fish passage adjustment period is uncommon. There were four hourly instances over two different days in which TDG values were observed higher than 110% outside of the fish bypass season during 2023 (Figure 4). On September 13, 2023, TDG values were over 110% for three hours in the late morning. This was during a time of very low flows in the Columbia River at Wells Dam and there was no spill occurring. It is unknown what caused this TDG increase but it may have been due to a change in aquatic vegetation

respiration during this low water period immediately adjacent to the TDG sonde. On October 31, 2023, incoming flow to the Wells Project area exceeded BPA estimates, spill occurred, and two hours of TDG values were recorded over 110%.

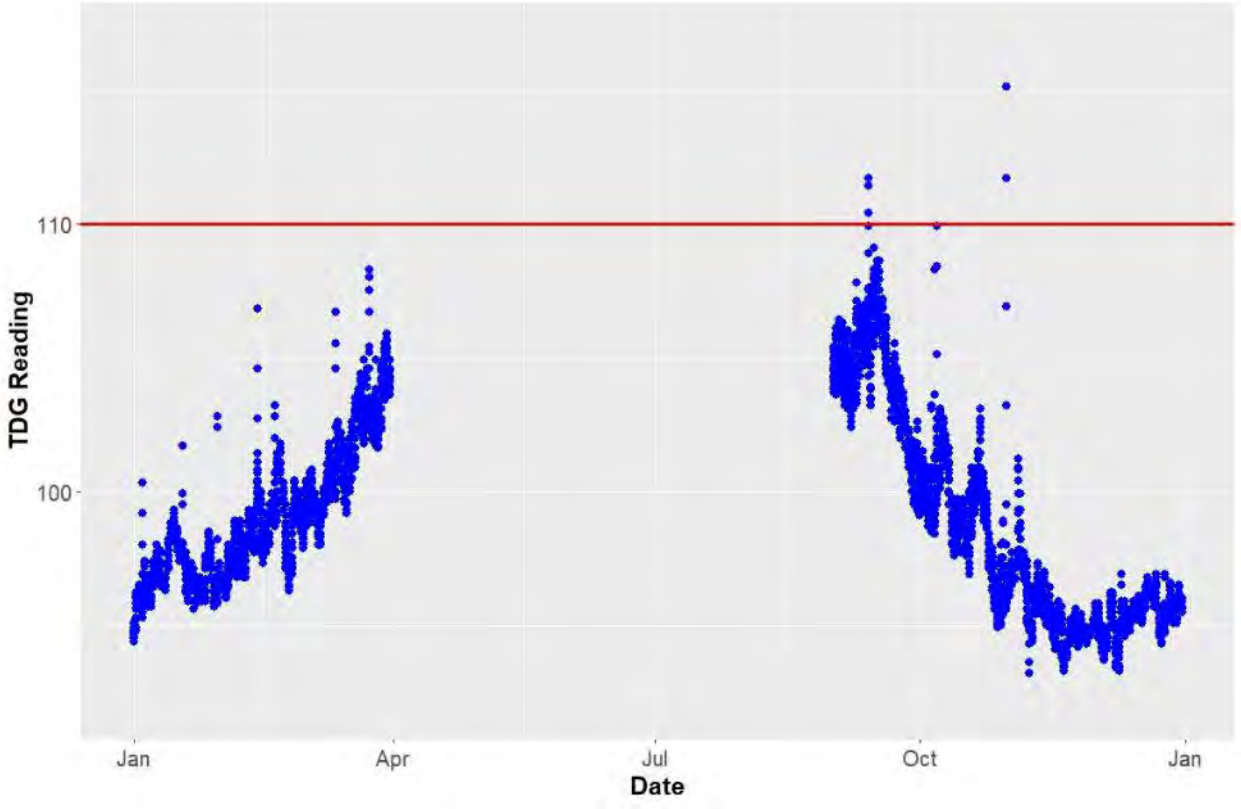


Figure 4. **Hourly TDG data for the Wells Tailrace during the non-fish bypass season in 2023. Values colored red and appearing above the reference line represent exceedances of the standard.**

3.5.2 Spring Fish Passage Season (April through June) Compliance

Mean of Highest 12-Hour TDG Values (Wells Tailrace: 125%)

In 2023, there were no instances of the mean highest 12-hour TDG values exceeding the 125% criteria from April through June.

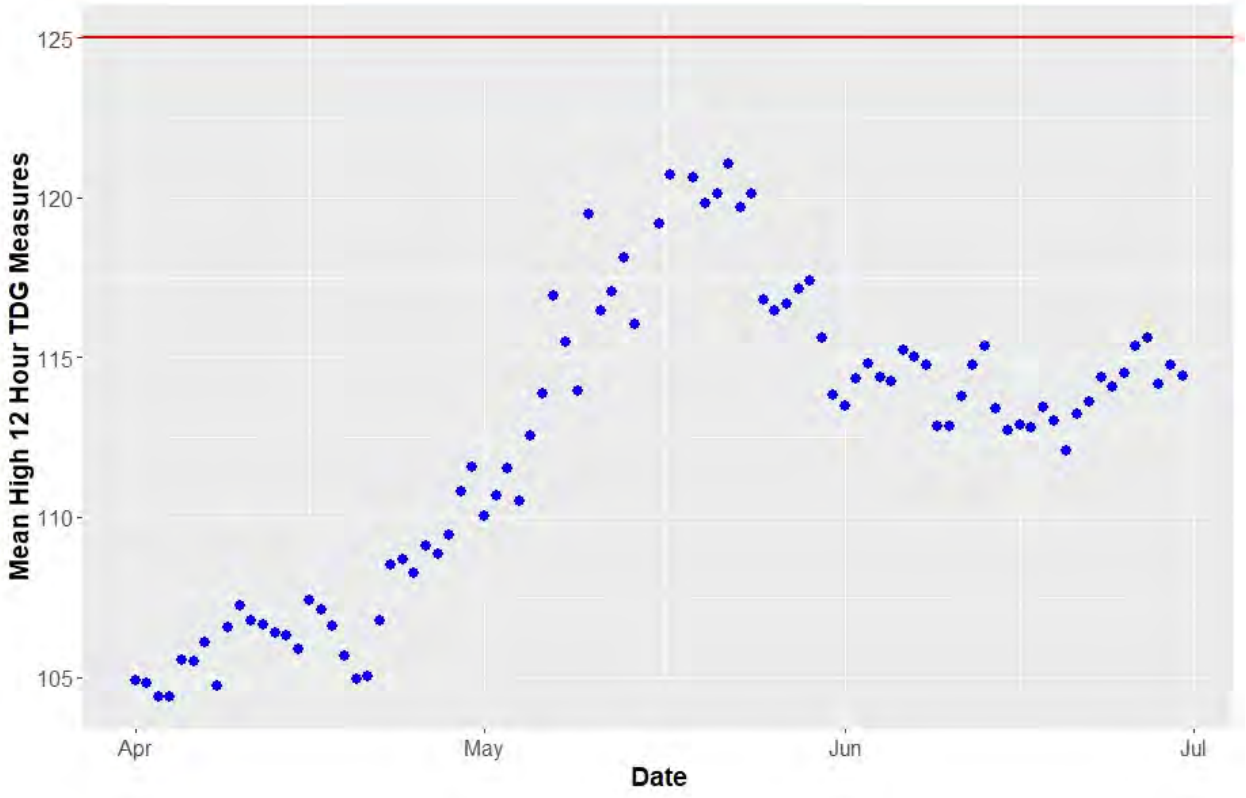


Figure 5. Mean highest 12-hour TDG measures in the Wells Tailrace from April through June 2023. Reference line indicates the compliance standard of 125%.

Mean Consecutive 2-Hour TDG Values (Wells Tailrace: 126%)

In 2023, there were only two exceedances of the 126% 2-hour consecutive mean TDG standard in the Wells Tailrace during the April - June period. On May 7, 2023, the 2-hour consecutive mean was 130.3% and 132.4% both exceedances occurring in the early morning during spring run-off and as a result of high volume of water being spilled at the Wells Project. Post event analysis suggested that the TDG violation may have been preventable, even though it occurred during the early morning (night) hours of May 7, 2023, and when load requests would have been reduced. Similar situations throughout the bypass season did not yield a non-compliant event.

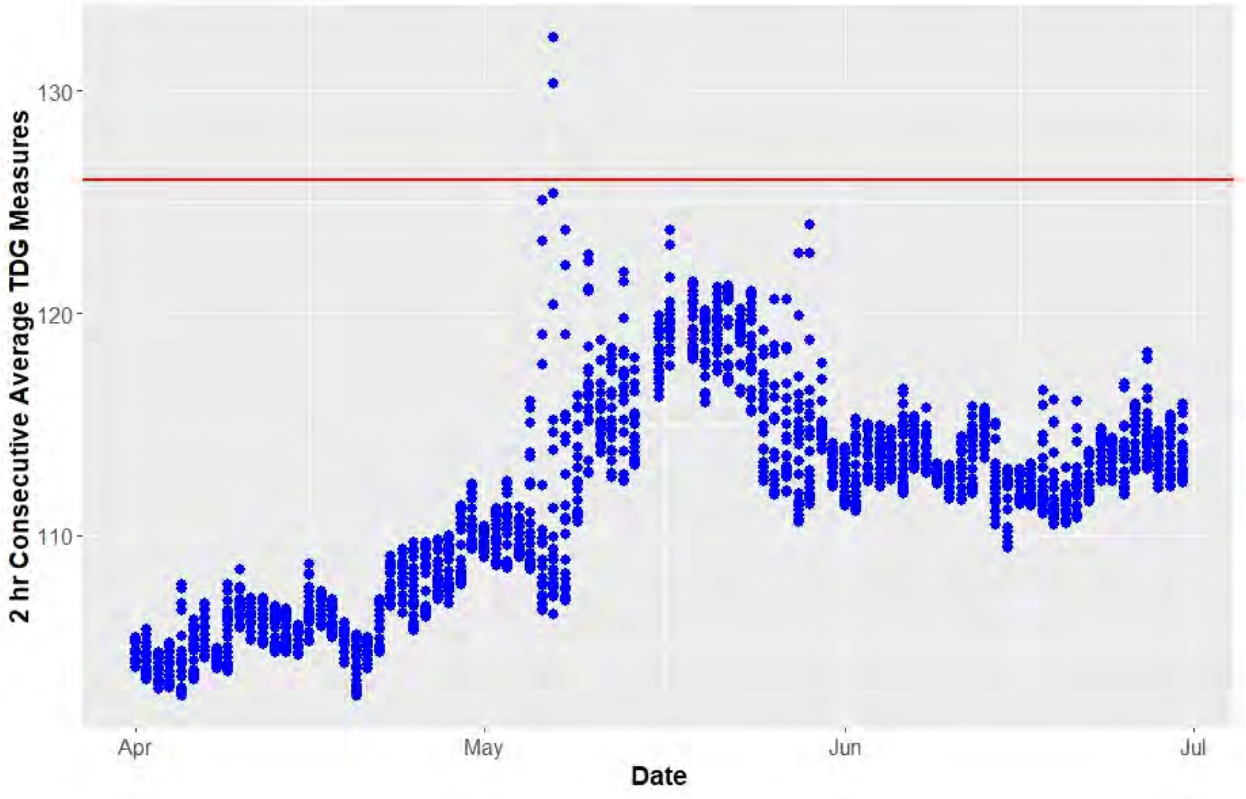


Figure 6. Two-hour consecutive average TDG values for the Wells Tailrace, April through June 2023. Reference line indicates the compliance level of 126%.

3.5.3 Summer Fish Passage Season (July and August) Compliance

Mean of Highest 2-Hour TDG Values (Wells Tailrace: 125%)

In 2023, there were no instances of the mean highest two-hour TDG values in the Wells Tailrace exceeding the 125% criteria between July and August.

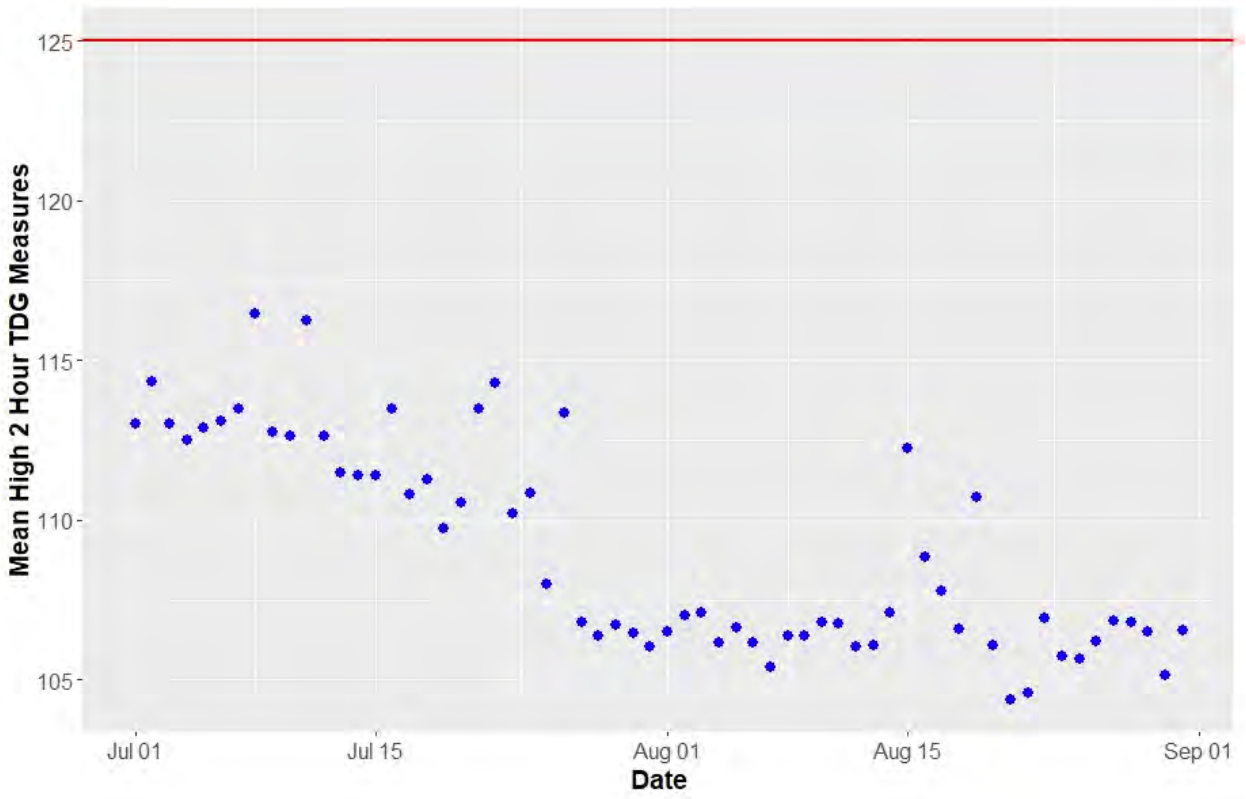


Figure 7. Mean highest 2-hour TDG measures in the Wells tailrace from July to August 2023. Reference line indicates the compliance standard of 125%.

Mean of Highest 12-Hour TDG Values (Wells Tailrace: 120%)

In 2023, there were no instances of the mean highest 12-hour TDG values in the Wells Tailrace exceeding the 120% criteria between July and August.

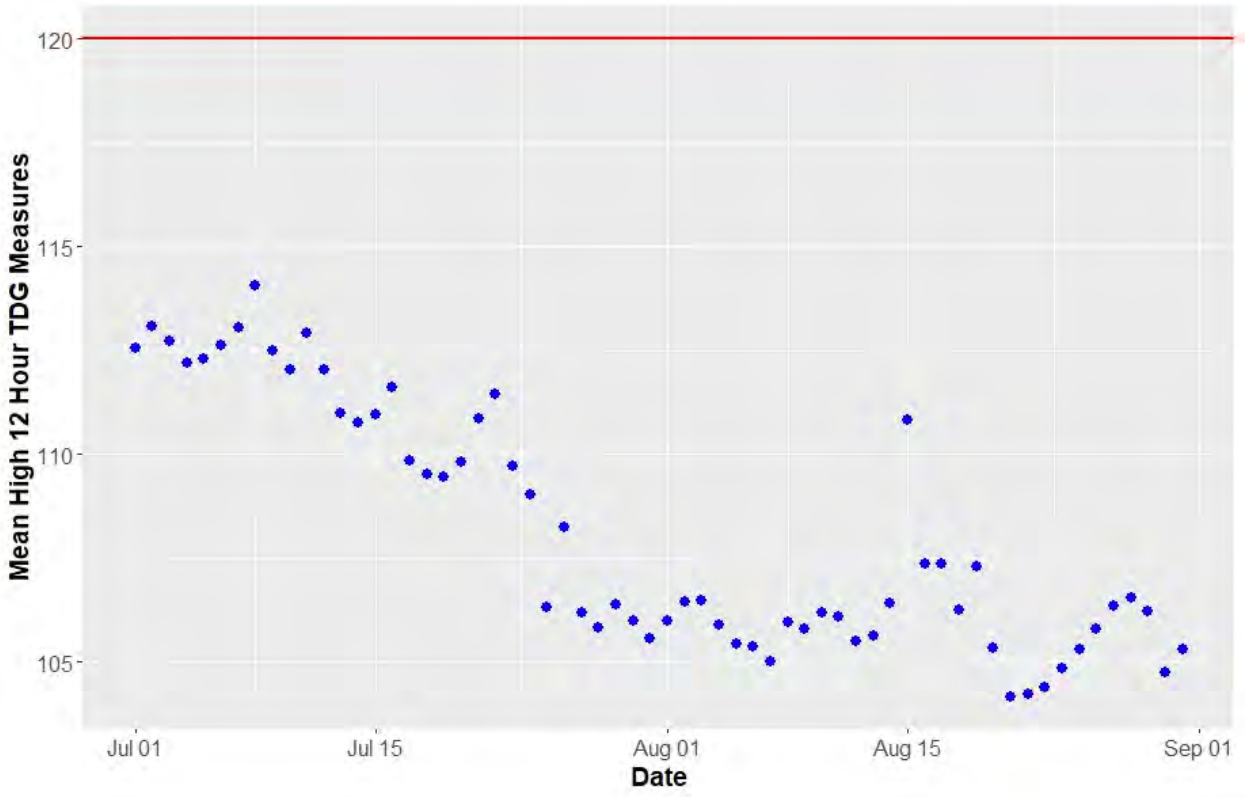


Figure 8. Mean highest 12-hour TDG measures in the Wells Tailrace from July to August 2023. Reference line indicates the compliance standard of 120%.

Mean of Highest 12-Hour TDG Values (Rocky Reach Forebay: 115%)

In 2023, there were no instances of the mean highest 12-hour TDG values in the Rocky Reach Forebay exceeding the 115% criteria between July and August.

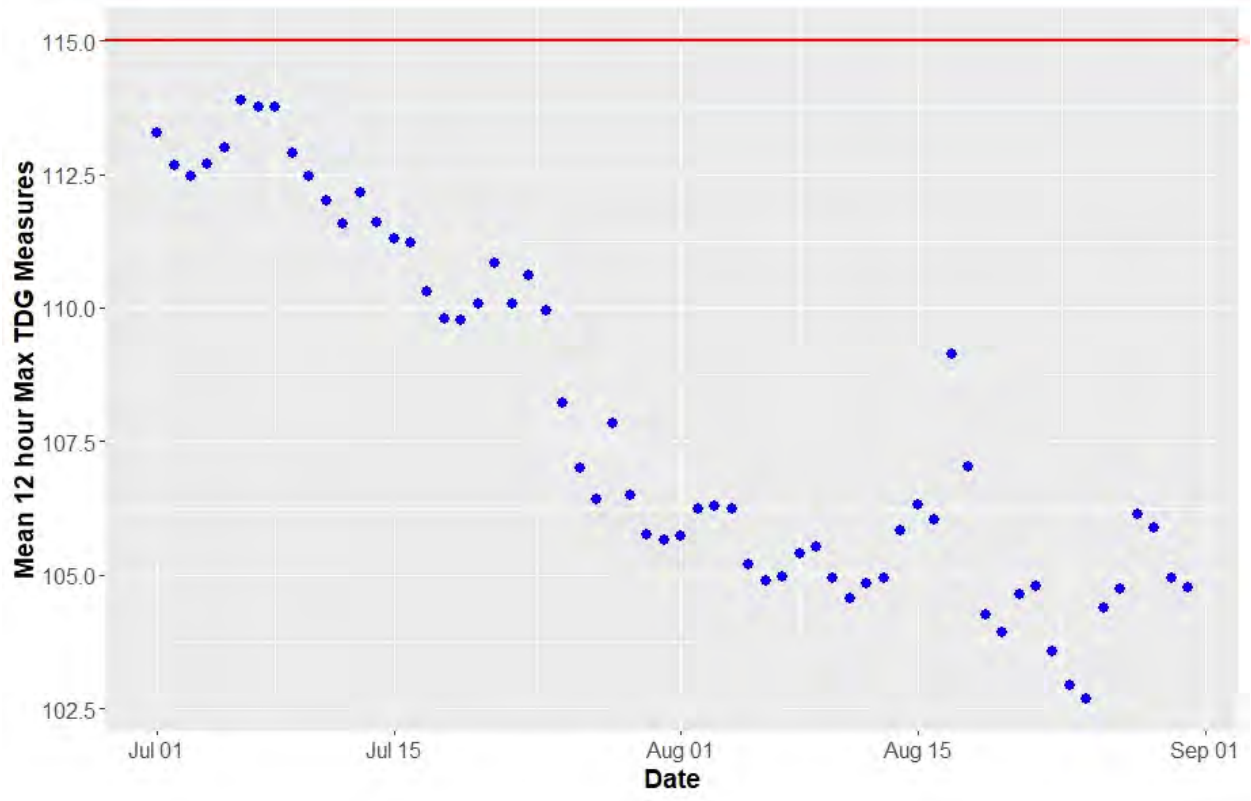


Figure 9. Mean highest 12-hour TDG measures in the Rocky Reach Forebay from July to August 2023. Reference line indicates the compliance standard of 115%.

Wells Forebay TDG Compliance

While the Wells Project's level of TDG compliance in 2023 was near perfect, it is typically difficult to achieve complete WQS compliance due to incoming water entering the Wells Forebay is frequently greater than the Environmental Protection Agency (EPA) and Tribal Water's TDG WQS standard of 110%. For example, between June 1 and July 31, 2023, water entering the Wells Forebay was above 110% TDG over 85% of the time (Figure 10).

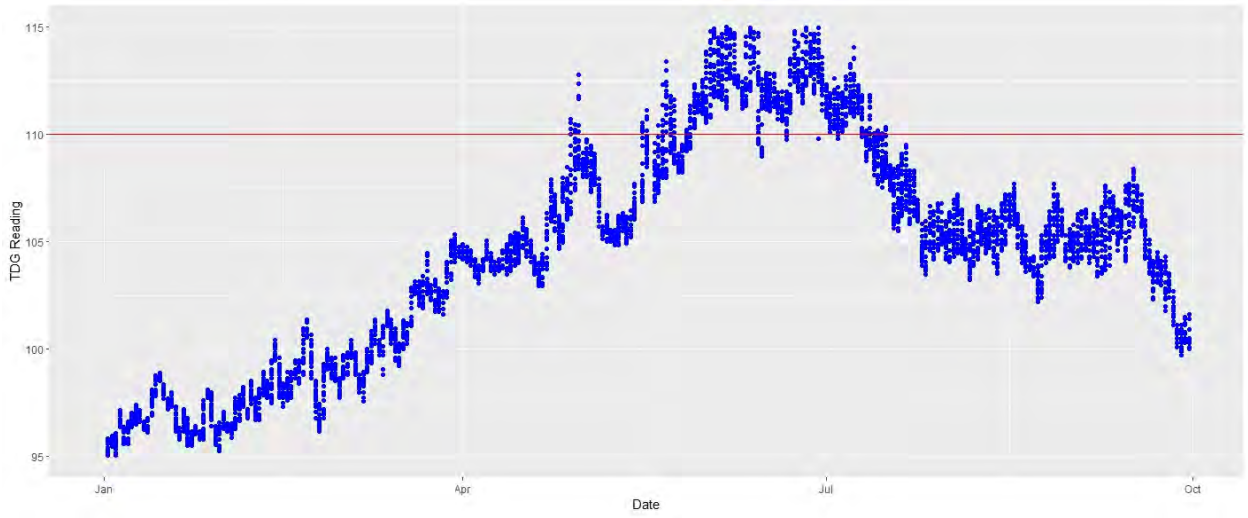


Figure 10. Wells Forebay TDG from January to October 2023. The reference line at 110% represents the EPA and Tribal Waters compliance threshold.

Table 4 TDG compliance at the Wells Project for the entire 2023 season.

April - June	**Mean of Highest 12-Hour TDG Values: Wells Tailrace 125%**	
	Non-compliant measurements	0
	7Q-10 flow measurements	0
	Total measurements	91
	DCPUD compliance	**100.0%**
	Mean Consecutive 2-Hour TDG Values: Wells Tailrace 126%	
	Non-compliant measurements	2
	7Q-10 flow measurements	0
	Total measurements	2093
	DCPUD compliance	**99.9%**
July & August	**Mean of Highest 2-Hour TDG Values: Wells Tailrace 125%**	
	Non-compliant measurements	0
	7Q-10 flow measurements	0
	Total measurements	62
	DCPUD compliance	**100.0%**
	Mean of Highest 12-Hour TDG Values: Wells Tailrace 120%	
	Non-compliant measurements	0
	7Q-10 flow measurements	0
	Total measurements	62
	DCPUD compliance	**100.0%**
	Mean of Highest 12-Hour TDG Values: Rocky Reach Forebay 115%	
	Non-compliant measurements	0
	7Q-10 flow measurements	0
	Total measurements	62
	DCPUD compliance	**100.0%**
Jan - Mar & Sept - Dec	**Wells Tailrace: <110% Standard**	
	Non-compliant measurements	5
	Total measurements	5086
	DCPUD compliance	**99.9%**

4 DISCUSSION OF GAS ABATEMENT MEASURES

4.1 Water Quality Attainment Plan Activities

As required by the Wells Project 401 Certification, Douglas PUD developed a Water Quality Attainment Plan (WQAP) that was approved by Ecology and the FERC in 2013. The WQAP provides a detailed strategy for achieving compliance with the TDG state WQS within a required ten-year timeframe (i.e., compliance schedule). In December 2023, Douglas PUD completed a WQAP 10-Year Review (Douglas PUD 2023) and submitted to the Department of Ecology and the Aquatic SWG for 30-day review. Once approved, the final document is expected to be filed with the FERC in the first quarter of 2024. This report details all actions taken to meet water quality standards and the next steps for water quality attainment. For 2023, the WQAP implementation actions include updating and implementing the Spill Playbook, continuing with biological monitoring for GBT, coordinating river flows with power sales and system operators, implementing the TDG prediction tool (found here: https://www.cbr.washington.edu/shiny/DAM_CONDITIONS/), and assessing the need to update any relevant TDG models.

In 2023, modifications were made to the Spill Playbook to accommodate the unavailability of Spill Gate 9, which was undergoing maintenance activities for a prolonged period. Biological monitoring (i.e., GBT monitoring in biota, as needed) continued in 2023 toward determining the impact on salmonids and resident fish pursuant to the Biological Monitoring Plan portion of the 2022 Wells Dam GAP.

4.2 Operational

River levels were below average for most of the year with a short, high run-off occuring in late-May (Table 1; Figure 2). This lead to a short period of time were mean daily flows were above average before returning to low baseflow levels. September and October had the lowest average monthly flows at Wells Dam since Project commission in in the late 1960's.

Despite having a low-to-average flow year, there were mutliple maintenance and operational actions that took place during May that required short term deviation from the Spill Playbook, while remaining complaint with the opertaional requirements of the juvenile bypass system at Wells Dam. On May 10, 2023, the reservoir level was lowered in order to produce conditions that would help flush fine sediment from the mouth of the Methow River. This required spill to be allowed through Spill Gates 3 and 5 for brief periods, in addition to 7, in order to safely reduce the forebay level. After the reservoir reached the desired level, the flow barrier on Spill Gate 6 was removed and spill was returned to Spill Gates 6 and 7, per the Spill Playbook desired configuration. Additionally, in order to prepare Turbine Unit 6 for maintenance, stop logs needed to be installed in the turbine unit intake. This required spill to be diverted through Spill Gate 3 and 4 rather than using Spill Gates 6, 7, and 8. Given the high incoming flows the flow barrier on Spill Gate 4 was removed on May 15, 2023 to accomadate the stop log work and to safely pass the high incoming flow volume. On May 17, 2023, stop log installation was attempted by diverting spill near Spill Gate 6, but the high flow conditions proved unsafe for

completing this operational effort.The Methow River flush was completed on May 22, 2023 and operators were able to reinstall the bypass barrier to Spill Gate 6 on May 23, 2023, returning the reservoir to normal levels.

The Flow barrier was returned to Spill Gate 4 on May 25, 2023. The stop log installation was attempted again on May 27, 2023, and again, spill was diverted into Spill Gate 3. All stop logs were fully set by May 29, 2023, and spill was returned to Spill Gate 6 by mid-afternoon. While the order of the bypass barrier removal was modified during these maintenance activities, units were shutoff when a bypass bay became unavailable or discharge through a spill gate that had a removed barrier could not be kept at 15 kcfs.

By June 2023, river flows had decreased and all major maintenance that required spill gate manipulation was complete. Spill was managed according to the Spill Playbook for the remainder of the juvenile bypass season.

4.2.1 Structural

No permanent structural modifications were proposed or completed during the 2023 monitoring season. Continued maintenance work on Spill Gate 9 precluded the release of spill through Spillbay 9 for the duration of the fish bypass period. Although influencing the Spill Playbook, the reduced operational flexibility caused by the maintenance activity did not adversely affect compliance with TDG standards.

5 CONCLUSIONS

TDG performance at the Wells Project during the 2023 season was very good overall. Results support the continued implementation of the Spill Playbook to manage TDG production through operational means and suggest future operational performance should return to extremely high rates of compliance with TDG standards under average flow conditions. There were four instances of exceedances of the 110% TDG standard occurring outside the bypass period that may have been avoidable, and these events are expected to continue to decrease as Douglas PUD maintains its emphasis on system operator training, utilization of the Columbia Basin Research's TDG RealTime Forecaster model, EAS accounting, and coordination with control room operators. Douglas PUD will emphasize testing the Spill Playbook in years where ten units are available 95% of the time (expectation of reliability). The ongoing turbine rebuild project currently only provides 9 out of 10 units for operation during the peak hydrograph, thereby reducing the amount of water that can be passed through the turbine units by approximately 15-20 kcfs. Turbine maintenance is expected to be completed in 2028. Lack of unit availability increases the difficulty of maintaining compliance with WQS because when Wells Project inflow exceeds the reduced turbine capacity, the additional water must be spilled creating more opportunity for TDG increases in the Wells Tailrace. Despite this challenge, overall, Douglas PUD has maintained high TDG compliance with WQS. Douglas PUD will continue to work closely with Ecology towards meeting year-round TDG standards in subsequent years.

6 REFERENCES

Beer, W. N. 2022. Explore, Analyze & Visualize Total Dissolved Gas and environmental conditions at Snake and Columbia River dams. Available online at https://www.cbr.washington.edu/shiny/DAM_CONDITIONS/.

Bickford, S. A., J. R. Skalski, R. Townsend, S. McCutcheon, R. Richmond, R. Frith and R. Fechhelm. 2001. Project survival estimates for yearling summer steelhead migrating through the Wells Hydroelectric Facility, 2000.

Bickford, S. A., T. Kahler, R. Townsend, J. R. Skalski, R. Richmond, S. McCutcheon and R. Fechhelm. 2011. Project survival estimates for yearling Chinook migrating through the Wells Hydroelectric Project, 2010 (2010 spring migrant survival verification study).

Buchanan, R.A. and R.L.Townsend. 2023. Proportion of Juvenile Plan Species Out-migrating through Wells Dam during Juvenile Bypass Operations in 2023. Columbia Basin Research, School of Aquatic and Fishery Sciences, University of Washington. Seattle, Washington.

Buchanan, R.A. and R.L.Townsend. 2022. Proportion of Juvenile Plan Species Out-migrating through Wells Dam during Juvenile Bypass Operations in 2022. Columbia Basin Research, School of Aquatic and Fishery Sciences, University of Washington. Seattle, Washington.

Gingerich, A., S.A. Bickford, T. Kahler, J.R. Skalski, R. L. Townsend, R. Richmond, and S. Anglea. 2020. Project Survival Estimates for Yearling Chinook Migrating Through the Wells Hydroelectric Project, 2020 (2020 Spring Migrant Survival Verification Study). Douglas County Public Utility District. East Wenatchee, WA.

National Marine Fisheries Service (NMFS). 2000. Endangered Species Act – Section 7 Consultation: Biological Opinion. Consultation on Remand for Operation of the Columbia River Power System and 19 Bureau of Reclamation Projects in the Columbia Basin. F/NWR/2004/00727. November 30, 2005. Pages 5-6, 5-7, 5-53, 10-9, and Appendix E: Risk Analysis.

Pickett, P., H. Rueda, M. Herold. 2004. Total Maximum Daily Load for Total Dissolved Gas in the Mid-Columbia River and Lake Roosevelt. Submittal Report. Washington Department of Ecology, Olympia, WA. U.S. Environmental Protection Agency, Portland, OR. June 2004. Publication No. 04-03-002.

Skalski, J. R., G.E. Johnson, C.M. Sullivan, E. Kudera, and M.W. Erho. 1996. Statistical evaluation of turbine bypass efficiency at Wells Dam on the Columbia River, Washington. Canadian Journal of Fisheries and Aquatic Sciences 53:2188-2198.

APPENDIX B

PRE-FILING CONSULTATION RECORD FOR THE 2023 ANNUAL REPORT TOTAL DISSOLVED GAS ABATEMENT PLAN FOR THE WELLS HYDROELECTRIC PROJECT

NOTICE TO AQUATIC SETTLEMENT WORK GROUP TO REVIEW THE TOTAL DISSOLVED GAS ABATEMENT PLAN 2023 ANNUAL REPORT

From: Kristi Geris <kgeris@anchorqea.com>
Sent: Tuesday, January 9, 2024 4:29 PM
To: Andrew Gingerich <andrew.gingerich@dcpud.org>; Blanchard, Monica R (DFW) <Monica.Blanchard@dfw.wa.gov>; Chad Brown <chbr461@ecy.wa.gov>; Chas Kyger <chas.kyger@dcpud.org>; David Blodgett, III <blod@yakamafish-nsn.gov>; Fety, Stuart B (FWS) <stuart_fety@fws.gov>; Jason McLellan <Jason.McLellan@colvilletribes.com>; John Ferguson <jferguson@anchorqea.com>; John Rohrback <john.rohrback@dcpud.org>; Keely Murdoch (murk@yakamafish-nsn.gov) <murk@yakamafish-nsn.gov>; Kristi Geris <kgeris@anchorqea.com>; Laura.Heironimus@dfw.wa.gov; Mariah Mayfield <mariah.mayfield@dcpud.org>; Verhey, Patrick M (DFW) <patrick.verhey@dfw.wa.gov>; Ralph Lampman (lamr@yakamafish-nsn.gov) <lamr@yakamafish-nsn.gov>; RD Nelle <RD_Nelle@fws.gov>; bzim461 <bzim461@ECY.WA.GOV>
Subject: FW: 2023 TDG Annual Report

Hi ASWG Technical Reps: please see the email below from Mariah and the attached draft 2023 TDG/GAP Annual Report, which is available for a 30-day review with edits and comments due to Mariah by **February 10, 2024**.

The attached draft report is also available for download from the Aquatic SWG Extranet Site, under: Documents > All by Mtg Date > 1/10/2024 (instructions below). Thanks! –Kristi

Instructions:

To gain access to the Aquatic SWG Extranet Homepage, please use the following procedure:

* Visit: https://extranet.dcpud.net/sites/nr/aswg/
* Login using “Forms Authentication” (for non-Douglas PUD employees)

You should now be at the Aquatic SWG homepage.

If you encounter problems, or need a login username and password to access the site: Please feel free to contact me, Andrew Gingerich, or Julene McGregor [jmcgregor@dcpud.org; (509) 881-2236] and we will gladly assist you with questions or issues.

Kristi Geris

ANCHOR QEA, LLC
kgeris@anchorqea.com
O (509) 492-3102
M (360) 220-3988

From: Mariah Mayfield <mariah.mayfield@dcpud.org>
Sent: Tuesday, January 9, 2024 16:17
To: Kristi Geris <kgeris@anchorqea.com>
Subject: 2023 TDG Annual Report

Attached is the 2023 TDG Annual Report for the ASWG 30-day review. We would like all comments emailed to me (mariah.mayfield@dcpud.org) by February 10, 2024 and we will be voting to approve the report at the February 14th ASWG meeting. Thank you and let me know if there are any questions.

Mariah

Mariah Mayfield
Aquatic Resource Biologist
Public Utility District No. 1 of Douglas County
1151 Valley Mall Parkway
East Wenatchee, WA 98802
Direct: (509) 881-2326
mariah.mayfield@dcpud.org

COLVILLE CONFEDERATED TRIBES' EMAIL SHOWING APPROVAL OF TOTAL DISSOLVED GAS ABATEMENT PLAN 2023 ANNUAL REPORT

From: John Ferguson <jferguson@anchorqea.com>
Sent: Wednesday, February 14, 2024 8:36 AM
To: Andrew Gingerich <andrew.gingerich@dcpud.org>; Chas Kyger <chas.kyger@dcpud.org>; Mariah Mayfield <mariah.mayfield@dcpud.org>
Cc: Kristi Geris <kgeris@anchorqea.com>
Subject: FW: Aquatic SWG: 2/14 conf call agenda

FYI, from Jason.
J

From: Jason McLellan <jason.mclellan@colvilletribes.com>
Sent: Wednesday, February 14, 2024 8:23 AM
To: Kristi Geris <kgeris@anchorqea.com>; John Ferguson <jferguson@anchorqea.com>
Subject: Re: Aquatic SWG: 2/14 conf call agenda

Hi John,

I have a conflict and this am unable to make today's call. I vote to approve the meeting notes, BOP and GAP reports, and the Bull Trout report.

Sturgeon update - 157 BY23 wild larvae original juvenile White Sturgeon originally caught in Lake Roosevelt are being transferred to Wells hatchery today to make up for the shortfall in the Chelan PUD program.

SAP screening of the BY23 CPUD program fish at Wells is scheduled to start on March 4.

Thanks,
Jason

> On Feb 2, 2024, at 5:52 PM, Kristi Geris <kgeris@anchorqea.com> wrote:
>
> Hi Aquatic SWG: attached is the agenda for the Aquatic SWG conference call on February 14, 2024.
>
> The attached final agenda is also available for download from the Aquatic SWG Extranet Site, under: Documents > All by Mtg Date > 2/14/2024 (instructions below). Thanks, and have a great weekend! –kristi

Instructions:

To gain access to the Aquatic SWG Extranet Homepage, please use the following procedure:

* Visit: https://extranet.dcpud.net/sites/nr/aswg/
* Login using “Forms Authentication” (for non-Douglas PUD employees)

You should now be at the Aquatic SWG homepage.

If you encounter problems, or need a login username and password to access the site:
Please feel free to contact me, Andrew Gingerich, or Julene McGregor [jmcgregor@dcpud.org; (509) 881-2236] and we will gladly assist you with questions or issues.

Kristi Geris | ANCHOR QEA, LLC
Managing Scientist

kgeris@anchorqea.com
Tri-Cities WA
O (509) 492-3102
M (360) 220-3988

ANCHOR QEA,LLC
Please consider the environment before printing this email.
This electronic message transmission contains information that may be confidential and/or privileged work product prepared in anticipation of litigation. The information is intended for the use of the individual or entity named above. If you are not the intended recipient, please be aware that any disclosure, copying distribution or use of the contents of this information is prohibited. If you have received this electronic transmission in error, please notify us by telephone at (206) 287-9130.

FINAL AQUATIC SETTLEMENT WORK GROUP ACTION ITEMS SHOWING APPROVAL OF TOTAL DISSOLVED GAS ABATEMENT PLAN 2023 ANNUAL REPORT

FINAL

Conference Call Action Items

Aquatic Settlement Work Group

To: Aquatic SWG Parties **Date:** February 15, 2024

From: John Ferguson, Chair, Anchor QEA, LLC

Re: **Final Action Items of the February 14, 2024, Aquatic SWG Conference Call**

Below is a summary of Action Items from the Aquatic Settlement Work Group (SWG) meeting that was held by conference call on Wednesday, February 14, 2024, from 10:00 a.m. to 12:00 p.m. Attendees are listed in Attachment A. These action items include the following:

Summary of Action Items

1. The Yakama Nation (YN) will ask Pacific Northwest National Laboratory (PNNL) about possibly presenting results from their 2023 juvenile Pacific Lamprey passage behavior and survival study during a joint meeting of the Aquatic SWG, Rocky Reach Fish Forum (RRFF), and Priest Rapids Fish Forum (PRFF) this spring, 2024 (Item I-C).
2. Douglas PUD will provide additional information about the operation of the return-to-river pipe at Wells Dam, including photographs of inside the Adult Handling Facility where the pipe connects to the sorting table and approximate dates and hours of when flush water might be running through the pipe (Item I-C).
3. Douglas PUD will contact the Washington Department of Fish and Wildlife (WDFW) genetics laboratory regarding *Bull Trout Movement and Life History Investigation 2022–2023* (2022–2023 Bull Trout Study Report), *Appendix C. Genetic Analysis for Bull Trout Prepared by Washington Department of Fish and Wildlife Dated June 2023*, notably for clarification about methods used and populations considered in the genetic analysis (Item II-C).
4. Douglas PUD will ask Grant PUD for information about lamprey trap operations at Priest Rapids Dam, including photographs of how the orifices are configured when the traps are operated (Item II-E).
5. Douglas PUD will consult the YN about lamprey trap operations for implementation at Wells Dam in 2024, including possibly collecting genetic fin clips and release location for fish collected in the traps, for further discussion with the Aquatic SWG (Item II-E).
6. The Aquatic SWG meeting on March 13, 2024, will be held by conference call (Item III-A).

Summary of Decisions

1. Aquatic SWG representatives present approved the *2024 Total Dissolved Gas Abatement Plan and appended Wells Bypass Operating Plan* (2024 GAP/BOP). The Confederated Tribes of the Colville Reservation (CTCR) approved the plan via email prior to the Aquatic SWG conference call on February 14, 2024 (Item II-A).
2. Aquatic SWG representatives present approved the *2023 Annual Report Total Dissolved Gas Abatement Plan* (2023 TDG Report). The CTCR approved the report via email prior to the Aquatic SWG conference call on February 14, 2024 (Item II-B).
3. Aquatic SWG representatives present approved the 2022–2023 Bull Trout Study Report, as revised, including *Appendix A. FERC Order Granting Variance from Radio Telemetry Study Pursuant to Bull Trout Stranding, Entrapment, and Take Study Plan and Article 402 Issued October 12, 2021*, *Appendix B. 2022–2023 Bull Trout Detection History Plots of Individual Study Fish*, and *Appendix C. Genetic Analysis for Bull Trout Prepared by Washington Department of Fish and Wildlife Dated June 2023*. The CTCR approved the report via email prior to the Aquatic SWG conference call on February 14, 2024 (Item II-C).

Agreements

1. Aquatic SWG representatives present agreed to Douglas PUD's proposal to use new sampling methods, fyke nets and hoop nets, for the 2024 Resident Fish Assemblage Study, so Douglas PUD can move forward with purchasing gear for implementation this spring 2024 (Item II-F).

Review Items

1. The draft *Total Dissolved Gas Water Quality Attainment Plan Year 10 Report* (Water Quality Attainment Plan 10-Year Report) was distributed to the Aquatic SWG by Kristi Geris on November 14, 2023, and is available for review with edits and comments due to Mariah Mayfield.
2. The draft 2024 Resident Fish Assemblage Study Plan was distributed to the Aquatic SWG by Kristi Geris on January 29, 2024, and is available for a 30-day review with edits and comments due to Chas Kyger by February 28, 2024. Douglas PUD will request approval of the draft plan during the Aquatic SWG conference call on March 13, 2024 (Item II-F).
3. The draft *2024 Aquatic Settlement Agreement and Workgroup Action Plan* (2024 ASA Action Plan) was distributed to the Aquatic SWG by Kristi Geris on February 13, 2024, and is available for a 30-day review with edits and comments due to Andrew Gingerich by March 12, 2024. Douglas PUD will request approval of the draft plan during the Aquatic SWG conference call on March 13, 2024 (Item II-H).

Documents Finalized

1. The final 2022–2023 Bull Trout Study Report, as revised, including Appendices A, B, and C, were distributed to the Aquatic SWG by Kristi Geris following the Aquatic SWG conference call on February 14, 2024 (Item II-C).

Attachment A – List of Attendees

Name	Role	Organization
John Ferguson	Aquatic SWG Chairman	Anchor QEA, LLC
Kristi Geris	Administration/Technical Support	Anchor QEA, LLC
Chas Kyger	Aquatic SWG Technical Alternate	Douglas PUD
John Rohrback	Aquatic SWG Technical Support	Douglas PUD
Mariah Mayfield	Aquatic SWG Technical Support	Douglas PUD
RD Nelle	Aquatic SWG Technical Representative	U.S. Fish and Wildlife Service
Stuart Fety	Aquatic SWG Technical Alternate	U.S. Fish and Wildlife Service
Patrick Verhey	Aquatic SWG Technical Representative	Washington Department of Fish and Wildlife
Laura Heironimus	Aquatic SWG Technical Alternate	Washington Department of Fish and Wildlife
Breean Zimmerman	Aquatic SWG Technical Representative	Washington State Department of Ecology
Ralph Lampman	Aquatic SWG Technical Representative	Yakama Nation

Appendix L
Wells Hydroelectric Project 2024 Total Dissolved Gas Abatement Plan and appended Wells Bypass Operating Plan

From: eFiling@ferc.gov
To: Amber Nealy; efilingacceptance@ferc.gov
Subject: FERC Acceptance for Filing in P-2149-156
Date: Wednesday, February 28, 2024 11:50:36 AM

Acceptance for Filing

The FERC Office of the Secretary has accepted the following electronic submission for filing (Acceptance for filing does not constitute approval of any application or self-certifying notice):

-Accession No.: 202402285171
-Docket(s) No.: P-2149-156
-Filed By: Public Utility District No. 1 of Douglas County, Washington
-Signed By: Amber Nealy
-Filing Type: Environmental and Recreational Compliance Report
-Filing Desc: Public Utility District No. 1 of Douglas County, Washington submits 2024 Gas Abatement Plan and Bypass Operating Plan for the Wells Hydroelectric Project under P-2149.
-Submission Date/Time: 2/28/2024 1:37:44 PM
-Filed Date: 2/28/2024 1:37:44 PM

Your submission is now part of the record for the above Docket(s) and available in FERC's eLibrary system at:

https://elibrary.ferc.gov/eLibrary/docinfo?accession_num=20240228-5171

If you would like to receive e-mail notification when additional documents are added to the above docket(s), you can eSubscribe by docket at:

https://ferconline.ferc.gov/eSubscription.aspx

Thank you again for using the FERC Electronic Filing System. If you need to contact us for any reason:

E-Mail: ferconlinesupport@ferc.gov mailto:ferconlinesupport@ferc.gov (do not send filings to this address)
Voice Mail: 866-208-3676.

Commissioners:
RONALD E. SKAGEN
MOLLY SIMPSON
AARON J. VIEBROCK

General Manager:
GARY R. IVORY

Public Utility District No. 1 of Douglas County

1151 Valley Mall Parkway • East Wenatchee, Washington 98802-4497 • 509/884-7191 • FAX 509/884-0553 • www.douglaspud.org

Via Electronic Filing

Honorable Kimberly D. Bose
Secretary
Federal Energy Regulatory Commission
888 1st Street N.E.
Washington, D.C. 20426

February 28, 2024

Subject: 2024 Gas Abatement Plan and Bypass Operating Plan
Wells Hydroelectric Project No. 2149 – FERC License Article 401(a)

Dear Secretary Bose:

Pursuant to Article 401(a) of the license for the Wells Hydroelectric Project (Wells Project), the Public Utility District No. 1 of Douglas County (Douglas PUD) hereby submits for approval the 2024 Total Dissolved Gas Abatement Plan (GAP) and the 2024 Bypass Operating Plan (BOP) for the Wells Project.

Article 401(a) requires Douglas PUD to file a GAP approved by the Washington State Department of Ecology (Ecology) by February 28th during each year of the license. The final GAP is attached as Appendix A to this letter and was reviewed and approved by all of the parties to the Aquatic Settlement Agreement (ASA) and Anadromous Fish Agreement and Habitat Conservation Plan (HCP) including Ecology, the National Marine Fisheries Service (NMFS), United States Fish and Wildlife Service (USFWS), Washington State Department of Fish and Wildlife (WDFW), the Confederated Tribes of the Colville Reservation (CTCR) and the Confederated Tribes and the Bands of the Yakama Nation (Yakama Nation).

The enclosed 2024 GAP is consistent with (1) the Water Quality Management Plan that is contained within the ASA and Condition 6.7(2)(a) of Ecology's Clean Water Act Section 401 Water Quality Certification (401 Certification) and (2) the NMFS Endangered Species Act Incidental Take Statement (ITS) Reasonable and Prudent Measure No. 2 for the Wells Project.

Article 401(a) also requires Douglas PUD to file a BOP that has been approved by the NMFS within year one of the new license. The Wells HCP requires Douglas PUD to annually submit the BOP to the HCP Coordinating Committee (HCP CC) for review and approval. Section 6.7(2)(d) of the 401 Certification requires Douglas PUD to closely coordinate the content and review processes for the GAP and BOP. No comments or revisions on the 2024 GAP and BOP were received from HCP CC members prior to approving the final GAP and BOP. The final 2024 BOP is attached within Appendix A to this letter. The 2024 GAP and BOP were reviewed by all of the agencies and tribes participating in the HCP process, including the NMFS. The 2024 GAP and

BOP were distributed to the HCP CC on January 9, 2024 and was approved by all parties present during the February 27, 2024 HCP CC meeting. The USFWS approved the 2024 GAP and BOP by email, in advance of the February 27, 2024 conference call. The HCP CC consultation and approval process is attached in Appendix B.

A draft copy of the 2024 GAP and BOP was provided to the Aquatic Settlement Work Group (Aquatic SWG) on January 9, 2024 to ensure close coordination between the review of the BOP and the GAP. No comments or revisions on the 2024 GAP and BOP were received from Aquatic SWG members prior to approving the final GAP and BOP. Ecology, in accordance with the requirements of the 401 Certification, section 6.7 [2][d]), and the remaining Aquatic SWG members present during the February 14, 2024 Aquatic SWG conference call approved the 2024 GAP and BOP. The CTCR approved the 2024 GAP and BOP on February 14, 2024 by email, in advance of the February 14, 2024 conference call. The Aquatic SWG's consultation and approval process specific to the 2024 GAP and BOP is attached as Appendix C.

Douglas PUD respectfully requests that the FERC approve the enclosed GAP and BOP for the Wells Project prior to the start of the fish spill season that will begin in April 2024. If you have any questions or require further information regarding the enclosed plans or the consultation record supporting the approval and coordination of these plans, please feel free to contact Tom Kahler at (509) 881-2322, tomk@dcpud.org or Mariah Mayfield at (509) 881-2326, mariah.mayfield@dcpud.org.

Sincerely,

Andrew Gingerich
Natural Resources Supervisor

Appendix A – 2024 Total Dissolved Gas Abatement Plan and Bypass Operating Plan – Wells Project

Appendix B – HCP Coordinating Committee Pre-filing Consultation Record for the 2024 Gas Abatement Plan and Bypass Operating Plan

Appendix C – Aquatic Settlement Work Group Pre-filing Consultation Record for the 2024 Gas Abatement Plan and Bypass Operating Plan

Cc: Wells HCP Coordinating Committee
Wells Aquatic Settlement Work Group
Mr. Chad Brown – Ecology
Ms. Mariah Mayfield – Douglas PUD
Mr. John Rohrback – Douglas PUD
Mr. Shane Bickford – Douglas PUD
Mr. Tom Kahler – Douglas PUD

APPENDIX A

2024 TOTAL DISSOLVED GAS ABATEMENT PLAN AND BYPASS OPERATING PLAN FOR THE WELLS HYDROELECTRIC PROJECT

2024 TOTAL DISSOLVED GAS ABATEMENT PLAN

WELLS HYDROELECTRIC PROJECT

FERC PROJECT NO. 2149

Prepared by:

Public Utility District No. 1 of Douglas County
East Wenatchee, Washington

Prepared for:

Washington Department of Ecology
Water Quality Program
Central Regional Office
1250 West Alder Street
Union Gap, WA 98903-0009

And

Aquatic Settlement Work Group

February 2024

© Copyright 2024. Public Utility District No. 1 of Douglas County. All Rights Reserved.

TABLE OF CONTENTS

1.0 INTRODUCTION AND BACKGROUND 2

1.1 Project Description 2
1.2 Regulatory Framework 5
1.2.1 Federal Columbia River Power System 8
1.2.2 7Q-10 Flood Flows 9
1.2.3 Fish Passage Season and Spill 9
1.2.4 Incoming TDG Levels 9
1.2.5 Additional 401 Certification Requirements 10
1.2.6 Additional Requirements of the FERC Operating License 13
1.3 History of Operations and Compliance 13
1.3.1 Historical Project Operation Flows 13
1.3.2 Spill Operations 14
1.3.2.1 General Operation 14
1.3.2.2 Spill for Fish 14
1.3.2.3 Flows in Excess of Hydraulic Capacity 15
1.3.2.4 Flow in Excess of Power Demand 16
1.3.2.5 Gas Abatement Spill 16
1.3.2.6 Other Spill 16
1.3.3 Compliance Activities in Previous Years 17
1.3.3.1 Operational 17
1.3.3.2 Structural and maintenance 19
1.3.4 Compliance Success in 2023 19

2.0 PROPOSED OPERATIONS AND ACTIVITIES 21

2.1 Operational Spill 21
2.2 Implementation 21
2.2.1 Fisheries Management Plans 21
2.2.2 Biological Monitoring Plan 23
2.2.3 Water Quality Forums 25
2.3 Water Quality Attainment Plan and Quality Assurance Project Plans 25

3.0 COMPLIANCE AND PHYSICAL MONITORING 26

3.1 Monitoring Locations 26
3.2 Quality Assurance 27
3.3 Reporting 28

4.0 CONCLUSIONS 28

5.0 LITERATURE CITED 29

6.0 APPENDICES 31

LIST OF TABLES

Table 1. Monthly average river discharge (kcfs) from the Wells Project, 1969-2023. New historic (since 1969) minimum values were set in September and October of 2023 (bolded values). 13
Table 2. Percent of migration of Plan Species passing Wells Dam during 2023 bypass operations. 15
Table 3. 2023 TDG Compliance Summary. 20
Table 4. Wells Project Juvenile Survival Study Results for 1998-2000, 2010, and 2020 22
Table 5. Wells Project Habitat Conservation Plan Species Phase Designations. 22

LIST OF FIGURES

Figure 1. Map of the Wells Hydroelectric Project in Central Washington. 3
Figure 2. Artistic depiction of Wells Dam illustrating its hydrocombine design and Juvenile Bypass System. 4
Figure 3. Wells forebay TDG from January to October 2023. The reference line at 110% represents the EPA and CTCR Tribal Waters compliance threshold. 10
Figure 4. Total incoming flows to Wells Dam (blue) December 14-15, 2022 relative to outflows at Wells Dam (green) during the same period. 14

APPENDICES

Appendix 1 Wells Hydroelectric Project Spill Playbook 32
Appendix 2 Wells Hydroelectric Project Bypass Operating Plan 43

EXECUTIVE SUMMARY

Washington State Water Quality Standards (WQS) are defined in Washington Administrative Code (WAC) Chapter 173-201A and are administered by the Washington Department of Ecology (Ecology). Compliance with the total dissolved gas (TDG) standard requires that TDG not exceed 110% at any point of measurement in any state water body. A dam operator is not held to the TDG standards when the river flow exceeds the seven-day, 10-year-frequency flood (7Q-10). In addition to allowances for natural flood flows, Ecology has approved a TDG exemption for Columbia and Snake River dams on a per-application basis (WAC 173-201A-200(1)(f)(ii)). The exemption allows for adjusted TDG criteria to provide spill for juvenile fish passage at hydroelectric dams when consistent with an Ecology-approved Gas Abatement Plan (GAP).

Prior to 2020, a project operator providing anadromous fish passage might apply for modifications to the 110% TDG standard on the Columbia and Snake rivers that would allow for the employment of three separate standards during the fish migration period: 1) TDG shall not exceed 125% in the tailrace of a dam, as measured in any one-hour period; 2) TDG shall not exceed 120% in the tailrace of a dam; and 3) TDG shall not exceed 115% in the forebay of the next dam downstream. Compliance with the latter two standards was determined using an average of the 12 highest consecutive hourly readings in any 24-hour period. The increased levels of spill, resulting in elevated TDG levels, were intended to allow increased fish passage with less harm to anadromous fish populations than what would be caused by turbine fish passage. Ecology's scientific basis for the TDG exemption was a risk analysis conducted by the National Marine Fisheries Service (NMFS; NMFS 2000).

Beginning in 2020, Ecology's TDG rules allow for the employment of a simplified TDG criteria for the spring migration period (generally defined as April through June). Dam operators providing anadromous fish passage on the mainstem Columbia and Snake Rivers may apply for new spring TDG criteria, whereby TDG may not exceed 126% in the tailrace of dams as measured by the average of the two highest consecutive hourly readings in a day, nor have any TDG values above 125% as measured as the 12 highest hourly values in a day. Outside the spring migration period, the pre-2020 120% tailrace and 115% forebay standards apply when spilling water at dams is necessary to aid in fish passage (at Wells Dam, this is typically July-August). Applicants intending to use this modified rule must develop an Ecology-approved GAP and a biological monitoring plan that examines both salmonids and resident fish species (beginning in 2021).

The goal of the 2024 Wells Total Dissolved GAP is to implement a long-term strategy to achieve compliance with the Washington State WQS criteria for TDG in the Columbia River at the Wells Hydroelectric Project (Wells Project) while continuing to provide safe passage for downstream migrating juvenile salmonids. Public Utility District No. 1 of Douglas County, which owns and operates the Wells Project, is submitting this GAP to Ecology as required for receipt of a TDG exemption at Wells Dam.

1.0 INTRODUCTION AND BACKGROUND

The 2024 Wells Hydroelectric Project (Wells Project or Project) Gas Abatement Plan (GAP) provides details on operational and structural measures to be implemented by Public Utility District No. 1 of Douglas County, Washington (Douglas PUD) at Wells Dam under the Federal Energy Regulatory Commission (FERC) license for Project No. 2149. These measures are intended to result in compliance with the modified Washington State water quality standards (WQS) for total dissolved gas (TDG) allowed under the TDG exemption, provided incoming water to the Project is in compliance and flows are below the seven-day, 10-year-frequency flood levels (7Q-10: 246 kcfs).

The goal of the 2024 GAP is to implement a long-term strategy to achieve compliance with the Washington State WQS for TDG in the Columbia River at the Wells Project while continuing to provide safe passage for downstream migrating juvenile salmonids via spill. Public Utility District No. 1 of Douglas County (Douglas PUD) is the owner and operator of the Wells Project and is submitting this GAP to the Washington Department of Ecology (Ecology) for approval as required for receipt of a TDG exemption for fish passage.

Since 2003, Ecology has approved GAPs and issued TDG exemptions for the Wells Project on an annual basis. The 2024 GAP contains the following information: Section 1.0 summarizes the background regulatory and project-specific TDG information at the Wells Project; Section 2.0 contains proposed Wells Project operations and activities related to TDG management; Section 3.0 provides a summary of compliance and physical monitoring plans, quality assurance and quality control procedures, and reporting; and Section 4.0 provides conclusions of the GAP.

1.1 Project Description

The Wells Project is located at river mile (RM) 515.6 on the Columbia River in the State of Washington (Figure 1). Wells Dam is located approximately 30 river miles downstream from the Chief Joseph Hydroelectric Project, which is owned and operated by the United States Army Corps of Engineers (USACE), and 42 miles upstream from the Rocky Reach Hydroelectric Project, which is owned and operated by Public Utility District No. 1 of Chelan County (Chelan PUD). The nearest town is Pateros, Washington, which is located approximately 8 miles upstream from Wells Dam.

The Wells Project is the chief generating resource for Douglas PUD. It includes ten generating units with a nameplate rating of 832,320 kW and a peaking capacity of approximately 840,000 kW. The spillway consists of eleven spill gates that are capable of spilling a total of 1,180 thousand cubic feet per second (kcfs). The crest of the spillway is approximately five and a half feet above normal tailwater elevation and two feet below tailwater elevation when plant discharge is 219 kcfs (the hydraulic generating capacity of the Wells Project, see below Section 1.3.2.3). The design of the Wells Project is unique in that the generating units, spillways, switchyard, and fish passage facilities were combined into a single structure referred to as the hydrocombine. Fish passage facilities reside on both ends of the hydrocombine, which is 1,130 feet long, 168 feet wide, with a dam top elevation of 795 feet above mean sea level (msl).

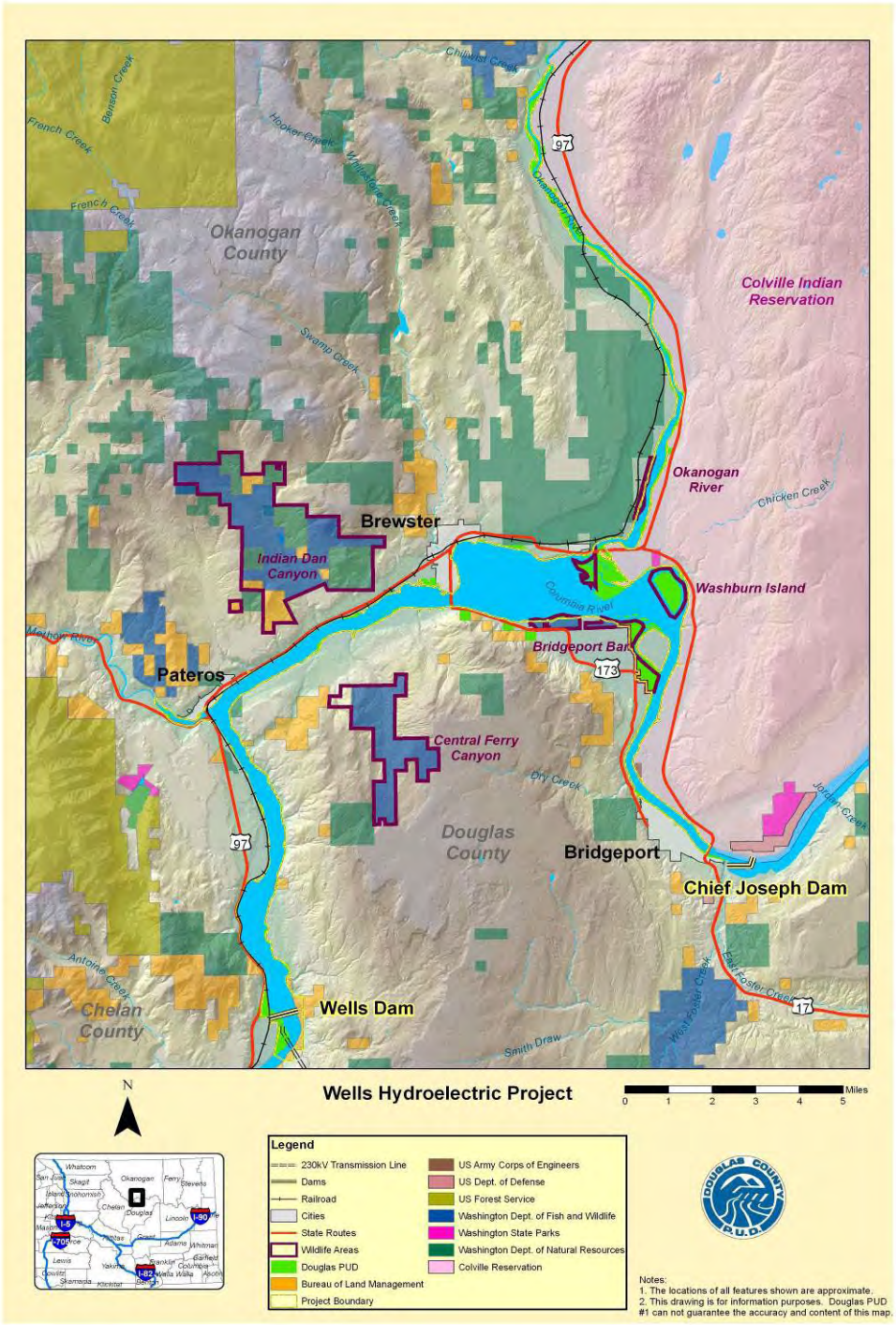


Figure 1. Map of the Wells Hydroelectric Project in Central Washington.

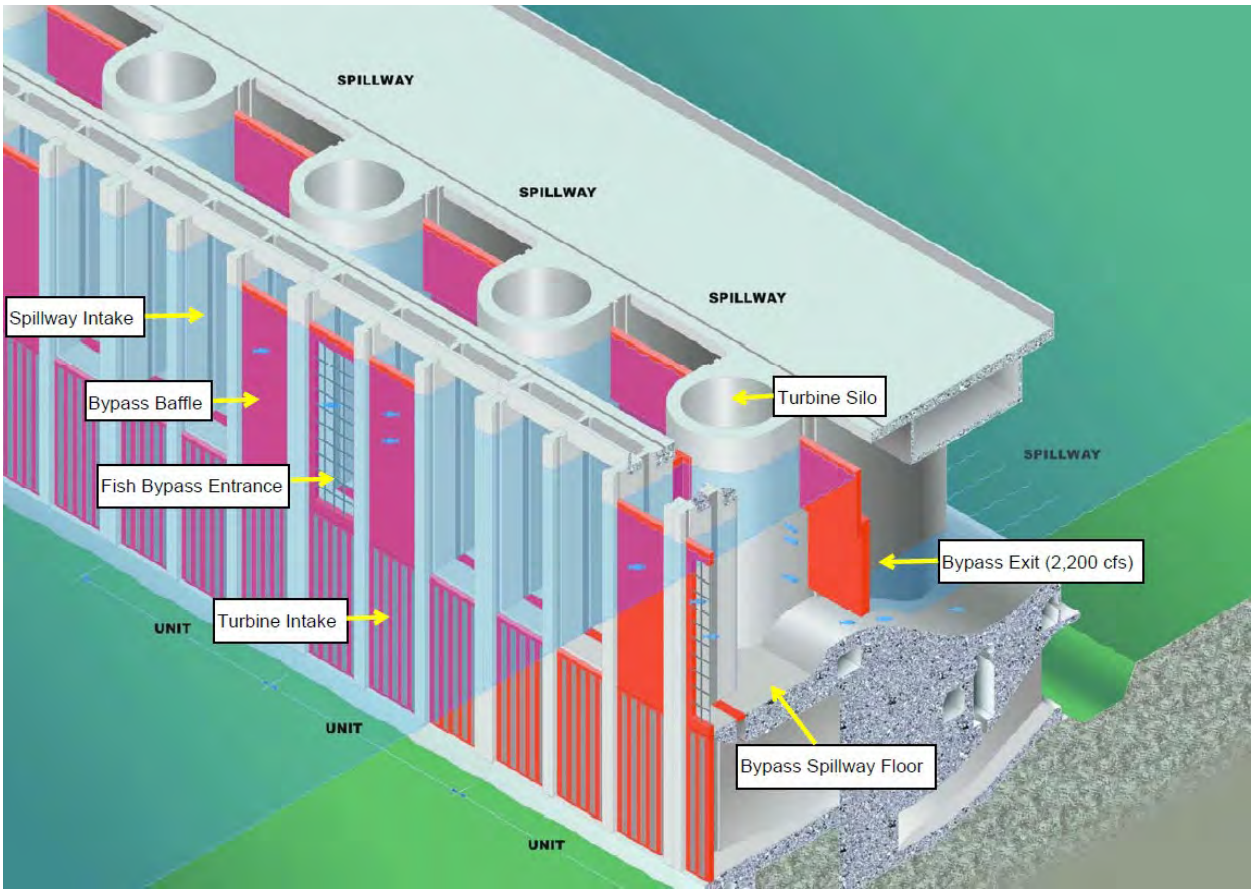


Figure 2. Artistic depiction of Wells Dam illustrating its hydrocombine design and Juvenile Bypass System.

The Juvenile Bypass System (JBS) was developed by Douglas PUD and uses a barrier system to modify the intake velocities on all even-numbered spillways (2, 4, 6, 8 and 10). Figure 2 illustrates the hydrocombine and JBS, as described below (italicized terms are identified in the figure). Ten *Turbine Silos* are straddled by 11 spillways, five of which are operated to function as the JBS. During juvenile salmon migration, *Spillway Intakes* for each even-numbered spillway are modified by the insertion of *Bypass Baffles* on either side of *Fish Bypass Entrances* to constrict surface flows and direct fish towards the *Bypass Exit* (spillway gate). *Fish Bypass Entrances* provide 64, 4x4-foot openings in the upper 73 feet of the water column and extend to the *Bypass Spillway Floor*. *Turbine Intakes* are located approximately 75 feet below the water surface and extend to the forebay floor at a depth of approximately 130 feet.

The Wells Project is considered a "run-of-the-river" project due to its relatively limited usable storage capacity. As a run-of-river project, the daily average volume of water discharged from Wells Dam equals the daily average volume of water received into the project from the upstream federal storage dams plus smaller inputs of water from the Methow and Okanogan Rivers. During most of the year, more than 95% of the water entering the Wells Project originates from Chief Joseph Dam with only 5% of the flow being sourced from these two tributaries. Spring

run-off and strong fall/winter rain systems provide the only aberrations to the percent of bulk flows from tributary inputs into the Project.

The Wells Reservoir is approximately 30 miles long. The Methow and Okanogan Rivers are tributaries to the Columbia River within the Wells Reservoir. The Wells Project boundary extends approximately 1.5 miles up the Methow River and approximately 15.5 miles up the Okanogan River. The surface area of the reservoir is 9,740 acres with a gross storage capacity of 331,200 acre-feet and usable storage of 97,985 acre-feet at the normal maximum water surface elevation of 781 feet.

1.2 Regulatory Framework

Article 401(a) of the FERC license for the Wells Project requires that the GAP be developed in consultation with the United States Fish and Wildlife Service (USFWS), Washington State Department of Fish and Wildlife (WDFW), Ecology, Confederated Tribes of the Colville Reservation (CTCR), Confederated Tribes and Bands of the Yakama Nation, United States Bureau of Land Management, and United States Bureau of Indian Affairs. The GAP must also be developed in consultation with the National Marine Fisheries Service (NMFS), which occurs via the review process in the Wells Habitat Conservation Plan (HCP) Coordinating Committee (CC) where the Wells Bypass Operating Plan (BOP) is integrated with the GAP to minimize TDG production during periods of JBS operation. The Ecology-approved GAP must then be submitted to the FERC for approval by February 28 of each year as required by the Wells Project license (FERC license article 401[a]). The GAP is also due to Ecology by February 28 each year (401 Certification 6.7[2][a][i]).

Under the WQS found in WAC Chapter 173-201A, Section 200(1)(f), TDG shall not exceed 110% at any point of measurement in any state water body. However, the standards exempt dam operators from this TDG standard when the river flow exceeds the 7Q-10 flow. The 7Q-10 flow is the highest calculated flow of a running seven consecutive day average, using the daily average flows that may occur in a 10-year period. The 7Q-10 total river flow for the Wells Project was computed using the hydrologic record from 1974 through 1998, coupled with a statistical analysis to develop the number from 1930 through 1998. These methods follow the United States Geological Survey (USGS) Bulletin 17B, “Guidelines for Determining Flood Flow Frequency” and determined that the 7Q-10 flow at Wells Dam is 246,000 cfs (Ecology et. al. 2004).

In addition to allowances for natural flood flows, historically Ecology allowed adjustment to the TDG criteria to aid fish passage over hydroelectric dams when consistent with an Ecology-approved GAP (as defined in subsection ii of Section 200(1)(f)). Such a plan must have been accompanied by fisheries management and physical and biological monitoring plans. Ecology approved, on a per-application basis, an exemption to the TDG standard (110%) that allowed Columbia and Snake River dam operators to spill water at projects that often increase TDG beyond 110% but allow for safe juvenile fish passage through non-turbine passage. The Ecology-approved TDG exemption comprises three separate criteria:

1. TDG shall not exceed 125% in any one-hour period in the tailrace of a dam;
2. TDG shall not exceed 120% in the tailrace of a dam; and
3. Shall not exceed 115% in the forebay of the next dam downstream.

Compliance criteria 2 and 3 above were measured as an average of the 12 highest consecutive hourly readings (12C-High) and could include hours from the previous or subsequent day in calculation. Ecology's scientific basis for the TDG exemption at Columbia and Snake Rivers hydroelectric projects was based on a risk analysis conducted by the NMFS (NMFS 2000). However, in 2019 Ecology modified this rule to be the average 12 highest hourly readings within a calendar day. Since 2020, this new calculation has been implemented in the GAP annual compliance monitoring and reporting.

On July 31, 2019, Ecology proposed amendments to Chapter 173-201A Washington Administrative Code (WAC) WQS for Surface Waters of the State of Washington (AO # 19-02). The proposed amendments considered during rulemaking included amending the numeric criteria for TDG in the Snake and Columbia rivers at WAC 173-201A-200(1)(f)(ii). The goal of this amendment was to improve fish passage for salmon and steelhead migrating downstream in the Snake and Columbia rivers (Ecology, 2019). On December 30, 2019, Ecology adopted the new WQS (WSR 20-02-091) with minor revisions to the draft. The new rule allows dam operators on the Columbia River that provide anadromous fish passage to implement one of two WQS during the spring bypass period. Option A is largely a preservation of the WQS (prior to 2020), with some subtle changes to calculations (See footnotes below). Option B is a reduction from three standards to two tailrace standards during spring migration periods (generally April through June), with additional biological monitoring requirements. The final rule with options A and B described is provided below:

The TDG criteria may be adjusted to aid fish passage over hydroelectric dams that spill for anadromous juvenile fish as of the 2020 spill season. The elevated TDG levels are intended to allow increased fish passage without causing more harm to fish populations than caused by turbine fish passage. The following special fish passage exemptions for the Snake and Columbia rivers apply when spilling water at dams is necessary to aid fish passage:

***(A)** TDG must not exceed:*

- *An average of one hundred fifteen percent as measured in the forebays of the next downstream dams and must not exceed an average of one hundred twenty percent as measured in the tailraces of each dam (these averages are calculated as an average of the twelve highest hourly readings[1] in a calendar day[2], relative to atmospheric pressure); and*
- *A maximum TDG saturation level of one hundred twenty-five percent calculated as an average of the two[3] highest hourly TDG measures in a calendar day during spillage for fish passage.*

[1] Used to be 12 highest *consecutive* hours.
[2] Used to allow for spanning *multiple* days.
[3] Used to be highest *single* hourly value

OR

(B) *To further aid fish passage during the spring spill season (generally from April through June), spill may be increased up to the following levels as measured at the tailrace fixed site monitoring location:*

- *A maximum TDG saturation level of one hundred twenty-five percent calculated as an average of the twelve highest hourly TDG measures in a calendar day; and*
- *A maximum TDG saturation level of one hundred twenty-six percent calculated as an average of any two consecutive hourly TDG measures.*

These TDG criteria may be applied in place of (f)(ii)(A) of this subsection during spring spill operations when applied in accordance with the following conditions:

- *In addition to complying with the requirements of this chapter, the tailrace maximum TDG criteria at hydropower dams shall be applied in accordance with Endangered Species Act (ESA) consultation documents associated with spill operations on the Snake and Columbia rivers, including operations for fish passage. The ESA consultation documents are those by which dams may legally operate during the time that the adjusted criteria in (f)(ii)(B) of the rule subsection are in use.*
- *Application of the tailrace maximum TDG criteria must be accompanied by a department (Ecology) approved biological monitoring plan designed to measure impacts of fish exposed to increased TDG conditions throughout the spring spill season. Beginning in the year 2021, plans must include monitoring for nonsalmonid fish species and must continue for a minimum of five years, and thereafter as determined by the department.*
- *TDG must be reduced to allowances specified in (f)(ii)(A) of this subsection if the calculated incidence of gas bubble trauma (GBT) in salmonids (with a minimum sample size of fifty fish required weekly) or nonsalmonids (with a minimum sample size of fifty fish required weekly) exceeds:*
  - *GBT in nonpaired fins of fifteen percent; or*
  - *GBT in nonpaired fins of five percent and gas bubbles occlude more than twenty-five percent of the surface area of the fin.*

If GBT exceeds these biological thresholds, additional monitoring must demonstrate the incidence of GBT below biological thresholds before TDG can be adjusted to allowances specified in this subsection. GBT monitoring data shall be excluded from comparison to biological thresholds when higher than normal river flow contributes to excess spill above the ability to meet (f)(ii)(B) of this subsection. This monitoring data exclusion shall apply for one full calendar day after reduced river flow allows attainment of (f)(ii)(B) of this subsection.

For the 2024 Bypass Season, Douglas PUD requests to implement WAC 173-201A-200(1)(f)(ii)(B) from April through June and WAC 173-201A-200(1)(f)(ii)(A) from July through August.

1.2.1 Federal Columbia River Power System

A substantial portion of the Wells Reservoir shares a boundary with the Colville Reservation. Wells Project operations do not affect TDG levels in tribal waters, where the CTCR's TDG standard is a maximum of 110%, year-round, at all locations. This TDG standard is also the U.S. Environmental Protection Agency's (EPA) standard for all tribal waters on the Columbia River, from the Canadian border to the Snake River confluence. TDG levels on the Colville Reservation portion of the mainstem Columbia River within Wells Reservoir result from the operations of upstream federal dams: the USACE's Chief Joseph Dam, located approximately 30 miles upstream of Wells Dam; and Grand Coulee Dam, operated by the U.S. Bureau of Reclamation (Reclamation) and located approximately 52 miles upstream of Chief Joseph Dam.

In 2004, Ecology, the Spokane Tribes of Indians, and the U.S EPA developed a Total Maximum Daily Load (TMDL) report for TDG in the Mid-Columbia and Lake Roosevelt (Pickett et al. 2004). The document indicates that compliance in the Chief Joseph Dam tailrace is regulated by Ecology, CTCR, and EPA. Ecology's standards differ between Phase I and Phase II of implementation of the TMDL with Phase I having identical WA State WQS TDG criteria during fish passage periods (i.e., TDG exemption criteria) and Phase II being 73 mm of Hg (or 110% TDG) in the tailrace of Chief Joseph to the mouth of the Okanogan River (Pickett et al. 2004). In addition, TDG standards in the tailrace of Chief Joseph Dam are enforced by CTCR, whereby standards are 110% as measured at any time of year along the reservation boundary, including the Chief Joseph tailrace, and as an instantaneous measurement (Protection of the Environment, 40 CFR § 131.35; Wright 2017).

Since 2016, the TDG standard in the Chief Joseph and Grand Coulee tailraces were expected to be 110% year-round because Phase I of the TMDL is complete and Phase II of the TMDL is officially being implemented. A spill plan filed by the USACE in July 2015, for the purpose of modifying the TDG standards to facilitate fish passage at the federal Columbia River dams, did not include Chief Joseph or Grand Coulee dams as it had in years before 2015. As such, incoming water and subsequent TDG concentration entering the Wells Project is expected to be ≤110% year-round. However, the USACE should be consulted for updated Spill Priority lists (available at: https://pweb.crohms.org/tmt/documents/spill-priority/) and their performance around the state water quality standard for TDG.

In 2017, Bonneville Power Administration (BPA) and the USACE attempted to spill up to the "gas caps" (TDG limits) at the four lower Columbia and four lower Snake River projects to meet judiciary obligations associated with the Biological Opinion for those Projects. In December 2018, a new agreement was reached between stakeholders, which prevented ongoing legal action against operators in favor of accommodating higher spill volumes at these eight projects. More detail about the Spill Agreement is found in Section 1.2.4 below.

In December 2018, the State of Oregon (Oregon), the State of Washington (Washington), the Nez Perce Tribe, the USACE, Reclamation, and BPA entered into a Spill Agreement for 2019-2021 in response to ongoing litigation between the NMFS and the National Wildlife Federation et al. and related to the protection of ESA listed salmonids on the Snake and Columbia Rivers.

The agreement was put in place with the assumption that both Oregon and Washington would have their respective state agencies provide a temporary 125% TDG standard, thereby allowing for large spill volumes at USACE projects in the spring of 2020 and 2021. To facilitate higher spill volumes at mainstem Columbia River projects, in July of 2019 Ecology proposed draft language that would modify the TDG standards, thereby allowing increased spill volumes (See 1.2 above). Final rule modification occurred on December 30, 2019. From 2020, the USACE has implemented spill regimes in the Lower Snake and Columbia Rivers that facilitate spilling to the gas cap or TDG standards. Litigation is ongoing but similar spill regimes are expected in 2024 as was observed 2020-2023.

1.2.2 7Q-10 Flood Flows

The 7Q-10 flood flow at the Wells Project is 246.0 kcfs. TDG values are not considered in the context of WQS compliance when flows at the Project are at or above the 7Q-10 value.

1.2.3 Fish Passage Season and Spill

The juvenile fish passage season as defined in the HCP runs from the first of April through the end of August. Juvenile fish spill at the Wells Project is a defined action implemented by the HCP CC, and juvenile fish spill at the Project during the fish passage season results in an increase in the survival of downstream migrating juvenile salmonids by passing fish over the spillways instead of through the turbines. The HCP requires that fish spill occur during at least 95% of the migration of juvenile salmonids, and normally fish spill is implemented such that those spill operations have provided non-turbine passage for the middle 99% of the spring and summer migration of juvenile salmonids. Outside the juvenile fish passage season (i.e., September 1st to March 31st), Douglas PUD intends to remain in compliance with the 110% TDG standard. During the juvenile fish passage season, Douglas PUD operates within Project constraints toward compliance with the TDG exemption criteria as detailed in Section 1.2 above. Nothing in these special conditions allows an impact to existing and characteristic uses.

1.2.4 Incoming TDG Levels

During the juvenile fish spill season, TDG concentrations in the Wells Project forebay are primarily determined by operations at upstream projects. The greatest contribution to forebay TDG concentrations is from operations at Chief Joseph and Grand Coulee dams, but operations at hydroelectric projects in Canada immediately upstream of Lake Roosevelt or those on Pend Oreille and Spokane rivers also contribute to TDG production.

On average, water entering the Wells Project in June and July is above 110% more than half the time (Douglas PUD 2023). This mass influx of supersaturated water has resulted in significantly higher TDG concentrations observed in the forebay of Wells Dam that often-exceeded TDG values of 115%. When incoming TDG concentrations are non-compliant, it is impossible for Douglas PUD to comply with WQS, much less to operate the JBS and remain compliant with WQS. However, currently there is no Washington State standard that addresses receiving non-compliant water.

In 2023, the Wells Dam forebay TDG station observed hourly TDG values that were above the 110% WQS during 1248 hours of the juvenile bypass season (Figure 3). During June and July of 2023, this equated to receiving noncompliant water over 85% of the time. Receiving water that enters the Wells Dam forebay that is already out of compliance with Washington State Water Quality Criteria precludes Douglas PUD's ability to meet WQS, particularly during July and August when the Rocky Reach 115% 12-C High compliance metric is in place. Although the Federal Columbia River Power System above Wells Dam is required to meet these WA State WQS, Douglas PUD continues to receive non-compliant water from these Projects.

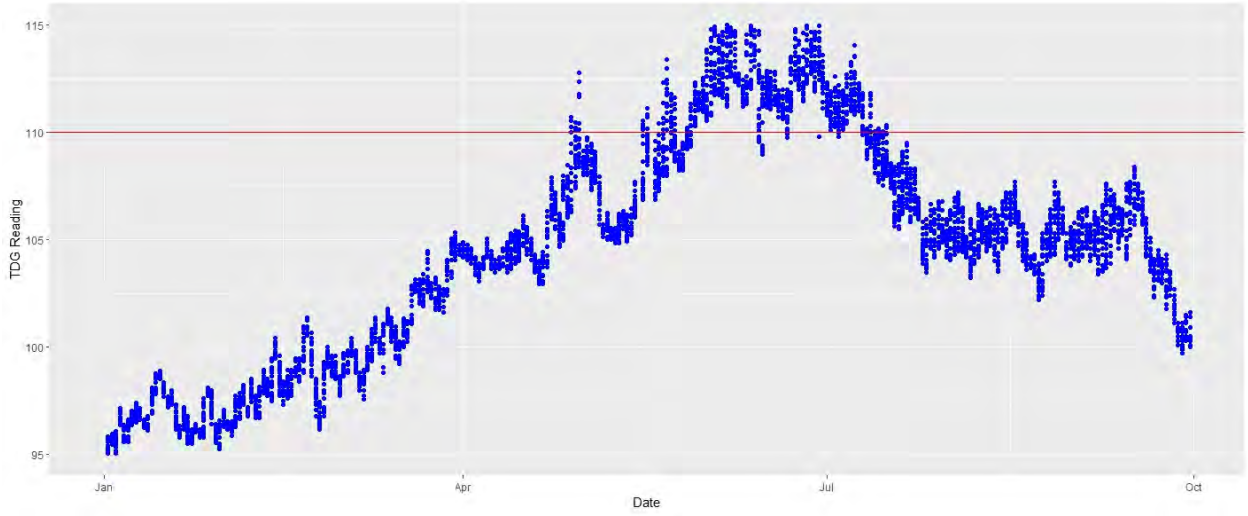


Figure 3. Hourly TDG values observed in the Wells Dam forebay from January to October 2023. The horizontal red reference line at 110% represents the EPA and CTCR Tribal Waters compliance threshold.

1.2.5 Additional 401 Certification Requirements

On May 27, 2010, Douglas PUD filed an application for a new license with the FERC for the Wells Project. On September 30, 2010, Ecology received an application for a 401 Certification from Douglas PUD, requested pursuant to the provisions of 33 USC §1341 (§401 of the Clean Water Act). On September 12, 2011, Douglas PUD withdrew its request and reapplied. On February 27, 2012, Ecology concluded that the Wells Project, as conditioned by its 401 Certification/Order No. 8981, would comply with all applicable provisions of 33 USC 1311, 1312, 1313, 1316, 1317 and appropriate requirements of Washington State law. The 401 Certification general conditions that are relevant to the GAP and the abatement of TDG under the TDG exemption are as follows:

- Douglas PUD shall consult with Ecology before it undertakes any change to the Project or Project operations that might significantly and adversely affect compliance with any applicable water quality standard (including designated uses) or other appropriate requirement of state law.

- Copies of the Wells Project 401 Certification and associated permits, licenses, approvals and other documents shall be kept on site and made readily available for reference by Douglas PUD, its contractors and consultants, and by Ecology.
- Douglas PUD shall allow Ecology access to inspect the Project and Project records required under the 401 Certification for the purpose of monitoring compliance with conditions of the 401 Certification. Access will occur after reasonable notice, except in emergency circumstances.
- Douglas PUD shall, upon request by Ecology, fully respond to all reasonable requests for materials to assist Ecology in making determinations under the 401 Certification and any resulting rulemaking or other process.
- Douglas PUD shall operate the Wells Project in compliance with a GAP approved by Ecology. By February 28 of each year, Douglas PUD shall submit a GAP to Ecology for approval. Pending Ecology's approval of each subsequent GAP, Douglas PUD shall continue to implement the activities identified within the previously approved plan.
- The GAP will include the Spill Operations Plan and will be accompanied by a fisheries management plan (Section 2.2.1) and physical (Section 4.1.1) and biological (Section 2.2.2) monitoring plans. The GAP shall include information on any new or improved technologies to aid in the reduction in TDG.
- Commencing one year after issuance of a new FERC license, Douglas PUD shall monitor and report spill and TDG during non-fish spill season to determine TDG compliance with the 110% standard (Section 4.1.1). The non-fish spill season (generally September to the end of March) is defined as the times of the year that are not considered the fish spill season (generally April to end of August).
- If Douglas PUD, at any point, considers modifying any of the measures identified in the Spill Playbook, they will immediately develop proposed alternative(s) that will produce levels of TDG equal to or less than those estimated to be produced by the measures to be replaced. These measures should be implementable in a similar timeframe and must be submitted to Ecology for review and approval prior to implementation.
- The Project shall be deemed in compliance with the TMDL for TDG as long as it remains in compliance with the terms of the 401 Certification. The certification, including the GAPs and the Water Quality Attainment Plan (Section 2.2.4), is intended to serve as the Project's portion of the Detailed Implementation Plan for the TDG TMDL.

Specific 401 Certification conditions that are relevant to the GAP and the abatement of TDG under the TDG exemption are as follows:

- Commencing one year after issuance of the new license, Douglas PUD shall monitor and report spills and TDG during non-fish spill season to determine compliance with the 110% standard. *(Note. Douglas PUD began collecting the required TDG data toward determining compliance with the 110% standard during the non-fish spill season starting in August 2013).*
- Douglas PUD shall maintain a TDG monitoring program at its Fixed Monitoring Locations in the forebay and tailrace of Wells Dam and/or at other locations as determined by Ecology, in order to monitor TDG and barometric pressure. Douglas PUD shall monitor TDG hourly throughout the year. *(Note. Since the early 2000s, Douglas*

PUD has maintained fixed monitoring stations in the forebay and tailrace of Wells Dam. Since 2013, data has been collected hourly and year-round).

- The TDG monitoring program shall conform to the Ecology Quality Assurance Project Plan (QAPP) requirements per Section 6.7 (f) of the [license] order and the procedures shall be at least as stringent as the quality assurance/quality control calibration and monitoring procedures developed by the USGS for the Columbia River. *(Note. In 2013, Douglas PUD worked with Ecology and filed with the FERC a QAPP for TDG and water temperature monitoring. The FERC issued an Order approving the QAPP on August 8, 2013).*
- Douglas PUD shall provide an annual TDG report to Ecology for review and approval by February 28 of each year. *(Note. Since license issuance, Douglas PUD has submitted a TDG Annual Report to Ecology on or before February 28th of each year).*
- Within one year of issuance of the new license, Douglas PUD shall coordinate the annual HCP Project Fish Bypass/Spill Operations Plan with the GAP, using best available information to minimize the production of TDG. This coordination shall be accomplished in consultation with the Wells HCP Coordinating Committee (HCP CC) and the Aquatic Settlement Work Group (Aquatic SWG). *(Note. Since 2013, Douglas PUD has annually worked with Ecology and the HCP CC to develop the GAP and Bypass Operation Plan concurrently. Once developed these documents are approved by Ecology, the Aquatic SWG and HCP CC before being filed and approved by the FERC).*
- Within one year of license issuance, Douglas PUD shall submit a TDG Water Quality Attainment Plan (WQAP) to Ecology for review and approval. The plan shall include a detailed schedule to ensure compliance with the TDG water quality criteria within 10 years of approval of the WQAP. *(Note. In 2013, Douglas PUD, in consultation with Ecology, developed a TDG WQAP and filed it with the FERC. The FERC filing date was October 21st, 2013. FERC subsequently reviewed and approved the WQAP in an order issued on December 20, 2013. In December 2023, Douglas PUD completed and submitted to Ecology the TDG WQAP Year 10 Report [Douglas PUD 2023]. See Section 2.3 below for additional detail on the WQAP).*
- Douglas PUD shall manage spill toward meeting water quality criteria for TDG during all flows below 7Q-10 by minimizing voluntary spill through operations, including scheduling maintenance based upon predicted flows, avoiding spill by coordinating operations with upstream dams to the extent that it reduces TDG, maximize generation discharge, especially during periods of high river flows, and manage voluntary spill in real time in an effort to continue to meet TDG numeric criteria consistent with the GAP. *(Note. Wells Dam operations continue to manage spill via an annually updated Spill Playbook and GAP).*

1.2.6 Additional Requirements of the FERC Operating License

Article 401(a) of the FERC operating license for Project No. 2149 requires that the GAP be filed with the FERC for approval following the approval of the GAP by NMFS, USFWS, and Ecology. Article 401(b) requires the TDG report be submitted to the FERC by February 28 of each year. Article 401(c) requires FERC authorization of an application to amend the license, prior to the implementation of measures to address non-compliance with numeric water quality criteria.

1.3 History of Operations and Compliance

1.3.1 Historical Project Operation Flows

The Columbia River originates in the headwaters of the Canadian Rockies and receives flow from tributary streams as it travels over 1,243 miles before emptying into the Pacific Ocean. There are 85,300 square miles of drainage area above Wells Dam. The historical natural hydrograph had low flows in November through January with high flows in May through July. Storage dams on the Columbia River and its tributaries upstream of the Wells Project in the U.S. and Canada capture high spring and summer flows to hold for release in the fall and winter months. The current hydrograph of the Columbia River is controlled by upstream, federally managed storage and release regimes, and typically mimics historical flow regimes in terms of the highest flows being observed from May through July (Table 1). Juvenile anadromous salmonid migration occurs within a regime of reduced high flows during the spring migration period.

Table 1. Monthly average river discharge (kcfs) from the Wells Project, 1969-2023. New historic (since 1969) minimum values were set in September and October of 2023 (bolded values).

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
2023	85.7	88.7	66.2	59.7	171.7	97.4	98.2	98.6	49.3	51.1	87.5	76.6	86.3
Average since 1969	109.1	108.5	105.1	115.9	153.2	163.4	133.6	105.8	73.7	73.5	88.2	101.1	110.8
Minimum since 1969	67.4	69.9	56.0	51.9	55.2	73.7	53.4	63.9	**49.3**	**51.0**	63.8	72.6	--
Maximum since 1969	159.2	180.7	193.9	203.8	266.3	348.7	253.8	181.3	123	108.9	110.0	149.0	--
10YR mean (2014-2023)	111.0	111.8	102.3	114.0	167.2	158.0	125.1	105.3	64.5	90.4	90.6	98.1	109.2

In general, the hydropower system and reservoir operations in the Columbia River are coordinated through a set of complex agreements and policies that are designed to optimize the benefits and minimize the adverse effects of project operations. The Wells Project operates within the constraints of the Pacific Northwest Coordination Agreement, Columbia River Treaty, the Hanford Reach Fall Chinook Protection Program Agreement, and the FERC regulatory and license requirements.

1.3.2 Spill Operations

1.3.2.1 General Operation

Douglas PUD receives daily average discharge estimates from BPA for the project immediately upstream, Chief Joseph Dam, and these estimates include values for the next day and following two to three days. Although daily average estimates are provided by BPA, actual flows received can vary dramatically around the daily average. This variability is termed "shape" (e.g. Figure 4), and the more the shape of the received flow deviates from generation requests, the more difficult it is to match turbine discharge to flow shape. When necessary, Douglas PUD can place minimum generation requirements on Wells Dam thereby maintaining or increasing turbine discharge relative to what it may have been under normal load requests. This action is taken to prevent TDG exceedances. Finally, to aid in the minimization of TDG production at downstream projects, Douglas PUD also sends its Wells Project discharge estimates to Chelan PUD, operator of the Rocky Reach Hydroelectric Project immediately downstream.

Figure 4. Total incoming flows to Wells Dam (blue) December 12-14, 2023 relative to outflows at Wells Dam (green) during the same period.

1.3.2.2 Spill for Fish

Wells Dam is a hydrocombine design (see Figure 2) where the spillways are situated above the generating units. Research at Wells Dam in the mid-1980s showed that a modest amount of spill effectively guided 92.0 - 96.2% of the spring and summer downstream migrating juvenile salmonids through the JBS (Skalski et al. 1996; Table 2). The operation of the Wells Project JBS utilizes the five even-numbered spillways. These spillways are modified during the juvenile migration with constricting barriers to improve the attraction flow while using modest levels of water (see Section 1.1). These modified spillways provide non-turbine passage routes for downstream migrating juvenile salmonids during the juvenile outmigration period. Normal operation of the JBS uses approximately 10 kcfs. During periods of extreme high flow, one or more sets of the JBS barriers will be removed to provide adequate spill capacity to respond to an emergency load rejection. Spill barriers may also be removed to minimize TDG production during high spill events, or when flood flows are forecast. Bypass gates are opened when adjacent turbines are operating.

Typically, the JBS will pass approximately 6% to 8% of the total river flow for fish guidance. The operation of the JBS adds a small amount of TDG while meeting a very high level of fish guidance and survival. This high level of fish survival at Wells Dam has met the approval of the fisheries agencies and tribes and is vital to meeting the survival performance standards contained within the FERC-approved HCP. The Wells Project JBS is the most efficient bypass system on the mainstem Columbia River.

Table 2. Percent of migration of Plan Species passing Wells Dam during 2023 JBS operations.

Plan Species	Percent of Migration During JBS Operations
Sockeye	99.98%
Subyearling Chinook	98.93%
Yearling Chinook	99.99%
Coho	100.0%
Steelhead	99.95%

Historically, annual start and stop dates for JBS operations were set by the HCP CC before the beginning of the season based on annually updated long-term monitoring, with the intent of bracketing the run timing of at least 95% of both the spring and summer migrants. However, beginning in 2023, the HCP CC used the data from RealTime Forecasters for estimating cumulative passage of juvenile salmonids at Wells Dam, and to end the JBS operations once 95% passage has been reached at Rocky Reach Dam[4], rather than on a date fixed at the beginning of the season. In 2023, JBS operations ended on July 24, when over 98% of all juvenile HCP Plan Species had passed Wells Dam (Buchanan and Townsend 2023). Douglas PUD will continue to use RealTime Forecasters to determine the appropriate end date for the JBS for 2024. RealTime Forecasters is a publicly available program created by University of Washington School of Aquatic and Fishery Sciences staff associated with the Columbia Basin Research office and available online at https://www.cbr.washington.edu/analysis/rt.

1.3.2.3 Flows in Excess of Hydraulic Capacity

The forebay elevation at Wells Dam is maintained between 781.0 and 771.0 feet msl. The Wells Project has a hydraulic generating capacity of 219 kcfs (ASL 2007) and a spillway capacity of 1,180 kcfs. In recent years, however, the Wells Project has had less than 200 kcfs generating capacity due to ongoing generator and turbine rebuild projects.

[4] Using Rocky Reach Dam JBS index counts and program RealTime Forecaster is a conservative approach to ending bypass operations at Wells Dam since it does not correct for the travel-time delay between Wells Dam and Rocky Reach. If 95% of the run is completed at Rocky Reach, then some value greater than 95% will have passed Wells Dam given that travel times for summer Chinook between Wells and Rocky Reach dams are more than one day and had a median of 11 days in the most recent passage dates analysis (Buchanan and Townsend 2023).

The Wells Project is a run-of-the-river project with relatively small usable storage capacity (~98,000-acre ft.). By comparison, Grand Coulee Dam, two projects upstream of Wells Dam, has a reservoir with 58 times the storage capacity of the Wells Reservoir. River flows in excess of the hydraulic generating capacity at Wells Dam must be passed over the spillways.

1.3.2.4 Flow in Excess of Power Demand

Spill may occur at flows less than the Wells Project hydraulic generating capacity when the volume of water is greater than the amount required to meet electric power system loads. This may occur during temperate weather conditions and when power demand is low, or when non-power constraints on river control result in water being moved through the Mid-Columbia at a different time of day than when power is required (i.e. off-peak periods). Spill in excess of power demand provides benefit to migrating juvenile salmonids since fish passing through the spillways survive at a higher rate relative to fish passing through a turbine. Additionally, when spill is increased, turbulence in the tailrace may help reduce predation and increased velocities can help reduce egress time, both of which may help increase survival.

1.3.2.5 Gas Abatement Spill

Gas Abatement Spill is used to manage TDG levels throughout the Columbia River Basin. The Technical Management Team (including NMFS, USACE, and BPA) implements and manages this spill. Gas Abatement Spill is requested by dam operators at other projects in the Columbia and Snake rivers where gas levels are high and the spill is occurring past unloaded turbine units. A trade of power generation for spill is made between operators, providing power generation in the river with high TDG and trading that energy for an equivalent amount of spill from a project or river where TDG is well below standards. Historically, Douglas PUD accommodated requests to provide Gas Abatement Spill. However, in an effort to limit TDG generated at the Wells Project, Douglas PUD has adopted a policy of only accepting Gas Abatement Spill at Wells Dam when it can be demonstrated that it will not result in a violation of the WQS for TDG.

1.3.2.6 Other Spill

Other spill includes spill as a result of maintenance or plant load rejection. A load rejection occurs when the generating plant is forced off-line by an electrical fault, which trips breakers and shuts off generation. At a run-of-the-river hydroelectric dam, if water cannot flow through operating turbines, then the river flow that was producing power must be spilled until turbine operation can be restored. These events are extremely rare, and account for approximately 10 minutes every ten years.

Maintenance spill is utilized for any activity that requires spill to assess the routine operation of individual spillways and turbine units. These activities include checking gate operation, conducting index and generator load testing and all other maintenance activities that would require spill to pass water or debris. The FERC requires that all spillway gates be operated once per year. To control TDG levels associated with maintenance spill, Douglas PUD limits, to the extent practical, maintenance spill during periods of peak flow and high TDG.

1.3.3 Compliance Activities in Previous Years

1.3.3.1 Operational

Since the Wells Project is a run-of-the-river project with a relatively small storage capacity, river flows in excess of the ten-turbine hydraulic capacity must be passed over the spillways. Minimization of involuntary spill has primarily focused on minimizing TDG production dynamics of water spilled based upon a reconfiguration of spillway operations. The 2009 Wells Project GAP (Le and Murauskas 2009) introduced the latest numerical model developed by the University of Iowa's IIHR-Hydroscience and Engineering Hydraulic Research Laboratories. The two-phase flow computational fluid dynamics tool was used to predict hydrodynamics of TDG distribution within the Wells Dam tailrace and further identify operational configurations that would minimize TDG production at the Project. In an April 2009 report, the model demonstrated that Wells Dam can be operated to meet the TDG exemption criteria during the passage season at flows up to 7Q-10 levels provided the forebay TDG levels are below 115%. Compliance was achieved through the use of a concentrated spill pattern through Spillway 7 and surplus flow volume through adjacent odd numbered spillways in a defined pattern and volume. These preferred operating conditions create surface-oriented flows by engaging submerged spillway lips below the ogee, thus increasing degasification at the tailrace surface, decreasing supersaturation at depth, and preventing high-TDG waters from bank attachment. These principles were the basis of the 2009 Wells Project Spill Playbook and were fully implemented for the first time during the 2009 fish passage (spill) season with success. Overall, no exceedances were observed in either the Wells Dam tailrace or the Rocky Reach forebay in 2009.

In 2010, the concepts from the 2009 Spill Playbook were integrated into the 2010 Wells Project Spill Playbook, given their effectiveness in maintaining levels below TDG criteria during the previous year. High Columbia River flows in June, which exceeded the preceding 15-year average flow, resulted in several exceedances of the hourly (125% maximum) and 12C-High (120%) TDG limits in the Wells Dam tailrace, and Rocky Reach forebay (115%). In response, Douglas PUD implemented an in-season analysis of the 2010 Spill Playbook and determined that full implementation of the recommendations from IIHR Engineering Laboratory would require the removal of the juvenile fish bypass system flow barriers in one even numbered spillway. Following the in-season analysis and consultation with the HCP CC, changes were made to the 2010 Spill Playbook that allowed for the removal of the juvenile fish bypass system barriers in Spillway 6. Specifically, the Spill Playbook was modified to state that when spill levels approach the 53-kcfs threshold, the JBS barriers in Spillway 6 would be removed in order to remain in compliance with the TDG criteria in the Wells Dam tailrace and Rocky Reach Dam forebay. When spill exceeded 53 kcfs, excess spill would be directed through Spillways 6 and 7 rather than through Spillways 5 and 7. This operational configuration resulted in a more compact spill pattern that reduced the air-water interface surface area between spillway flows and the subsequent potential for lateral mixing and air entrainment.

In February 2011, Douglas PUD conducted an additional technical analysis of the 2010 Spill Playbook (after in-season changes) and confirmed that continued implementation would be appropriate for 2011 with additional minor modifications. Following approval of the 2011 GAP

by Ecology, the 2011 Spill Playbook was implemented. Only minor changes were made to the 2012 Spill Playbook as a result of high compliance during the 2011 spill season.

In December of 2012, the final GAP report was completed for the 2012 spill season. After analysis it was determined that the 2012 spill season had the 3rd highest average monthly flows since 1969 (April- August). In addition, incoming flows from Chief Joseph Dam were consistently above 115%. Despite these conditions Wells Dam demonstrated high compliance with all standards aside from the Rocky Reach Forebay 115% 12C-High standard, since incoming flows to Wells Dam were above 115% for more than half the days in the spill season.

A Spill Playbook nearly identical to 2012 was employed in 2013-2014. One minor modification included the use of Spillways 5 and 6 when flows exceeded 40 kcfs instead of Spillway 7 since the prolonged rebuild of turbine unit 7 precluded spilling over a loaded unit. Flows for the 2013 and 2014 fish passage season were lower compared to flows observed in the previous two years, which allowed Douglas PUD to reduce spill volumes and maintain normal bypass operations for greater lengths of time compared to 2011 and 2012. In addition, this resulted in improved TDG performance.

The 2015–2020 Spill Playbooks returned to concentrating spill over 40 kcfs through Spillway 7 rather than Spillway 5, since turbine unit 7 returned to service. The 2021 GAP and BOP again use a concentrated spill pattern that was identified as having a preferred TDG abatement during relicensing studies. However, unlike 2015-2020, in 2021 the concentration spill occurred over units 5, 6, and 4. This modification was made to address spillway maintenance needs on bay 7. Maintenance was needed partly due to the extra use spillway 7 received over the last decade.

The 2022 Spill Playbook used a modified concentrated spill pattern that the concentration of spill utilized Spillways 8, 10, and 4. This modification was necessary to address spillway maintenance needs on Spillway 7 and turbine unit 5. Concentrated spill over Spillway 7 returned for the 2023 bypass season after maintenance was complete.

The 2023 Spill Playbook used a spill pattern that was necessary to account for maintenance on Spillway 9 that made it unavailable during the entirety of the bypass season. In 2023, spill was concentrated through Spillways 7, 6, and 8. Despite having a low-to-average flow year, there were mutliple maintenance and operational actions that took place during May 2023 that required short term deviation from the Spill Playbook, while remaining complaint with the opertaional requirements of the JBS at Wells Dam. These deviations were needed to accomadate maintenance on turbine unit 6 and the lowering of the Wells Reservoir to produce conditions that would help flush fine sediment from the mouth of the Methow River (during a period between May 10, 2023 and May 23, 2023). By June 2023, river flows had decreased and all major maintenance that required spill gate manipulation was complete. Spill was managed according to the Spill Playbook for the remainder of the juvenile bypass season.

Due to continual maintenance activities at the Wells Project, the 2024 Spill Playbook will again utilize a modified spill pattern with concentrations through Spillways 9, 8, and 10 (listed in priority order). As such, a modified Spill Playbook can be found attached as Appendix 1.

1.3.3.2 Structural and maintenance

No structural modifications to the spillways or bypass system were implemented (none were scheduled) during the 2023 fish passage season, although bypass barriers were removed from two spillways: Spillway 4, from which barriers were removed on May 15 and reinstalled on May 24 and Spillway 6, from which barriers were removed on May 10 and reinstalled May 25, because a sustained period of flow in excess of 175 kcfs triggered sequential criteria for JBS barrier removal and in association with the lowering of the Wells Reservoir to allow for a Methow River sediment flush. As with previous versions of the GAP/BOP, the ongoing turbine rebuild project at Wells Dam will not require any additional changes in the 2024 Spill Playbook or GAP implementation apart from the condition that one turbine unit will be unavailable because of the rebuild (Unit 6 in 2024). No other structural modifications are expected in 2024, and the 2024 GAP/BOP has been tailored to this outage.

Typically, each spring and fall two units are taken out of service for biannual maintenance. Under this schedule all ten of the units at Wells Dam are serviced at least every two and half years. Normal biannual maintenance is expected to occur in March and April of 2024 prior to the onset of the elevated spring flows and again in the fall after flows recede. Having increased generation capacity allows Douglas PUD to direct water through the turbines that would otherwise be spilled. This reduces the addition of TDG in the tailrace, and therefore it is critical to be a 9-unit plant during peak flows that are normally observed in May through July of each year. As part of Douglas PUD's commitment to the 401 Certification, operational and maintenance issues like these are examined critically toward meeting compliance with the Washington State WQS.

1.3.4 Compliance Success in 2023

In 2023, five standards were monitored closely during the juvenile fish passage season towards determining effectiveness and developing the 2024 GAP. During the 2023 juvenile fish passage season, despite high flows in May necessitating spill events, compliance with TDG WQS were nearly perfect (Table 3) with only two instances of two-hour-consecutive mean TDG over 126% observed on May 7, 2023. Flows were above average in May but below average during summer and fall months in 2024 (see Table 1). A sixth standard (<110% standard) is included in Table 3 below to provide comprehensive compliance reporting but is not related to fish passage season.

Table 3. 2023 TDG Compliance Summary.

April - June	**Wells Tailrace 125% - Mean 12 Highest Hourly / Day**	
	Non-compliant measurements	0
	7Q-10 flow measurements	0
	Total measurements	91
	DCPUD compliance	**100.0%**
	Wells Tailrace 126% - Two Consecutive Hourly Values	
	Non-compliant measurements	2
	7Q-10 flow measurements	0
	Total measurements	2093
	DCPUD compliance	**99.9%**
July & August	**Wells Tailrace 125% Two-Hour Mean Standard**	
	Non-compliant measurements	0
	7Q-10 flow measurements	0
	Total measurements	62
	DCPUD compliance	**100.0%**
	Wells Tailrace 120% 12C-High Standard	
	Non-compliant measurements	0
	7Q-10 flow measurements	0
	Total measurements	62
	DCPUD compliance	**100.0%**
	Rocky Reach Forebay 115% 12C-High Standard	
	Non-compliant measurements	0
	7Q-10 flow measurements	0
	Total measurements	62
	DCPUD compliance	**100.0%**
Jan - Mar & Sept - Dec	**Wells Tailrace <110% Standard**	
	Non-compliant measurements	5
	Total measurements	5086
	DCPUD compliance	**99.9%**

2.0 PROPOSED OPERATIONS AND ACTIVITIES

2.1 Operational Spill

Based on the Wells Project's TDG performance as a result of 2021-2023 operations implementing the Wells Project Spill Playbook and due to Well Project maintenance activities over the last several years, modified operating principles will be implemented for the 2024 juvenile fish passage season. The most notable change from the 2024 Spill Playbook will be returning to a modified version of the Spill Playbook similar to that employed in 2022 because Unit 6 will remain out of service as part of the turbine rebuild project. High spill events will be directed through Spillway 9 and Bypass Barrier 8 will be the first barrier to be removed when flows reach 200 kcfs at the Wells Project. Additional details are provided in the Appended Spill Playbook (Appendix 1).

In addition to minimizing the addition of TDG through the implementation of the Spill Playbook, Douglas PUD shall manage spill toward meeting water quality criteria for TDG during all flows below 7Q-10 as follows:

- Minimize voluntary spill through operations, including to the extent practicable, by scheduling biannual maintenance[5] based on predicted flows;
- Avoid spill by continuing to coordinate operations with upstream dams, to the extent that it reduces TDG;
- Maximize generation discharge, especially during periods of high river flows; and,
- During fish passage season, manage voluntary spill levels in real-time in an effort to continue to meet TDG numeric criteria.

2.2 Implementation

2.2.1 Fisheries Management Plans

Juvenile salmon and steelhead survival studies conducted at the Wells Project in accordance with the HCP have shown that the operation of the Wells Project, of which the JBS is an integral part, provides an effective means for out-migrating salmon and steelhead to pass through the Wells Project with a high rate of survival (Bickford et al. 2001, Bickford et al. 2011, Gingerich et al. 2020) (Table 4). The Wells JBS is the most efficient juvenile fish bypass system on the mainstem Columbia River (Skalski et al. 1996). The Wells Anadromous Fish Agreement and HCP (Douglas PUD 2002) is the Wells Project's fisheries management plan for anadromous salmonids, and directs operations of the Wells Project (JBS, adult fishways) to achieve the No Net Impact (NNI) standard for HCP Plan Species. The Aquatic Resource Management Plans (for White Sturgeon, Bull Trout, Pacific Lamprey, resident fish, water quality, and aquatic nuisance species) in the Wells Project's Aquatic Settlement Agreement (developed in support of the

[5] Biannual maintenance is the regularly scheduled maintenance that each unit receives and does not include the long-term outage of the ten generating units that are being completely rebuilt one at a time.

current Wells Project operating license) are the fisheries management plans for all other aquatic life designated uses.

Table 4. Wells Project Juvenile Survival Study Results for 1998-2000, 2010, and 2020.

Species	% Project Survival
Yearling Chinook (2020)	95.7
Yearling Chinook (2010)	96.4
Yearling Chinook and Steelhead (1998-2000)	96.2

In spring 2010 and 2020, Douglas PUD conducted survival verification studies with yearling Chinook salmon. These studies were required as 10-year follow-up studies to confirm whether the Wells Project continues to achieve survival standards of the Wells Anadromous Fish Agreement and HCP. During these efforts, approximately 80,000-105,000 Passive Integrated Transponder (PIT)-tagged yearling summer Chinook were released over 30+ day periods in 15-16 replicates. Results showed that juvenile Chinook survival through the Wells Project from the mouth of the Okanogan and Methow rivers averaged 96.4% and 95.7% in 2010 and 2020, respectively (see Table 4). These recent results confirm results from the three previous years of study, and document that juvenile fish survival through the Wells Project continues to exceed the 93% Juvenile Project Survival Standard required by the HCP (Bickford et al. 2011; Gingerich et al. 2020).

The current phase designations (status of salmon and steelhead species achieving final survival determination) for the HCP Plan Species are summarized in Table 5. Specific details regarding survival study design, implementation, analysis, and reporting are available in annual summary reports prepared and approved by the Wells HCP CC.

Table 5. Wells Project Habitat Conservation Plan Species Phase Designations.

Species	Phase Designation
Yearling Chinook	Phase III[6] – Standard Achieved (22-Feb-2005)
Steelhead	Phase III – Standard Achieved (22-Feb-2005)
Sockeye	Phase III – Additional Juvenile Studies (22-Feb-2005)
Subyearling Chinook	Phase III – Additional Juvenile Studies (22-Feb-2005)
Methow River Coho	Phase III – Standard Achieved (16-Dec-2015)

In 2024, Douglas PUD will continue to operate the Wells Dam adult fishways and the JBS in accordance with HCP operations criteria to protect aquatic life designated uses. Furthermore, all fish collection (hatchery broodstock and/or evaluation activities) or assessment activities that occur at Wells Dam will require approval by Douglas PUD and the Wells HCP CC to ensure that such activities protect aquatic life designated uses.

[6] Phase III (Standards Achieved) = measured Juvenile Project Survival greater than or equal to 93%.

Douglas PUD shall continue to operate the Wells Project in a coordinated manner that reduces forebay fluctuations and maintains relatively stable reservoir conditions that are beneficial to multiple designated uses (aquatic life, recreation, and aesthetics). Coordinated operations with upstream projects reduce spill at Wells Dam and thus reduce the potential for exceedances of the TDG numeric criteria and impacts to aquatic life associated with TDG.

2.2.2 Biological Monitoring Plan

Pursuant to WAC 173-201A-200, operators applying for modification to TDG standards to protect downstream migrating salmon in April-June and July-August are required to provide a biological monitoring plan for both migrating salmonids and resident fishes (Ecology 2019).

NMFS has shown that the risk to fish of GBT is low if the level of TDG can be managed to below 120% (NMFS 2000). They recommend that "the biological monitoring components will include smolt monitoring at selected smolt monitoring locations and daily data collection and reporting only when TDG exceeds 125% for an extended period of time." Since the early 2000s, Douglas PUD has monitored smolts at the Rocky Reach Juvenile Bypass Sample Site and Wells Dam adult fish ladders following exceedances in the Wells tailrace that are above 125%. Further, since 2020, GBT incidence has been monitoring in the Wells Tailrace via boat electroshocking and at the Rocky Reach JBS at least weekly during the months of April-June.

All monitoring for GBT will follow examination techniques as described in 2019 Gas Bubble Trauma Monitoring Protocol (FPC 2019) and will focus on examining the eyes, unpaired fins, and caudal fin of all fishes. Ranks of GBT expression from 0-4 will be used per Fish Passage Center protocols.

Adult Salmonids
Adult salmonids may be sampled at the request of Ecology but are generally expected to perform better than juvenile salmonids. As such, juvenile salmonids will be the focus of biological monitoring on salmonids.

Juvenile Salmonids
The JBS at Wells Dam does not have facilities to allow for juvenile fish sampling and observation. As such, to address GBT sampling for juvenile anadromous salmonids, Douglas PUD will request biological sampling at the Rocky Reach Juvenile Bypass Sampling Facility. Douglas PUD will endeavor to evaluate a minimum of 50 salmonids once per week from April–June regardless of TDG concentration. If 50 or more salmonids cannot be captured and examined by Douglas PUD at the Rocky Reach JBS in a given week, observations carried out by another entity at another downstream location may be used to supplement the sample examined at Rocky Reach juvenile bypass facility. Additionally, when TDG values in the Wells tailrace exceed the 125% water quality standard in the April–June or July–August period, additional sampling for GBT at the Rocky Reach juvenile bypass facility will occur on the subsequent business day to the exceedance. However, if no GBT has been observed after two sampling instances within a calendar week, additional monitoring will be postponed until the next calendar week, regardless of TDG concentration. Furthermore, if flood flows above 7Q-10 occur within a week during the April-June or July-August period, GBT sampling will occur only once per week. Target species

for juvenile salmonid GBT sampling will consist of Coho, Sockeye, yearling and subyearling Chinook, and steelhead. Any GBT monitoring results will be summarized in annual TDG reporting and provided to the Aquatic SWG during monthly calls. Any lamprey captured in the Rocky Reach Dam juvenile bypass sampling facility will also be examined for GBT.

Resident Fish and Other Native Fishes

According to Ecology's 2019 rule change, non-salmonid fish (with the inclusion of lampreys) should be collected in the fish bypass system, within distance of the next downstream TDG fixed monitoring site, or within 1 mile downstream from the hydropower project. Four sources shall be considered acceptable sample locations to meet biological monitoring requirements for resident fishes, and are prioritized in order of preferred method to least preferred:

1. Below Wells within 5 miles of the project: boat electrofisher
2. Rocky Reach JBS[7]
3. Below Wells within 5 miles of the project: beach seine
4. Other location between Snake River and Columbia River Confluence and Chief Joseph tailrace in coordination with Chelan and/or Grant PUD

Biological monitoring will focus on relatively shallow areas of the river that have a higher likelihood of TDG-related impacts due to limited depth compensation. Fish collected and monitored at the Rocky Reach JBS will be considered susceptible to TDG related effects due to the shallow waters in the bypass system.

Regardless of TDG values in the Wells tailrace, from April-June, Douglas PUD will endeavor to sample a minimum of 50 non-salmonid resident fish each week at one or a combination of the sites listed above, depending on fish availability. Thresholds for additional resident fish sampling are listed above. An emphasis will be placed on examining native resident fishes including but not limited to Northern Pikeminnow (*Ptychocheilus oregonensis*), Mountain Whitefish (*Prosopium williamsoni*), and Peamouth (*Mylocheilus caurinus*). If sample sizes do not meet the minimum requirements, surrogate non-native species may be substituted (e.g. bass [*Micropterus* sp.], Walleye [*Sander vitreus*]). All fish examined for GBT will be included in the assessment of compliance with biological thresholds, regardless of its applicability to the minimum count of 50 resident fish, including lampreys.

Ecology's Implementation Plan allows for weekly sampling to occur at representative locations on the Columbia River, one of which is from the mouth of the Snake River to the tailrace of Chief Joseph Dam (Middle Columbia; Ecology 2019). Data and sampling plans may be shared between Grant, Chelan, and Douglas PUDs. Alternative sampling sites may be used to meet sampling requirements. Further, data collected by Douglas PUD may be used to satisfy obligations for Grant and Chelan PUDs, if they also apply for the adjusted spring WQS.

[7] Bypass systems have been recognized as suitable sample locations in the Implementation Plan (Ecology, 2019); however, data collected from Chelan PUD suggests that necessary sample sizes for non-salmonid resident fish may be difficult to obtain *(Scott Hopkins, Chelan PUD Personal Communication)*.

2.2.3 Water Quality Forums

Douglas PUD actively participates in regional water quality forums including those that include other hydroelectric operators on the mainstem Snake and Columbia rivers. Douglas PUD observes the Technical Management Team water management process, particularly in spring, to understand river operations and actions designed to limit TDG production. Finally, Douglas PUD is involved in Columbia River Treaty actions that are dedicated to water quality considerations.

2.3 Water Quality Attainment Plan and Quality Assurance Project Plans

In November 2012, Douglas PUD received a new FERC operating license for the Wells Project. As required by Douglas PUD's Clean Water Act 401 Certification, a WQAP for TDG and a QAPP for water temperature and TDG were developed, approved by the Aquatic SWG and the HCP CC, and filed with the FERC for approval prior to Oct 31st of 2013 (within one year of license issuance). Both the WQAP and the QAPP were approved by the FERC in 2013.

The WQAP includes a compliance schedule to ensure compliance with TDG criteria within 10 years. While the tenth year of the implementation plan was 2023, Douglas PUD will continue to employ several of the actions outlined in the WQAP to monitor water quality in the project.

Specific measures in the WQAP that will be conducted in 2024 include:

1. Testing and modifying an adaptive Spill Playbook in and outside of fish passage season.
    - Douglas PUD will implement the Spill Playbook and track its progress towards improving TDG performance and assessing compliance capability.
2. Monitoring gas bubble presence in biota.
    - At TDG levels above 125% in the Wells tailrace, Douglas PUD will initiate GBT monitoring. The collection of biological data serves two primary purposes. First, Douglas PUD is required to collect biological data to meet GAP requirements associated with the annual TDG adjustment for fish passage. Secondly, Douglas PUD's 401 Certification identifies potential alternative approaches (e.g., use attainability analysis and site-specific variance) as part of implementing the TDG compliance schedule (WAC 173-201A-510(5)(g).
    - GBT data collection will also include weekly sampling during the months of April, May, and June for resident fish. This sampling can be conducted in concert with Grant and Chelan PUDs per Ecology's draft Implementation Plan developed during rule making (while this action was not identified in the approved WQAP, data collected during this action should serve to support the WQAP process).
3. Employ the energy accounting Wells Project Database towards improved Project operations that help limit TDG production.
4. Monitor and record spill-gate opening width through automation and SCADA towards using Project operation data to more closely understand TDG production at Wells Dam.

In December 2023, Douglas PUD completed a draft 10-Year Report for the WQAP that has been sent to Ecology for review. Douglas PUD is currently working through finalizing this document

to determine next steps for improving water quality, which may include a second compliance schedule or alternatives provided in WAC 173-201A-510(5)(g).

The employment of the new higher resolution Project operations database should better inform operations toward the improvement of TDG management. Operations and data parameters include spill-gate openings, unit megawatt production, unit outages, forebay/tailrace water-surface elevation, incoming TDG, and water temperature. Additionally, following the successful implementation of the energy accounting database, Douglas PUD staff determined that reducing spill volumes might be accommodated if operators had improved predictions of available water. If estimates of available water could be further improved, operators and power marketers could more easily sell power in near real-time. Furthermore, the installation of a forebay elevation sensor approximately 0.5 miles upstream of Wells Dam in 2019 continues to improve water forecasting and help to minimize unforced spill events.

In 2022, Douglas PUD acquired the assistance of staff at the University of Washington School of Aquatic & Fishery Sciences office of Columbia Basin Research (CBR) to produce a regression model that could forecast tailrace TDG using parameter values for Columbia River flow, project spill, and forebay TDG saturation (Beer 2022). The model is publicly available on the CBR website at https://www.cbr.washington.edu/shiny/DAM_CONDITIONS/ (Beer 2022). At times when incoming flows are forecast to exceed the hydraulic capacity of Wells Dam, Douglas PUD staff consult the model to guide decision making as to spill quantity, maintenance scheduling that would reduce hydraulic capacity further, minimum generation requirements for Project participants, and duration of spill with the intent of eliminating any downstream TDG violations. Staff expect that the tool will improve TDG performance, which has shown high compliance since the Water Quality Attainment Plan was approved in 2013.

In 2024, Douglas PUD will continue to emphasize evaluating conditions as they arise, which would lead to stringent minimum generation requirements at Wells in an effort to minimize unforced spill.

3.0 COMPLIANCE AND PHYSICAL MONITORING

3.1 Monitoring Locations

TDG monitoring has been implemented in the Wells Dam forebay since 1984. Douglas PUD began monitoring TDG levels in the Wells Dam tailrace in 1997 by collecting data from a boat and drifting through the tailrace at four points across the width of the river. During the transect monitoring, no TDG "hot spots" were detected; the river appeared completely mixed horizontally. A fixed TDG monitoring station was established in 1998. The placement of the fixed monitoring station was determined based upon the 1997 work and was further verified as collecting data representative of river conditions during a 2006 TDG assessment at Wells Dam (EES et al. 2007). Results of the 2008-2009 TDG numerical modeling activities conducted by University of Iowa/IIHR also confirmed that the tailrace monitoring station is located at a site representative of the mixed river flow, particularly during higher flows. Furthermore, locations of both forebay and tailrace sensors had to be protected to avoid sensor/data loss and damage and

for safe accessibility during extreme high flows. The current locations of both the forebay and tailrace monitors took these criteria into consideration.

Prior to November 2012, TDG monitoring at the Wells Project typically commenced on April 1 and continued until September 15, annually. This monitoring period encompasses the juvenile fish migration, the operation of the Wells JBS, as well as when river flows are at their highest and when a majority of spill occurs. Since August 2013, Douglas PUD continues to collect TDG data following the completion of the bypass period towards monitoring TDG outside of the spill and fish passage season (as required by the Wells Project 401 Certification). Currently, year-round data from both forebay and tailrace sensors are transmitted by radio transmitters to a master radio at Wells Dam. This system is checked and calibrated monthly or more frequently, as required. TDG data are sent to and logged at the Douglas PUD headquarters building in 15-minute intervals. Information on barometric pressure, water temperature, and river gas pressure is sent to the USACE on the hour over the Internet and uploaded in real-time to Douglas PUD's public website (www.douglaspud.org). The four data points (15 minute) within an hour are used in calculating the hourly compliance TDG values, the 24-hour TDG average, and the 12C-High readings in a day (24-hour period).

In 2014, Douglas PUD installed and began operating an additional TDG sensor station in the Wells Reservoir located several miles downstream of Chief Joseph Dam and upstream from the Okanogan River (Washburn Island). This new TDG sensor station provides reliable mixed-flow measurements of TDG generated at Chief Joseph Dam (USACE studies show mixing of powerhouse and spill flows at least seven miles from Chief Joseph Dam) before being diluted by degassing processing at the surface/water interface and diluted via tributary influence from the Okanogan River (Easthouse 2012; *pers. comm.* with Mike Schneider, USACE). The current system operated by the USACE below Chief Joseph Dam collects TDG values primarily from the project's spillways and does not provide a reliable measure of mixed flow (powerhouse and spillway combined) TDG values and therefore does not provide a reliable estimate of TDG headed for the forebay of Wells Dam.

In 2024, Douglas PUD will continue to monitor TDG at Washburn Island, and the forebay and tailrace stations located around the Wells Project.

3.2 Quality Assurance

The purpose of a QAPP is to direct the collection of the data necessary to determine whether or not changes to operations and infrastructure are required to achieve compliance with WQS. Douglas PUD developed a QAPP for TDG in 2013 in coordination with Ecology. The QAPP was filed on June 24, 2013, and approved by the FERC on August 8, 2013. An important part of Douglas PUD's Quality Assurance/Quality Control (QA/QC) program is the requirement that Douglas PUD's water quality consultant visit each of the TDG sensor sites monthly for maintenance and calibration of TDG instruments. Calibration follows criteria established by the USACE, except for monthly rather than bi-weekly calibration of sensors. A spare probe is always available and field-ready if a probe needs to be removed from the field for repairs.

Douglas PUD started collecting TDG data year-round beginning April 1, 2013, but spill season data (April–August) will be reported separately in an annual GAP report submitted to Ecology and the FERC. Real-time data is available at www.douglaspud.org consistent with reporting requirements found in Douglas PUD's 401 Certification.

3.3 Reporting

Upon approval of the Wells Project GAP and issuance of a Wells Project TDG exemption, Douglas PUD will submit an annual report to Ecology no later than February 28 subsequent to each year that the TDG exemption is approved. The annual report will summarize all GAP activities conducted for the prior year (i.e., annual report filed by February 28, 2025, will be for all GAP activities conducted in 2024) as required by Ecology and the FERC. In addition to reporting on spill season compliance, the annual report will include TDG compliance outside the spill season (110%), per the 401 Certification Section (6.7)(2)(c)(iii). Results will be shared with the Aquatic SWG, Ecology, and within water quality forums (see Section 2.2.3).

4.0 CONCLUSIONS

Pending approval by Ecology, implementation of the measures identified within the 2024 GAP are intended to serve as a long-term strategy to maintain compliance with the Washington State WQS for TDG in the Columbia River at the Wells Project while continuing to provide safe passage for downstream-migrating juvenile salmonids. In addition, the implementation of this GAP will be used as a tool to implement relevant measures identified in the Ecology-approved Wells Project WQAP.

5.0 LITERATURE CITED

ASL Environmental Sciences (ASL). 2007. Turbine Discharge Measurements by Acoustic Scintillation Flow Meter at Units 1 and 2, Wells Hydroelectric Project, Pateros, Washington, August 2006. Prepared by ASL Environmental Sciences Inc. Prepared for Public Utility District No. 1 of Douglas County, East Wenatchee, WA.

Beer, W. N. 2022. Explore, Analyze & Visualize Total Dissolved Gas and Environmental Conditions at Snake and Columbia river dams. Available online at https://www.cbr.washington.edu/shiny/DAM_CONDITIONS/. Accessed on January 6, 2023.

Bickford, S. A., J. R. Skalski, R. Townsend, S. McCutcheon, R. Richmond, R. Frith and R. Fechhelm. 2001. Project survival estimates for yearling summer steelhead migrating through the Wells Hydroelectric Facility, 2000.

Bickford, S.A., T. Kahler, R. Townsend, J.R. Skalski, R. Richmond, S. McCutcheon and R. Fechhelm. 2011. Project survival estimates for yearling Chinook migrating through the Wells Hydroelectric Project, 2010.

Buchanan, R. A., and R. L. Townsend. 2023. Proportion of Juvenile Plan Species Out-migrating through Wells Dam during Juvenile Bypass Operations in 2023. Columbia Basin Research, School of Aquatic and Fishery Sciences, University of Washington. Seattle, Washington.

Buchanan, R. A., and R. L. Townsend. 2022. Proportion of Juvenile Plan Species Out-migrating through Wells Dam during Juvenile Bypass Operations in 2022. Columbia Basin Research, School of Aquatic and Fishery Sciences, University of Washington. Seattle, Washington.

Douglas PUD. 2023. Total Dissolved Gas Water Quality Attainment Plan Year 10 Report. Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.

Douglas PUD. 2002. Wells Hydroelectric Project Anadromous Fish Agreement and Habitat Conservation Plan. Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.

Easthouse, K.B. 2012. Chief Joseph Dam 2012 Two Bay Uplift Spill Test: Total Dissolved Gas Exchange. U.S. Army Corps of Engineers. Seattle, WA.

Ecology. 2019. Draft Rule Implementation Plan Chapter 173-201A WAC Water Quality Standards for Surface Waters of the State of Washington. Department of Ecology State of Washington. Publication 19-10-024 Olympia, WA.

Ecology, Spokane Tribe of Indians, and U.S. Environmental Protection Agency. 2004. Total Maximum Daily Load for Total Dissolved Gas in the Mid-Columbia River and Lake Roosevelt: Submittal Report. Accessed online December 7, 2010 at: http://www.ecy.wa.gov/biblio/0403002.html

EES Consulting, Carroll, J., ENSR, and Parametrix. 2007. Total Dissolved Gas Production Dynamics Study. Wells Hydroelectric Project. FERC No. 2149. Prepared by EES Consulting, Joe Carroll, ENSR, and Parametrix. Prepared for Public Utility District No. 1 of Douglas County, East Wenatchee, WA.

Fish Passage Center (FPC). 2019. Gas Bubble Trauma Monitoring Protocol and GBT.net Data Entry Users Manual. Version – 2019 Season.

Gingerich, A., S.A. Bickford, T. Kahler, J.R. Skalski, R. L. Townsend, R. Richmond, and S. Anglea. 2020. Project Survival Estimates for Yearling Chinook Migrating Through the Wells Hydroelectric Project, 2020 (2020 Spring Migrant Survival Verification Study). Douglas County Public Utility District. East Wenatchee, WA.

Le, B. and J. Murauskas. 2009. Total Dissolved Gas Abatement Plan. Wells Hydroelectric Project. April 2009. Prepared for Washington Department of Ecology, Yakima, Washington, 98902-3452.

National Marine Fisheries Service (NMFS). 2000. Endangered Species Act – Section 7 Consultation: Biological Opinion. Consultation on Remand for Operation of the Columbia River Power System and 19 Bureau of Reclamation Projects in the Columbia Basin. F/NWR/2004/00727. November 30, 2005. Pages 5-6, 5-7, 5-53, 10-9, and Appendix E: Risk Analysis.

Pickett P.J, Rueda H., and Herold M. 2004. Washington Department of Ecology (Ecology), Spokane Tribe of Indians and U.S. Environmental Protection Agency. 2004. Total Maximum Daily Load for Total Dissolved Gas in the Mid-Columbia River and Lake Roosevelt: Submittal Report.

Skalski, J. R., G. E. Johnson, C. M. Sullivan, E. Kudera and M. W. Erho. 1996. Statistical Evaluation of Turbine Bypass Efficiency at Wells Dam on the Columbia River, Washington. Canadian Journal of Fisheries and Aquatic Science. Volume 53, No. 10, 1996. Pages 2188-2198.

Wright, E. 2017. Water Quality Assessment Report for the Confederated Tribes of the Colville Reservation. September 2017. Available at: https://www.cct-enr.com/assessment-report.

6.0 APPENDICES

Appendix 1 Wells Hydroelectric Project Spill Playbook

I. No Forced Spill

The Wells Dam JBS shall be operated continuously throughout the juvenile salmon outmigration (April 9 to a flexible stop date – late July or early August - as determined by Program RealTime Forecaster prediction of when 95% of the summer migrants have passed Rocky Reach Dam). The standard Wells HCP operating criteria, as described in Section 4.3.1 of the Wells HCP, will apply to the 2024 operating season. The operating criteria requires the operation of at least one bypass bay during the entire JBS season, requires that no turbine is operated without an open adjacent bypass bay, and requires operation of all five bypass bays continuously for 24-hours when the Chief Joseph Dam uncoordinated discharge estimate for that day is 140 kcfs or greater. The Wells JBS is normally operated with 1.7 kcfs passed through Spillway 2 (S2) and S10, and 2.2 kcfs through S4, S6, and S8. However, bottom spill will be utilized S10 to facilitate maintenance projects in 2024. Figure 1 (below) assumes that the Chief Joseph Dam uncoordinated discharge estimate is greater than 140 kcfs or sufficient turbines units are operating that all five bypass bays are open.

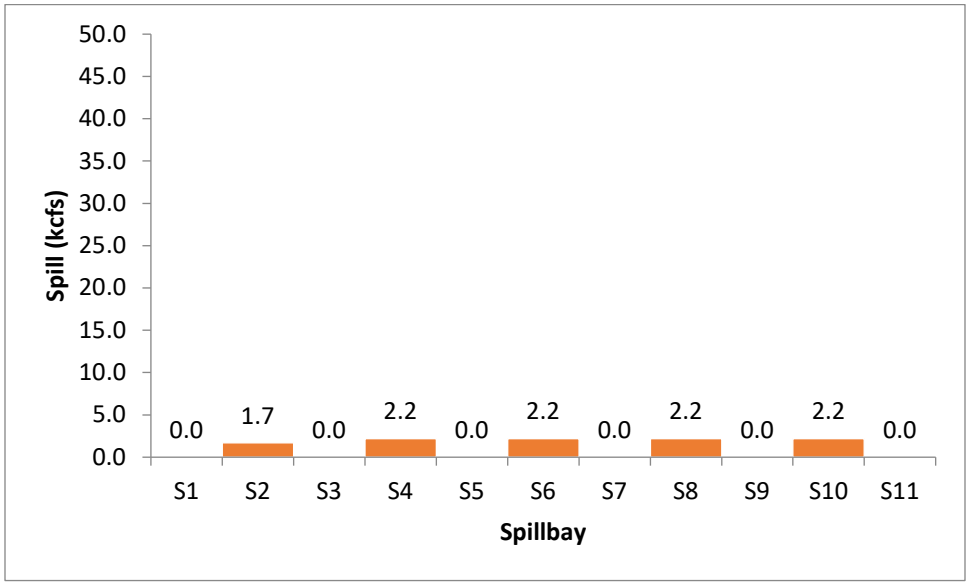


Figure 1. Operational configuration under no forced spill (JBS only).

II. Total Spill ≤ 53.5 kcfs, JBS Barriers in Place

As forced spill increases, Project Operators should allocate all spill through *S9* until the maximum capacity is reached through that spillbay (~43.0 kcfs). Note that S9 spill requires support of generation flows from turbine generator (unit or "U") U8 and U9 to minimize TDG production. This, along with the already established JBS spill (10.5 kcfs) would equal 53.5 kcfs (Figure 2). Over 90% of the spill events over the past decade could have been handled under this configuration.

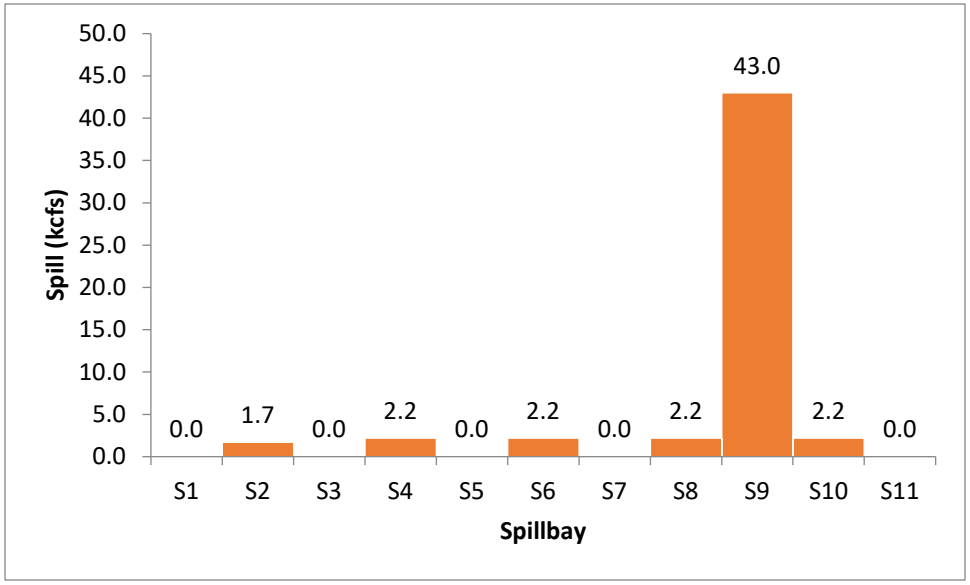


Figure 2. Operational configuration under spill ≤ 53.5 kcfs (including JBS).

JBS Barrier Removal Criteria

When either of the following occurs, remove the JBS barriers in S8:

Spill in S9 reaches 30 kcfs and total spill is expected to exceed 40 kcfs for more than 8 hours, or total spill is expected to exceed 53.5 kcfs. After the JBS barriers are removed from S8, shift 15 kcfs to S8 (Figure 3) at all times until the JBS barriers are reinstalled. It is best to have generating units 7, 8, and 9 operating to support this spill configuration, with U8 being the most important to provide surface degassing of spilled water via draft tube discharge. After at least 15 kcfs is being spilled through S8, additional spill can be allocated to S9 until 43.0 kcfs is reached. The 15 kcfs minimum spill through S8 is necessary to provide attraction of fish away from generating units 7 and 8 and to maintain sufficient spillway flow to engage the spillway lip below the ogee, which significantly attenuates TDG in the tailrace.

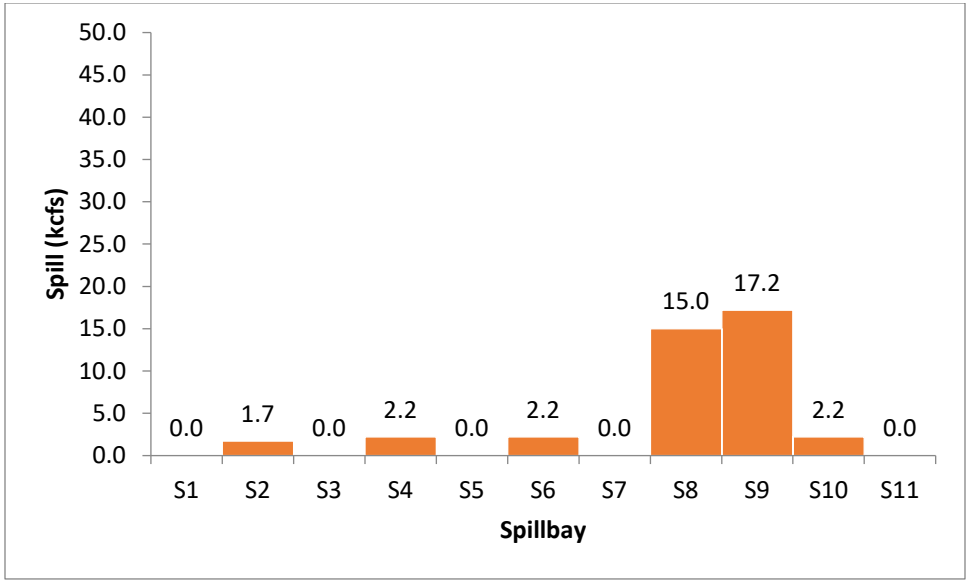


Figure 3. Operational configuration once spill reaches 30 kcfs in S9 and is expected to be above 40 kcfs for more than 8 hours (JBS removed from S8). Shift sufficient spill from S9 to maintain a minimum of 15 kcfs spill at S8.

Short Duration Decreases in Forced Spill (<53.5 kcfs) and JBS Barriers in S8 Removed

If after removal of JBS barriers in S8, total spill drops below 53.5 kcfs (between 10-53.5 kcfs) and is expected to stay in this range for only a short period (4 days or less), direct spill through S8 up to 15 kcfs (total spill < 23.3 kcfs). When total spill exceeds 23.3 kcfs, direct the remainder of spill through S9.

III. Forced Spill (> 53.5 kcfs) and JBS Barriers in S8 Removed

After spill through S9 reaches 43.0 kcfs, additional spill should be allocated to S8 (S8 is already spilling at least 15.0 kcfs). As flow increases, spill should continually increase through S8 (e.g., 43.0 kcfs through S9 and 26.0 kcfs through S8), until spill through S8 will also reach 43.0 kcfs (93.8 kcfs, Figure 5). Note that 31.2 kcfs is the minimum discharge in S9 without having to return to Section II above (See Spill Lookup Table VII).

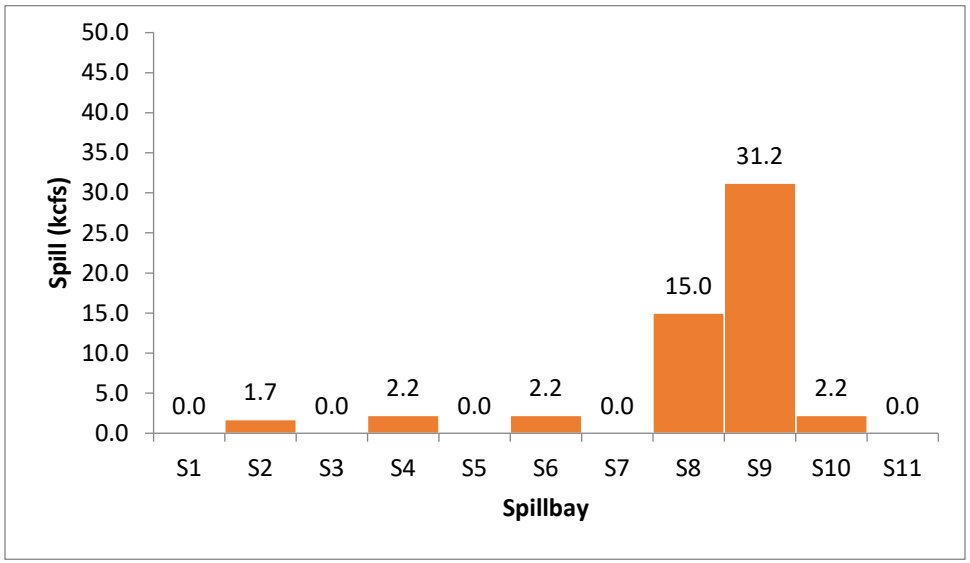


Figure 4. Operational configuration under forced spill at 53.5 kcfs (including JBS flow, with removal of JBS barriers in S8). S8 must maintain a flow of 15.0 kcfs when JBS is removed which may necessitate reducing flow from S9. As spill increases, it should be directed first to S9 and then to S8.

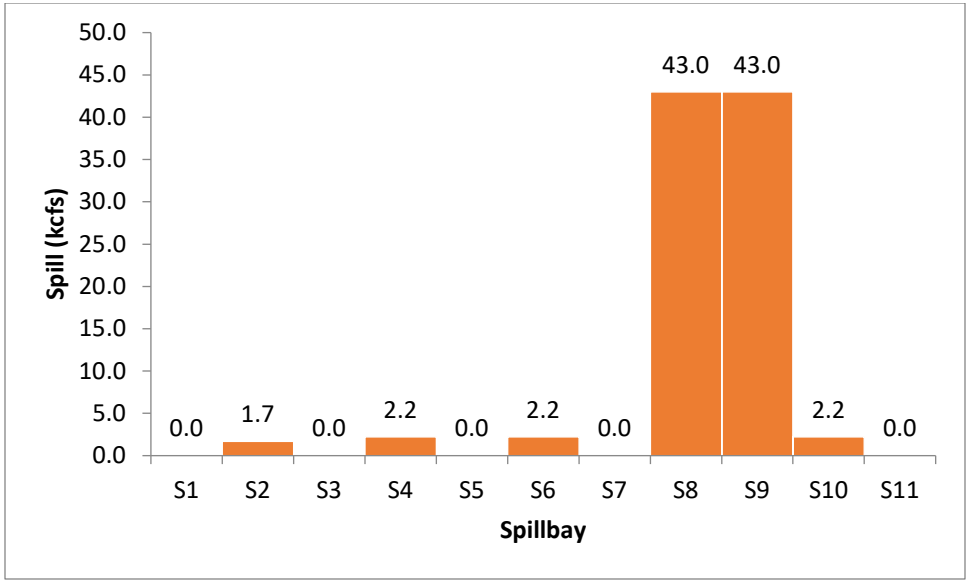


Figure 5. Operational configuration under forced spill between 53.5 and 94.3 kcfs (including JBS). In this instance, S8 has been fully allocated and 43.0 kcfs is now allocated through both S9 and S8. Total discharge in this scenario is likely to be approximately 230 kcfs (94.3 total spill and 135 kcfs of turbine discharge, assuming nine units available with an average discharge of approximately 15 kcfs per unit).

IV. Forced Spill (> 94.3 kcfs) and JBS Barriers in S8 and S10 Removed

After both S8 and S9 reach 43.0 kcfs, 86 kcfs (or 94.3 kcfs including fish bypass flow) in total is being spilled. Additional spill discharge is unlikely to occur without the removal of bypass barriers in S10 (e.g. 8 units with 15 kcfs in total discharge plus 94.3 kcfs of spill would have an approximate total plant discharge of 229.3 kcfs at Wells Dam in this scenario). Two hundred forty kcfs of total discharge necessitates the removal of bypass barriers in S10 to meet Emergency Action Plan constraints outlined in Appendix 2, Table 1 (see Bypass Operating Plan). As such, operators shall remove the barriers from S10 and provide minimum spill discharges in S8 and S10 of 15 kcfs (Figure 6a). Since S10 will be dogged off at 15 kcfs, S9 should be used to moderate spill while maintaining 15 kcfs through both S8 and S10. Both S8 and S10 can be increased until all three spillways have reached 43.0 kcfs.

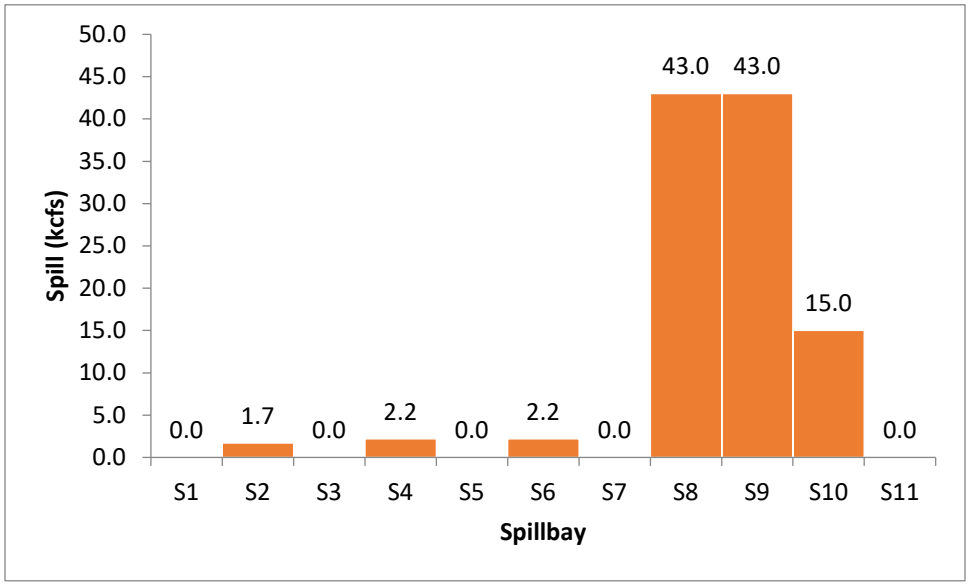


Figure 6a. Operational configuration when plant discharge or inflows are forecasted/over 240 kcfs. Bypass barriers in S10 are removed and S10 is dogged at 15 kcfs. Maintain a minimum of 15 kcfs through S8 and S10. Use S9 to regulate spill. Total plant discharge in the configuration above is 251.1 kcfs with 9 units available and an approximate value 15-16 kcfs being discharged through each unit. 7Q-10 flood flows occur when total plant discharge above 246 kcfs).

Modest amounts of spill in S7 can be used prior to total discharges of 240 kcfs (Figure 6b). If inflows reach or are expected to reach 240 kcfs, barriers in S10 should be removed and spill in S7 ceased.

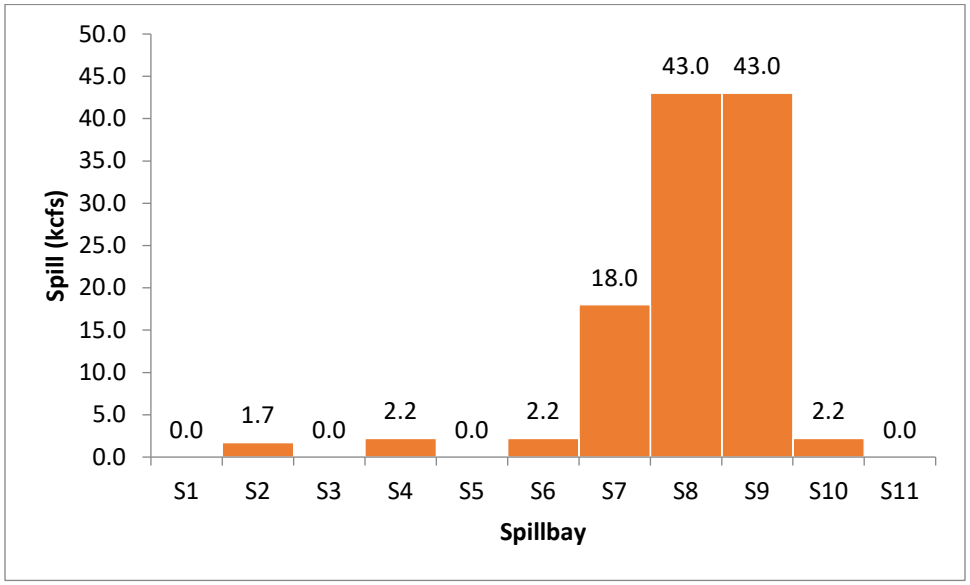


Figure 6b. Operational configuration under forced spill > 94.3 kcfs with S10 JBS in place. Short periods of spill in S7 are appropriate when plant discharge is approximately 220-240 kcfs.

S7 is available in 2024 but it should be used only for small amounts and short spill events (Figure 7a). S7 should be avoided, where possible since Unit 6 will be unavailable and no discharge will be coming from the draft tube. TDG performance suffers when spilling over an unloaded unit. Moreover, spill in S7 may complicate rebuild and construction activities inside Unit 6. However, since S7 has automation and S10 does not, it provides short term and emergency needs during the 2024 season. Operators should priortize spill in S9, S8, and S10 when spill volumes approach 100 kcfs (Figure 7b).

Bypass barrier in S4 should be the 3rd barrier to be removed following the 2024 EAP pathway.

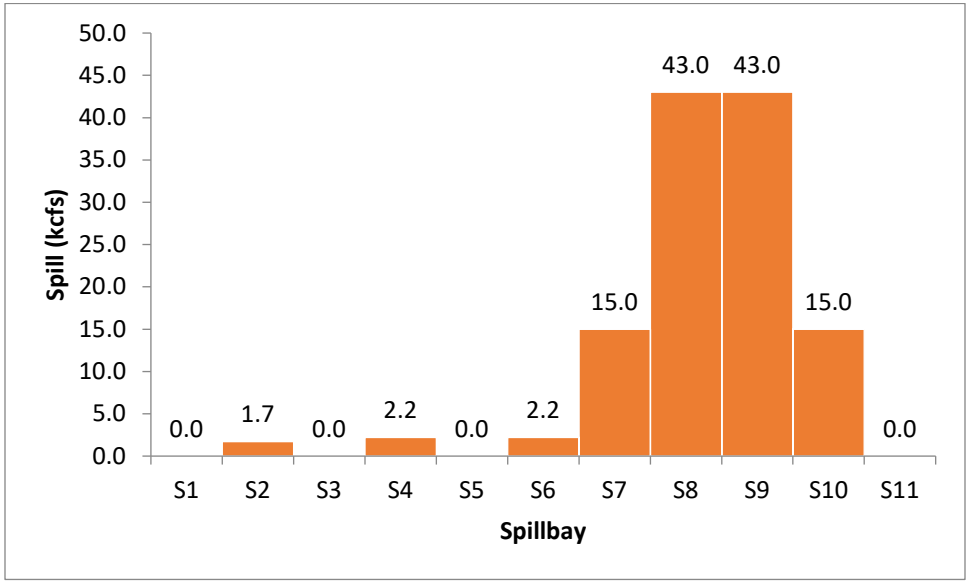


Figure 7a. Operational configuration when spill events exceed 101 kcfs but a third bypass barriers is not removed. S7 should be used irregularly with no discharge coming out of U6 and the need to keep the U6 area quiet for unit overhaul. Ideally, S10 would be dogged off at a higher opening like found in Figure 7b.

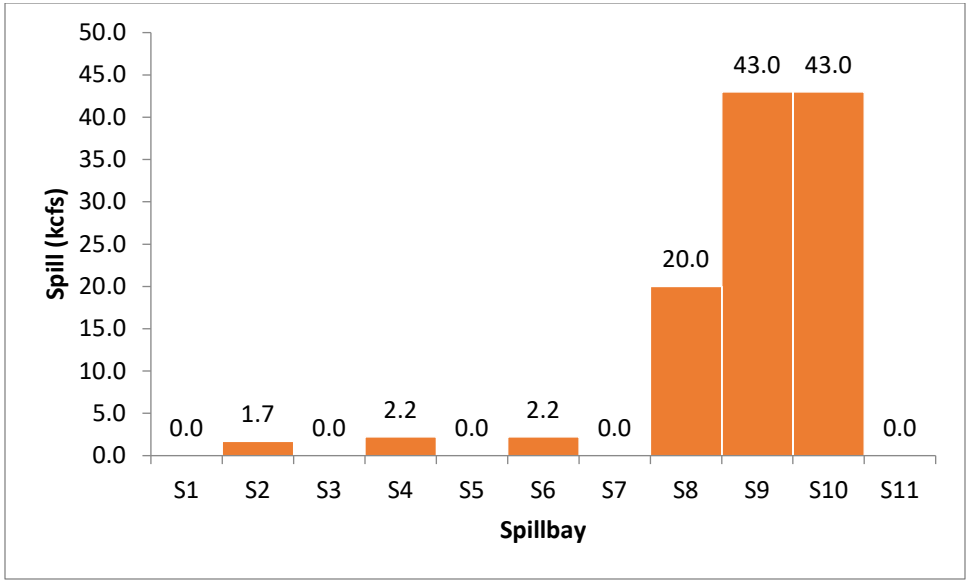


Figure 7b. Operational configuration when spill events exceed 101 kcfs but a third bypass barriers is not removed. S7 is not used, rather S10 is dogged off higher and S8 is modulated between 15-43 kcfs. Greater than or equal to 15 kcfs must be maintained through S8 and S10 at all times when bypass barriers are removed.

V. Forced Spill (> 135.1 kcfs)

Forced spill exceeding 135.1 kcfs rarely occurs (less than 0.5%). If these conditions arise and total river flow exceeds 246.0 kcfs, then 7Q-10 conditions are occurring and Wells Dam is exempt from the TDG standards. Under this situation, Project Operators may perform any combination of operations to ensure that flood waters are safely passed. Additionally, with a discharge forecast (Chief Joseph Dam discharge plus Okanogan and Methow rivers discharge) of greater than or equal to 200 kcfs, the JBS barriers will be removed from S8 to fulfill the requirements of the FERC-approved Wells Emergency Action Plan for the availability of automatic gate-hoist capacity (see Table 1 of Appendix 2). Also, at this point, other JBS barriers will likely be removed allowing additional flexibility to spill up to 43 kcfs each through S8, S10, S4, and S6 and S2 (note that removal of JBS barriers from S2 requires mobilization of our contractor Biomark to assist with removal because of the PIT-tag-detection system installed in the S2 barriers; therefore, S2 is last in the removal sequence of JBS barriers). Once JBS barriers have been removed from S2, Project Operators may pass spill through S2 in a similar fashion to operations described above (starting at a minimum of 15.0 kcfs to ensure that spillway lips are engaged).

VI. JBS Re-Installment Criteria

Once spills of less than 40.0 kcfs are predicted for at least four days, JBS barriers should be re-installed in the order they were removed. For example, if only two sets of barriers were removed, reinstall S10 first and S8 last.

VII. Spill Lookup Table

Operation	Total Spill	Spillbay Number										
		S1 -	S2 JBS	S3	S4 JBS	S5	S6 JBS	S7	S8 JBS	S9	S10 JBS	S11 -
I. No Forced Spill	10.5	0	1.7	0	2.2	0	2.2	0	2.2	0	2.2	0
II. Spill (≤ 53.5 kcfs), min.	11.5	0	1.7	0	2.2	0	2.2	0	2.2	1	2.2	0
II. Spill (≤ 53.5 kcfs), max.	53.5	0	1.7	0	2.2	0	2.2	0	2.2	43	2.2	0
III. Spill (> 53.5 kcfs, S8 JBS out), min.	54.5	0	1.7	0	2.2	0	2.2	0	15	31.2	2.2	0
III. Spill (> 53.5 kcfs, S8 JBS out), max.	94.3	0	1.7	0	2.2	0	2.2	0	43	43	2.2	0
IV. Spill (> 94.3 kcfs, S8 & S10 JBS out), min.	107.1	0	1.7	0	2.2	0	2.2	0	43	43	15	0
IV. Spill (> 94.3 kcfs, S8 & S10 JBS out), max.	135.1	0	1.7	0	2.2	0	2.2	0	43	43	43	0
V. Spill (> 135.1 kcfs, S8, S10, S4 JBS out), min. V. Total Flow (>246 kcfs), max.	-	*Operators may adjust as needed.* *TDG exemption in place when total river flows exceed 246.0 kcfs.*										

Notes: (1) No spill through S1 and S11 as to minimize interference with fish ladders. (2) Even-numbered spillways are designated as the Juvenile Bypass System (JBS). (3) Primary spillways for forced spill are S9, S8, S10, S7, and S4 (in that order).

Appendix 2 Wells Hydroelectric Project Bypass Operating Plan

Wells Hydroelectric Project

2024 Juvenile Fish Bypass Operating Plan

Approved February 27, 2024

Operation of the Wells Dam juvenile bypass system throughout the 2024 season will follow the criteria contained within the Wells Dam Juvenile Dam Passage Survival Plan found in Section 4.3 of the Wells HCP, which specifies a goal of providing bypass operations for at least 95 percent of both the spring and summer migrations of juvenile Plan Species.

Annual post-season analyses of bypass performance indicate that past dates of bypass operations at Wells Dam provided bypass passage during 98 to 100 percent of the migrations of all Plan Species. The lone possible exception to this record is in 2022, when bypass operations ended two days before the apparent passage of the 95th percentile of subyearling Chinook, as estimated from PIT-tag detections at Rocky Reach Dam. In 2023, all plan species were provided more than 95% bypass opportunity, which relied on an April 9th start data and a flexible end date using Program RealTime, ceasing on July 24, 2023. Given the success of the application, again in 2024, bypass operation will start April 9 but conclude when Program RealTime determines that 95 percent of the summer migrants have passed Rocky Reach Dam. This change is intended to eliminate pre-season forecasting of the date on which the 95th percentile will pass, replacing forecasting with in-season estimation of passage timing.

Dam safety emergency action planning, as required by the Federal Energy Regulatory Commission (FERC), calls for Douglas PUD to operate Wells Dam with sufficient automatic-gate-opening capacity in the spillways to pass the flow from a plant load-rejection of up to 200 thousand cubic feet per second (kcfs), in addition to any concurrent initial spillway discharge. Of the 11 spillways at Wells Dam, only spillways 3 through 9 have automated gate hoists. Thus, the seasonal installation of bypass barriers in spillways 2, 4, 6, 8 and 10, substantially reduces the automatic-gate-opening capacity of Wells Dam by reducing the capacity of each bypass spillway to 8.6 kcfs and less so when the forebay is not at full pool (781’ msl). Consequently, Douglas PUD must remove bypass barriers systematically when discharge-volume estimates exceed certain thresholds, as per Table 1, sufficient to provide the necessary automatic-gate-opening flow capacity as described in Appendix I of the FERC-required Emergency Action Plan for the Wells Project. Douglas PUD will make decisions to remove bypass barriers for dam-safety considerations each Monday (or at other times as necessary) during the bypass period based on forecasts of combined discharge from Chief Joseph Dam and side-flows from the Okanogan and Methow rivers (from the National Weather Service Northwest River Forecast Center [NWRFC]).

Table 1. Schedule for removal of spillway flow-barriers (bypass barriers) to accommodate flood flows and load rejections. Flow values are estimated. Actual thresholds may vary based on EAP protocols and high spill volumes associated with reduced turbine capacity.

Inflow Forecast (kcfs)	Bypass Barriers Removed
Up to 200	None
200 – 240	Spillway 8
240 – 275	Spillways 8, 10
275 – 310	Spillways 8, 10, 4 (7Q10 flows are occurring and the Project is managed for safety according to the EAP and Project operators. A minimum for four bypass barriers are removed.*)
310 - 350	Spillways 8, 10, 4, 6, and preset gates 1 and 11 to spill excess of 312 kcfs
350 – 400	Spillways 8, 10, 4, 6, and preset gates 1, 2, and 11 to spill excess of 312 kcfs
400 – 450	All spillways (2, 4, 6, 8, 10)

* SG 10 and SG 2 do not have automatic gate hoists; gates are lifted manually and set by crane and crew. If spillways 2 and 10 are used, openings for these gates will be fixed to some level > 15 kcfs.

Juvenile Fish Bypass Operations and Clean Water Act TDG Compliance

Seasonal bypass operations generally coincide with the spring freshet, an event during which operators of hydroelectric projects must cope with flows that often exceed the hydraulic capacity of their powerhouses. During such events, project operators must pass water via the spillways as "involuntary spill," which increases the concentration of atmospheric gases in the water below hydroelectric projects and can result in levels of total dissolved gas (TDG) that may injure fish. To minimize the potential for fish injury, the Washington State Department of Ecology (Ecology) imposes TDG standards on operators of hydroelectric projects.

Extensive modeling and study of spill operations at Wells Dam provide the basis for the development of annual "spill playbooks" for dam operations aimed at achieving the Ecology standards for TDG. These spill playbooks prescribe spill-gate configurations to implement under various flow scenarios. From modeling and physical-spill studies, Douglas PUD determined that concentrating spill through the middle of the spillway and on top of turbine discharge results in the most effective minimization of TDG. The best TDG performance is achieved when concentrating involuntary spill through Spillway 7, and allocating additional spill, beyond the capacity of Spillway 7, to adjacent spillways, up to a maximum of 43[8] kcfs per spillway. Given that Unit 6 will not be available in 2024 due to turbine rebuild, involuntary spill, should it occur, will be focused in Spillway 9.

To accomplish this TDG-minimizing pattern of concentrated spill requires the removal of the bypass barriers from at least one spillway during periods of excessive involuntary spill. The removal of the bypass barriers from one spillway can take up to eight hours and requires the use of a four-man mechanical crew and the powerhouse gantry cranes. To comply with the TDG standards below Wells, the bypass barriers must be removed from at least one spillway whenever

[8] 43 kcfs of spill does not include the roughly 10 kcfs of flow moving through bypass bays 2, 4, 6, 8, & 10 when flows from Chief Joseph Dam are over 140 kcfs (See Figure 1 in the Spill Playbook; IX. Spill Lookup Table), and known as bypass (spill) volumes.

involuntary spill exceeds 30 kcfs and one or both of the following conditions applies: 1) prolonged (> 8 hours) involuntary spill in excess of 40 kcfs is predicted (based on forecasted tributary inflows from the NWRFC and estimated discharge from Chief Joseph Dam provided by the US Army Corps of Engineers); or 2) total spill is predicted to exceed 53 kcfs, regardless of duration. Once involuntary spill of less than 40 kcfs is predicted for a period of at least four days, the respective bypass barriers would be reinstalled. At river flows greater than 240 kcfs, bypass barriers would be removed from additional bypass bays as described above (see Table 1) and reinstalled as appropriate sequentially in reverse order.

Juvenile Fish Bypass Contingency Plan

Following the failure of a gate-hoist cable in a bypass spillway at Wells Dam in late August 2010, Douglas PUD developed a contingency plan for bypass operations during an accident or unanticipated mechanical failure that would preclude normal bypass operations. High river discharge in 2011 and 2012 led to the incorporation of provisions for the management of TDG into the Bypass Contingency Plans in 2013. The 2024 Bypass Contingency Plan continues those provisions, as described below.

Section 4.3 of the Wells HCP directs Douglas PUD to shut down the turbine units adjacent to a bypass spillway that is not operating due to either low flow or an inability to operate the bypass spillway. Under the 2024 Bypass Contingency Plan, if shutting down the turbines would not threaten compliance with TDG standards, Douglas PUD would shut down the associated turbine units. However, if doing so would threaten compliance with TDG standards, Douglas PUD would not shut down the associated turbines but would instead direct spill through spillways adjacent to the affected turbine units in a manner that provides bulk flow for fish passage while minimizing TDG (Figure 1, Option 1). Douglas PUD would consult the Spill Playbook (see Appendix 1 of the Gas Abatement Plan, above) to select such spill configurations, and would spill at least 15 kcfs through each selected spillways to engage the submerged flip-lip as a TDG minimization measure and to provide bulk flow for fish attraction to the surface passage route. In circumstances where turbine shutdown would not jeopardize TDG compliance, Douglas PUD would shut down the associated turbine units to evaluate and repair the malfunction, but may then elect to move the bypass barriers from the inoperable bypass spillway to an adjacent, non-bypass spillway to obtain the use of an additional turbine unit (see Figure 1, options 2 and 3). The gate for that substitute bypass spillway would then be set at the standard 1-foot opening for bypass spillways and the adjacent turbine unit(s) could be operated without constraints. This configuration would meet the intent of HCP Section 4.3 by providing bypass spill immediately adjacent to every operating turbine unit and would comply with the goal of the 2024 Gas Abatement Plan.

During the repair of a bypass malfunction, Douglas PUD would daily reevaluate forecasts of Chief Joseph Dam discharge, tributary inflows, and TDG conditions, as well as repair progress, and determine which bypass option to implement as per Figure 1.

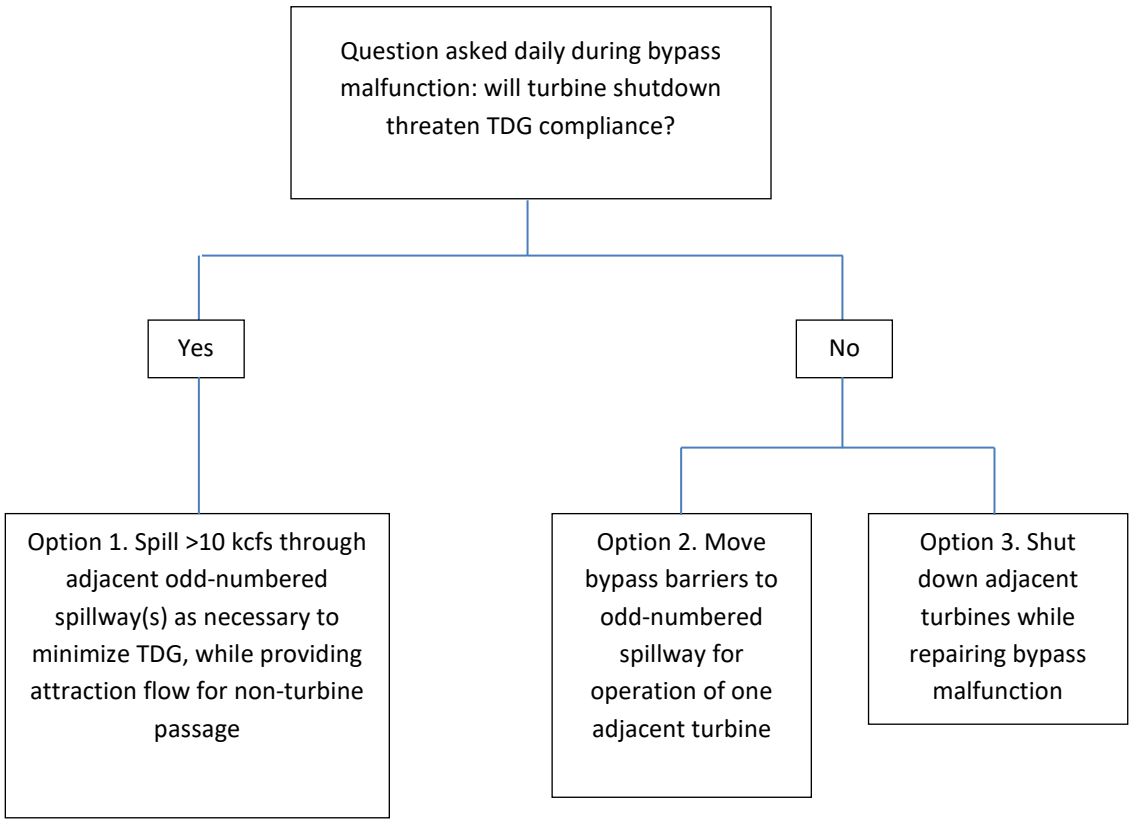


Figure 1. Evaluation flow chart for daily decisions regarding bypass, spill, and turbine operations during a bypass malfunction.

APPENDIX B

HCP COORDINATING COMMITTEE PRE-FILING CONSULTATION RECORD FOR THE 2024 GAS ABATEMENT PLAN AND BYPASS OPERATING PLAN

NOTICE TO HCP COORDINATING COMMITTEE TO REVIEW THE 2024 GAS ABATEMENT PLAN AND BYPASS OPERATING PLAN

From:	Andrew Gingerich
To:	Amber Nealy
Cc:	Mariah Mayfield
Subject:	FW: Draft 2024 Wells BOP/GAP for review
Date:	Tuesday, February 13, 2024 2:20:39 PM
Attachments:	2024_01_09 Douglas - Draft Wells Dam 2023 GAP and BOP.docx

---

From: Kristi Geris <kgeris@anchorqea.com>
Sent: Tuesday, January 9, 2024 6:10 PM
To: Tom Kahler <tom.kahler@dcpud.org>; Lance.Keller <Lance.Keller@chelanpud.org>; Scott Carlon <scott.carlon@noaa.gov>; 'william_gale@fws.gov' <william_gale@fws.gov>; Jackson, Chad S (DFW) <Chad.Jackson@dfw.wa.gov>; kirk.truscott <kirk.truscott@colvilletribes.com>; Keely Murdoch (murk@yakamafish-nsn.gov) <murk@yakamafish-nsn.gov>; John Ferguson <jferguson@anchorqea.com>; Kristi Geris <kgeris@anchorqea.com>
Cc: Andrew Gingerich <andrew.gingerich@dcpud.org>; John Rohrback <john.rohrback@dcpud.org>; Bill Towey <bill.towey@chelanpud.org>; Catherine.Willard <Catherine.Willard@chelanpud.org>; Andrew Murdoch (Andrew.Murdoch@dfw.wa.gov) <Andrew.Murdoch@dfw.wa.gov>
Subject: Fwd: Draft 2024 Wells BOP/GAP for review

Hi Wells HCP-CC Reps: please see the email below from Tom and the attached draft 2024 GAP/BOP, which is available for a 30-day review with edits and comments due to Tom by February 10, 2024.

The attached draft plan is also available for download from the HCP Coordinating Committees Extranet site under: Draft Documents > All by Mtg Date > 1/23/2024 (instructions below). Thanks! - kristi

Instructions:

To gain access to the HCP Coordinating Committees Extranet Homepage, please use the following procedure:

* Visit: https://extranet.dcpud.net/sites/nr/hcpcc/
* Login using “Forms Authentication” (for non-Douglas PUD employees)

You should now be at the HCP CC homepage.

If you encounter problems, or need a login username and password to access the site: Please feel free to contact me or Julene McGregor [jmcgregor@dcpud.org; (509) 881-2236] and we will gladly assist you with questions or issues.

Sent from my Google Pixel 7

From: Tom Kahler <tom.kahler@dcpud.org>
Sent: Tuesday, January 9, 2024 5:51:25 PM
To: Kristi Geris <kgeris@anchorqea.com>
Cc: Andrew Gingerich <andrew.gingerich@dcpud.org>; John Rohrback <john.rohrback@dcpud.org>; John Ferguson <jferguson@anchorqea.com>
Subject: Draft 2024 Wells BOP/GAP for review

Hi Kristi,

Please distribute this to the Wells CC for review, with edits/comments due no later than 2/10/24. That will give us time to provide a revised version (as necessary) to the CC in time for a approval before our deadline for submittal to Ecology.

Thanks,

Tom

FINAL HCP COORDINATING COMMITTEE ACTION ITEMS SHOWING APPROVAL OF THE 2024 GAS ABATEMENT PLAN AND BYPASS OPERATING PLAN

FINAL

1201 3rd Avenue, Suite 2600
Seattle, Washington 98101
206.287.9130

ANCHOR QEA

Memorandum

To: Wells, Rocky Reach, and Rock Island HCP Coordinating Committees

Date: February 28, 2024

From: John Ferguson, HCP Coordinating Committees Chairman

cc: Kristi Geris, HCP Coordinating Committees Support

Re: Final Action Items of the February 27, 2024, HCP Coordinating Committee Conference Call

This memorandum provides a summary of action items, decisions, agreements, and documents for review as discussed during the Hydroelectric Projects Habitat Conservation Plan (HCP) Coordinating Committees meeting, which met by conference call on Tuesday, February 27, 2024, from 12:00 p.m. to 4:15 p.m. Attendees are listed in Attachment A to this memorandum.

Action Item Summary

1. Chelan PUD will search their records for past investigations into dead-fish releases in the Upper Columbia River and will distribute any data located (Item I-C).
2. BioAnalysts will create trend graphs showing HCP Tributary Committees funding contributions over the years, including the number of projects approved by year, for distribution to the HCP Coordinating Committees (Item II-A).
3. National Marine Fisheries Service (NMFS) will inquire internally about what information or data were considered in the recent change in spill operations at federal dams in the Lower Snake and Lower Columbia rivers (Item III-E).
4. Chelan PUD will inquire internally about the feasibility of collecting fish length and weight measurements at the Rock Island Juvenile Sampling Facility (RIJSF) during the 2024 fish bypass season, starting March 1, 2024, and will report back to the Rock Island HCP Coordinating Committee via email by close-of-business (COB) Thursday, February 29, 2024 (Item IV-D).
5. The next scheduled HCP Coordinating Committees meeting is on Tuesday, March 26, 2024, from 12:00 p.m. to no later than 4:00 p.m. and is to be held in-person at the Confluence Technology Center in Wenatchee, Washington (Item VI-D).

Decision Summary

1. Wells HCP Coordinating Committee representatives present approved the *2024 Wells HCP Action Plan*. U.S. Fish and Wildlife Service (USFWS) approved the plan via email prior to the conference call on February 27, 2024 (Item III-A).
2. Wells HCP Coordinating Committee representatives present approved the *2024 Total Dissolved Gas Abatement Plan* and appended *Wells Bypass Operating Plan* (2024 GAP/BOP). USFWS approved the plan via email prior to the conference call on February 27, 2024 (Item III-B).

3. Rocky Reach HCP Coordinating Committee representatives present approved the *2023 Biological Evaluation of the Rocky Reach Juvenile Fish Bypass System Draft Report* (draft 2023 RRJFBS Report). USFWS approved the report via email prior to the conference call on February 27, 2024 (Item IV-A).
4. Rock Island HCP Coordinating Committee representatives present approved the *2023 Rock Island Dam Smolt Monitoring Program and Gas Bubble Trauma Evaluation Draft Report* (draft 2023 Rock Island Smolt and GBT Evaluation Report). USFWS approved the report via email prior to the conference call on February 27, 2024 (Item IV-A).
5. Rocky Reach and Rock Island HCP Coordinating Committees representatives present approved the *2024 Rocky Reach and Rock Island HCP Action Plan*. USFWS approved the plan via email prior to the conference call on February 27, 2024 (Item IV-B).
6. Rocky Reach and Rock Island HCP Coordinating Committees representatives present approved the *2024 Fish Spill Plan, Rock Island and Rocky Reach Dams Public Utility District No. 1 of Chelan County* (2024 Rock Island and Rocky Reach Fish Spill Plan). USFWS approved the plan via email prior to the conference call on February 27, 2024 (Item IV-C).
7. Rock Island HCP Coordinating Committee representatives present approved the *Rock Island Dam Smolt Monitoring and Gas Bubble Trauma Evaluation Plan 2024* (2024 Rock Island Bypass Monitoring Plan). USFWS approved the plan via email prior to the conference call on February 27, 2024 (Item IV-D).
8. Rocky Reach HCP Coordinating Committee representatives present approved the *2024 Rocky Reach Juvenile Fish Bypass System Operations Plan* (2024 RRJSF Protocol). USFWS approved the plan via email prior to the conference call on February 27, 2024 (Item IV-E).

Agreements

1. Rocky Reach HCP Coordinating Committee representatives present agreed that Chelan PUD will collect fish weight measurements, in addition to length measurements, at the Rocky Reach Juvenile Sampling Facility (RRJSF) during the 2024 fish bypass season, starting March 1, 2024 (Item IV-E).
2. HCP Coordinating Committees representatives present agreed to modify Washington Department of Fish and Wildlife's (WDFW's) recurring agenda item on steelhead overshoots to a joint recurring agenda item, where respective Parties will provide updates on this topic specific to Plan Species or non-Plan Species, as new information arises (Item V-A). *(Note: this joint recurring agenda item was created, as discussed.)*
3. HCP Coordinating Committees representatives present agreed to add Andrew Wilson (WDFW) to the HCP Hatchery Committees email list (Item VI-C).

Review Items

1. The draft 2023 Wells HCP Annual Report was distributed to the Wells HCP Coordinating Committee by Kristi Geris on February 23, 2024, and is available for a 70-day review with edits and comments due to Geris by May 7, 2024 (Item I-B).
2. The draft 2023 Rock Island and Rocky Reach HCP Annual Reports were distributed to the Rock Island and Rocky Reach HCP Coordinating Committees by Kristi Geris prior to the HCP Coordinating Committees conference call on February 27, 2024, and are available for a 70-day review with edits and comments due to Geris by May 9, 2024 (Item I-B).
3. Columbia River Inter-Tribal Fish Commission's (CRITFC's) annual request to tag Sockeye Salmon at Wells Dam in 2024 was distributed to the HCP Coordinating Committees by Kristi Geris on February 26, 2024 (Item III-D).

Finalized Documents

1. The updated final report, *Habitat Conservation Plan Confirmation Survival Study of Yearling Chinook Salmon through the Rocky Reach Project in 2023*, was distributed to the HCP Coordinating Committees by Kristi Geris on February 28, 2024 (Item I-C).

Attachment A
List of Conference Call Attendees

Name	Organization
John Ferguson	Anchor QEA, LLC
Kristi Geris	Anchor QEA, LLC
Tracy Hillman	Bioanalysts
Lance Keller*	Chelan PUD
Bill Towey*	Chelan PUD
Catherine Willard	Chelan PUD
Tom Kahler*	Douglas PUD
Andrew Gingerich*	Douglas PUD
John Rohrback	Douglas PUD
Scott Carlon*	National Marine Fisheries Service
Chad Jackson*	Washington Department of Fish and Wildlife
Andrew Murdoch*	Washington Department of Fish and Wildlife
Keely Murdoch*	Yakama Nation
Kirk Truscott*	Confederated Tribes of the Colville Reservation

Notes:
* Denotes HCP Coordinating Committees representative or alternate

UNITED STATES FISH AND WILDLIFE SERVICE EMAIL SHOWING APPROVAL OF THE 2024 GAS ABATEMENT PLAN AND BYPASS OPERATING PLAN

From: Gale, William <william_gale@fws.gov>
Sent: Tuesday, February 27, 2024 03:56
To: Kristi Geris <kgeris@anchorqea.com>; John Ferguson <jferguson@anchorqea.com>
Subject: Re: [EXTERNAL] USFWS vote before CC 2/27 conf call

On these items you can consider the FWS as a vote for approval assuming there are no significant issues brought forward at the meeting by the other parties. If there are any significant edits or alterations to the documents I would like to have a chance to do a quick review prior to approval.

Hope the meeting goes well and catch up with you in March when I return.

Bill

William Gale, Complex Manager
US Fish and Wildlife Service
Leavenworth Fisheries Complex
(509) 548-2991 (office)
(509)393-4172 (cell)

From: Kristi Geris <kgeris@anchorqea.com>
Sent: Tuesday, January 23, 2024 4:00 PM
To: Gale, William <william_gale@fws.gov>; Lance.Keller <Lance.Keller@chelanpud.org>; Tom Kahler <tom.kahler@dcpud.org>
Cc: Bill Towey <bill.towey@chelanpud.org>; Catherine.Willard <Catherine.Willard@chelanpud.org>; Andrew Gingerich <andrew.gingerich@dcpud.org>; John Rohrback <john.rohrback@dcpud.org>; John Ferguson <jferguson@anchorqea.com>
Subject: [EXTERNAL] USFWS vote before CC 2/27 conf call

This email has been received from outside of DOI - Use caution before clicking on links, opening attachments, or responding.

Hi Bill G, Lance, and Tom—

Below are the items the PUDs are seeking approval on at the next CC 2/27 conference call. Thanks for coordinating ahead of time on these! -kristi

Document title	Draft distribution date(s)	Review period > Deadline	Request for approval
Chelan PUD items			
Confluence Parkway Non-Capacity Amendment	12/12/23	60-day > 2/10/24	Pls submit comments or indication of no comments.
2023 Biological Evaluation of the Rocky Reach Juvenile Fish Bypass System Draft Report (2023 RRJFBS Report)	12/13/23	60-day > 2/12/24	CC 2/27 conf call
2023 Rock Island Dam Smolt Monitoring Program and Gas Bubble Trauma Evaluation Draft Report (2023 Rock Island Smolt and GBT Evaluation Report)	12/13/23	60-day > 2/12/24	CC 2/27 conf call
Rock Island Dam Smolt Monitoring and Gas Bubble Trauma Evaluation Plan 2024 (2024 Rock Island Bypass Monitoring Plan)	12/13/23	60-day > 2/12/24	CC 2/27 conf call
2024 Rocky Reach Juvenile Fish Bypass System Operations Plan (2024 RRJSF Protocol)	12/13/23	60-day > 2/12/24	CC 2/27 conf call
2024 Fish Spill Plan, Rock Island and Rocky Reach Dams Public Utility District No. 1 of Chelan County (2024 Rock Island and Rocky Reach Fish Spill Plan)	01/23/24	30-day > 02/22/24	CC 2/27 conf call

2024 Rocky Reach and Rock Island HCP Action Plan	01/23/24	30-day > 02/22/24	CC 2/27 conf call
Douglas PUD items			
2024 Total Dissolved Gas Abatement Plan and appended Wells Bypass Operating Plan (2024 GAP/BOP)	01/09/24	30-day > 02/10/24	CC 2/27 conf call
2024 Wells HCP Action Plan	01/23/24	30-day > 02/22/24	CC 2/27 conf call

Kristi Geris | ANCHOR QEA, LLC
Managing Scientist

kgeris@anchorqea.com
Tri-Cities WA
O (509) 492-3102
M (360) 220-3988

ANCHOR QEA,LLC
Please consider the environment before printing this email.
This electronic message transmission contains information that may be confidential and/or privileged work product prepared in anticipation of litigation. The information is intended for the use of the individual or entity named above. If you are not the intended recipient, please be aware that any disclosure, copying distribution or use of the contents of this information is prohibited. If you have received this electronic transmission in error, please notify us by telephone at (206) 287-9130.

APPENDIX C

AQUATIC SETTLEMENT WORK GROUP PRE-FILING CONSULTATION RECORD FOR THE 2024 GAS ABATEMENT PLAN AND BYPASS OPERATING PLAN

NOTICE TO AQUATIC SETTLEMENT WORK GROUP TO REVIEW THE 2024 GAS ABATEMENT PLAN AND BYPASS OPERATING PLAN

From:	Mariah Mayfield
To:	Amber Nealy
Subject:	FW: 2024 Total Dissolved Gas Abatement Plan
Date:	Wednesday, February 21, 2024 3:32:49 PM
Attachments:	2024_01_09 Douglas - Draft Wells Dam 2023 GAP and BOP.docx

Mariah Mayfield
Aquatic Resource Biologist
Public Utility District No. 1 of Douglas County
1151 Valley Mall Parkway
East Wenatchee, WA 98802
Direct: (509) 881-2326
mariah.mayfield@dcpud.org

From: Kristi Geris <kgeris@anchorqea.com>
Sent: Tuesday, January 9, 2024 4:49 PM
To: Andrew Gingerich <andrew.gingerich@dcpud.org>; Blanchard, Monica R (DFW) <Monica.Blanchard@dfw.wa.gov>; Chad Brown <chbr461@ecy.wa.gov>; Chas Kyger <chas.kyger@dcpud.org>; David Blodgett, III <blod@yakamafish-nsn.gov>; Fety, Stuart B (FWS) <stuart_fety@fws.gov>; Jason McLellan <Jason.McLellan@colvilletribes.com>; John Ferguson <jferguson@anchorqea.com>; John Rohrback <john.rohrback@dcpud.org>; Keely Murdoch (murk@yakamafish-nsn.gov) <murk@yakamafish-nsn.gov>; Kristi Geris <kgeris@anchorqea.com>; Laura.Heironimus@dfw.wa.gov; Mariah Mayfield <mariah.mayfield@dcpud.org>; Verhey, Patrick M (DFW) <patrick.verhey@dfw.wa.gov>; Ralph Lampman (lamr@yakamafish-nsn.gov) <lamr@yakamafish-nsn.gov>; RD Nelle <RD_Nelle@fws.gov>; bzim461 <bzim461@ECY.WA.GOV>
Subject: FW: 2024 Total Dissolved Gas Abatement Plan

Hi ASWG Technical Reps: please see the email below from Mariah and the attached draft 2024 GAP/BOP, which is available for a 30-day review with edits and comments due to Mariah by **February 10, 2024**.

The attached draft plan is also available for download from the Aquatic SWG Extranet Site, under: Documents > All by Mtg Date > 1/10/2024 (instructions below). Thanks! –Kristi

Instructions:

To gain access to the Aquatic SWG Extranet Homepage, please use the following procedure:

* Visit: https://extranet.dcpud.net/sites/nr/aswg/
* Login using “Forms Authentication” (for non-Douglas PUD employees)

You should now be at the Aquatic SWG homepage.

If you encounter problems, or need a login username and password to access the site: Please feel free to contact me, Andrew Gingerich, or Julene McGregor [jmcgregor@dcpud.org; (509) 881-2236] and we will gladly assist you with questions or issues.

Kristi Geris

ANCHOR QEA, LLC

kgeris@anchorqea.com
O (509) 492-3102
M (360) 220-3988

From: Mariah Mayfield <mariah.mayfield@dcpud.org>
Sent: Tuesday, January 9, 2024 16:36
To: Kristi Geris <kgeris@anchorqea.com>
Subject: 2024 Total Dissolved Gas Abatement Plan

Attached is the 2024 Total Dissolved Gas Abatement Plan (and Bypass Operations Plan) for the ASWG 30-day review. We would like all comments emailed to me (mariah.mayfield@dcpud.org) by February 10, 2024 and we will be voting to approve the report at the February 14th ASWG meeting. Thank you and let me know if there are any questions.

Mariah

Mariah Mayfield
Aquatic Resource Biologist
Public Utility District No. 1 of Douglas County
1151 Valley Mall Parkway
East Wenatchee, WA 98802
Direct: (509) 881-2326
mariah.mayfield@dcpud.org

FINAL AQUATIC SETTLEMENT WORK GROUP ACTION ITEMS SHOWING APPROVAL OF THE 2024 GAS ABATEMENT PLAN AND BYPASS OPERATING PLAN

FINAL

Conference Call Action Items

Aquatic Settlement Work Group

To: Aquatic SWG Parties **Date:** February 15, 2024

From: John Ferguson, Chair, Anchor QEA, LLC

Re: **Final Action Items of the February 14, 2024, Aquatic SWG Conference Call**

Below is a summary of Action Items from the Aquatic Settlement Work Group (SWG) meeting that was held by conference call on Wednesday, February 14, 2024, from 10:00 a.m. to 12:00 p.m. Attendees are listed in Attachment A. These action items include the following:

Summary of Action Items

1. The Yakama Nation (YN) will ask Pacific Northwest National Laboratory (PNNL) about possibly presenting results from their 2023 juvenile Pacific Lamprey passage behavior and survival study during a joint meeting of the Aquatic SWG, Rocky Reach Fish Forum (RRFF), and Priest Rapids Fish Forum (PRFF) this spring, 2024 (Item I-C).
2. Douglas PUD will provide additional information about the operation of the return-to-river pipe at Wells Dam, including photographs of inside the Adult Handling Facility where the pipe connects to the sorting table and approximate dates and hours of when flush water might be running through the pipe (Item I-C).
3. Douglas PUD will contact the Washington Department of Fish and Wildlife (WDFW) genetics laboratory regarding *Bull Trout Movement and Life History Investigation 2022–2023* (2022–2023 Bull Trout Study Report), *Appendix C. Genetic Analysis for Bull Trout Prepared by Washington Department of Fish and Wildlife Dated June 2023*, notably for clarification about methods used and populations considered in the genetic analysis (Item II-C).
4. Douglas PUD will ask Grant PUD for information about lamprey trap operations at Priest Rapids Dam, including photographs of how the orifices are configured when the traps are operated (Item II-E).
5. Douglas PUD will consult the YN about lamprey trap operations for implementation at Wells Dam in 2024, including possibly collecting genetic fin clips and release location for fish collected in the traps, for further discussion with the Aquatic SWG (Item II-E).
6. The Aquatic SWG meeting on March 13, 2024, will be held by conference call (Item III-A).

Summary of Decisions

1. Aquatic SWG representatives present approved the *2024 Total Dissolved Gas Abatement Plan and appended Wells Bypass Operating Plan* (2024 GAP/BOP). The Confederated Tribes of the Colville Reservation (CTCR) approved the plan via email prior to the Aquatic SWG conference call on February 14, 2024 (Item II-A).
2. Aquatic SWG representatives present approved the *2023 Annual Report Total Dissolved Gas Abatement Plan* (2023 TDG Report). The CTCR approved the report via email prior to the Aquatic SWG conference call on February 14, 2024 (Item II-B).
3. Aquatic SWG representatives present approved the 2022–2023 Bull Trout Study Report, as revised, including *Appendix A. FERC Order Granting Variance from Radio Telemetry Study Pursuant to Bull Trout Stranding, Entrapment, and Take Study Plan and Article 402 Issued October 12, 2021*, *Appendix B. 2022–2023 Bull Trout Detection History Plots of Individual Study Fish*, and *Appendix C. Genetic Analysis for Bull Trout Prepared by Washington Department of Fish and Wildlife Dated June 2023*. The CTCR approved the report via email prior to the Aquatic SWG conference call on February 14, 2024 (Item II-C).

Agreements

1. Aquatic SWG representatives present agreed to Douglas PUD's proposal to use new sampling methods, fyke nets and hoop nets, for the 2024 Resident Fish Assemblage Study, so Douglas PUD can move forward with purchasing gear for implementation this spring 2024 (Item II-F).

Review Items

1. The draft *Total Dissolved Gas Water Quality Attainment Plan Year 10 Report* (Water Quality Attainment Plan 10-Year Report) was distributed to the Aquatic SWG by Kristi Geris on November 14, 2023, and is available for review with edits and comments due to Mariah Mayfield.
2. The draft 2024 Resident Fish Assemblage Study Plan was distributed to the Aquatic SWG by Kristi Geris on January 29, 2024, and is available for a 30-day review with edits and comments due to Chas Kyger by February 28, 2024. Douglas PUD will request approval of the draft plan during the Aquatic SWG conference call on March 13, 2024 (Item II-F).
3. The draft *2024 Aquatic Settlement Agreement and Workgroup Action Plan* (2024 ASA Action Plan) was distributed to the Aquatic SWG by Kristi Geris on February 13, 2024, and is available for a 30-day review with edits and comments due to Andrew Gingerich by March 12, 2024. Douglas PUD will request approval of the draft plan during the Aquatic SWG conference call on March 13, 2024 (Item II-H).

Documents Finalized

1. The final 2022–2023 Bull Trout Study Report, as revised, including Appendices A, B, and C, were distributed to the Aquatic SWG by Kristi Geris following the Aquatic SWG conference call on February 14, 2024 (Item II-C).

Attachment A – List of Attendees

Name	Role	Organization
John Ferguson	Aquatic SWG Chairman	Anchor QEA, LLC
Kristi Geris	Administration/Technical Support	Anchor QEA, LLC
Chas Kyger	Aquatic SWG Technical Alternate	Douglas PUD
John Rohrback	Aquatic SWG Technical Support	Douglas PUD
Mariah Mayfield	Aquatic SWG Technical Support	Douglas PUD
RD Nelle	Aquatic SWG Technical Representative	U.S. Fish and Wildlife Service
Stuart Fety	Aquatic SWG Technical Alternate	U.S. Fish and Wildlife Service
Patrick Verhey	Aquatic SWG Technical Representative	Washington Department of Fish and Wildlife
Laura Heironimus	Aquatic SWG Technical Alternate	Washington Department of Fish and Wildlife
Breean Zimmerman	Aquatic SWG Technical Representative	Washington State Department of Ecology
Ralph Lampman	Aquatic SWG Technical Representative	Yakama Nation

COLVILLE CONFEDERATED TRIBES' EMAIL SHOWING APPROVAL OF THE 2024 GAS ABATEMENT PLAN AND BYPASS OPERATING PLAN

From: John Ferguson <jferguson@anchorqea.com>
Sent: Wednesday, February 14, 2024 8:36 AM
To: Andrew Gingerich <andrew.gingerich@dcpud.org>; Chas Kyger <chas.kyger@dcpud.org>; Mariah Mayfield <mariah.mayfield@dcpud.org>
Cc: Kristi Geris <kgeris@anchorqea.com>
Subject: FW: Aquatic SWG: 2/14 conf call agenda

FYI, from Jason.
J

From: Jason McLellan <jason.mclellan@colvilletribes.com>
Sent: Wednesday, February 14, 2024 8:23 AM
To: Kristi Geris <kgeris@anchorqea.com>; John Ferguson <jferguson@anchorqea.com>
Subject: Re: Aquatic SWG: 2/14 conf call agenda

Hi John,

I have a conflict and this am unable to make today's call. I vote to approve the meeting notes, BOP and GAP reports, and the Bull Trout report.

Sturgeon update - 157 BY23 wild larvae original juvenile White Sturgeon originally caught in Lake Roosevelt are being transferred to Wells hatchery today to make up for the shortfall in the Chelan PUD program.

SAP screening of the BY23 CPUD program fish at Wells is scheduled to start on March 4.

Thanks,
Jason

> On Feb 2, 2024, at 5:52 PM, Kristi Geris <kgeris@anchorqea.com> wrote:
>
> Hi Aquatic SWG: attached is the agenda for the Aquatic SWG conference call on February 14, 2024.
>
> The attached final agenda is also available for download from the Aquatic SWG Extranet Site, under: Documents > All by Mtg Date > 2/14/2024 (instructions below). Thanks, and have a great weekend! –kristi

Instructions:

To gain access to the Aquatic SWG Extranet Homepage, please use the following procedure:

* Visit: https://extranet.dcpud.net/sites/nr/aswg/
* Login using “Forms Authentication” (for non-Douglas PUD employees)

You should now be at the Aquatic SWG homepage.

If you encounter problems, or need a login username and password to access the site:
Please feel free to contact me, Andrew Gingerich, or Julene McGregor [jmcgregor@dcpud.org; (509) 881-2236] and we will gladly assist you with questions or issues.

Kristi Geris | ANCHOR QEA, LLC
Managing Scientist

kgeris@anchorqea.com
Tri-Cities WA
O (509) 492-3102
M (360) 220-3988

ANCHOR QEA,LLC
Please consider the environment before printing this email.
This electronic message transmission contains information that may be confidential and/or privileged work product prepared in anticipation of litigation. The information is intended for the use of the individual or entity named above. If you are not the intended recipient, please be aware that any disclosure, copying distribution or use of the contents of this information is prohibited. If you have received this electronic transmission in error, please notify us by telephone at (206) 287-9130.

Appendix M
Wells Dam Adult Lamprey Approach and Passage Study, 2022–23

WELLS DAM ADULT LAMPREY APPROACH AND PASSAGE STUDY, 2022-23

David Robichaud,
LGL Limited
Sidney, BC, Canada

John Rohrback, *and* **Mariah Mayfield**
Public Utility District No. 1 of Douglas County
East Wenatchee, WA, USA

Prepared for:

Public Utility District No. 1 of Douglas County
East Wenatchee, Washington

June 2024

LGL LIMITED
environmental research associates

DOUGLAS COUNTY P.U.D.

Executive Summary

Studies of the effectiveness of Wells Hydroelectric Project, operated by Public Utility District No. 1 of Douglas County (Douglas PUD), at passing Pacific Lamprey (*Entosphenus tridentatus*) have assumed that study fish exhibit upstream migratory behavior and are motivated to approach and attempt to pass Wells Dam. However, more recent lamprey tracking studies, including a telemetry study in 2016 to 2017, called that assumption into question. In light of this, and at the direction of the Aquatic Settlement Work Group (Aquatic SWG), Douglas PUD began in 2018 a four-year Pacific Lamprey translocation program, in which adults were captured at Priest Rapids Dam and released at locations upstream of Wells Dam. The intent of the translocation program was to reestablish or enhance the existing pheromone signal from Pacific Lamprey occupying habitats upstream of Wells Dam, which would ideally result in increased proportions of Pacific Lamprey within the Rocky Reach Reservoir that choose to approach and interact with the Wells Project. Meanwhile, fishway (i.e., combined collection gallery and fish ladder) maintenance activities occurred from 2019-2021, to eliminate any gaps greater than 1 inch between diffuser grating and concrete thereby returning grating to engineering specification. Following four years of translocations, Douglas PUD implemented an acoustic tracking study from 2022 to 2023 similar to that conducted in 2016 to 2017. The goal was to determine if Wells Dam approach rates were different in 2022 compared to 2016 following four years of translocation, and to further evaluate if the recent in-ladder modifications have improved upstream passage behavior through the Wells Dam fishways.

Adult Pacific Lamprey were captured at Priest Rapids Dam and transported to the Wells Fish Hatchery for tagging. Lamprey were tagged with acoustic and Passive Integrated Transponder (PIT) tags (n=170), or with a PIT tag only (n=475), and were released into the lower reaches of the Rocky Reach Reservoir, either approximately 1 mile upstream of Rocky Reach Dam (120 acoustic+PIT, 334 PIT-only), or at Daroga State Park (50 acoustic+PIT, 141 PIT-only). The movements of the tagged fish were tracked within Rocky Reach Reservoir, in the Wells Dam fishways, in the Wells Reservoir, and in local tributaries using a combination of fixed-station acoustic receivers, PIT receiver arrays, and by mobile tracking.

In general, fish in the Rocky Reach Reservoir moved quickly in the upstream direction after release. Travel speeds varied among individuals. The fastest reach-specific travel speeds were in the lowest parts of the reservoir. In each reach, there was a bimodal distribution of travel speeds, with some individuals moving very slowly, and a second group moving more quickly. At least 48% (82 of 170) of the fish appeared to pause at the end of the summer, and then resume their movements after the winter. Tracking data from after the pause showed continued upstream movement for 27% of the fish, a maintained position for 30%, and a reversal downstream for 43% of the fish.

Of the 170 acoustic-tagged lamprey that were released into the Rocky Reach Reservoir, 139 (82%) moved far enough upstream to be detected at or upstream of the Wells Dam tailrace. In all, 137 acoustic-tagged fish (81%) interacted with Wells Dam fishways (i.e., were detected at receivers deployed at or inside the collection gallery entrances), mostly at night. Forty of these fish (23.5% of total released) were detected inside the Wells Dam fish ladders, all of which moved successfully through Pool 68 and into the forebay. Larger-sized acoustic-tagged lamprey and fish released earlier in the study were more likely to approach Wells Dam, whereas fish condition and release site were not important factors. The probability of successful passage for acoustic-tagged fish was significantly affected by fish condition, but not fish length, release site, or release date.

Of the 475 lamprey that bore only a PIT tag, 156 (33%) were detected within the Wells Dam fish ladders, of which 149 successfully moved through Pool 68 and into the forebay (96%). The probability of fish ladder detection was greater for larger-sized lamprey, but was not affected by fish condition, release location, or release date. The

probability of successful passage for PIT-only fish was not significantly affected by fish length, condition, release site, or release date.

To evaluate the assumption that a PIT detection at Pool 68 constitutes a successful ladder ascension, the detection sequences for 40 ascents involving 39 acoustic-tagged fish detected in Pool 68 were examined. All but one (97.5%) of the Pool 68 detections were followed by upstream detections that confirmed successful dam passage.

To evaluate the preponderance of 'missed downstream exit events', the detection histories of 32 acoustic-tagged fish detected in Pool 19 were examined. All 32 of the fish (100%) had a detection history that showed a continued upstream movement into the Wells forebay. Since no fish disappeared mid route, later seen in the tailrace, there was no evidence in 2022 for exits via the diffuser grating or auxiliary water supply, suggesting that the in-ladder maintenance works were successful.

After four years of translocation efforts, the attractiveness of water upstream of Wells Dam, as measured by the proportions of fish that moved all the way through the Rocky Reach Reservoir into the Wells tailrace, appears to have increased. Also, the proportion of fish that interacted with Wells Dam fishways, and the probability of successful lamprey fishway ascent were higher in 2022 than they were in 2016. These results are consistent with the hypothesis that translocations above Wells Dam could have increased the motivation of migrating lamprey to approach and pass through Wells Dam.

Table of Contents

List of Tables iv
List of Figures iv
1. Introduction 1
2. Goal, Objectives, and Hypotheses 2
3. Study Area 3
3.1. Wells Hydroelectric Project 3
3.2. Rocky Reach Reservoir 3
3.3. Environmental Conditions 3
3.4. Lamprey Counts and Conversion Factors 3
4. Methods 5
4.1. Fish Collection and Transport 5
4.2. Tagging and Releases 6
4.3. Tracking 11
4.4. Data Processing 19
4.5. Data Analysis 19
4.5.1. Tag Detections 19
4.5.2. Detection Efficiency 19
4.5.3. Acoustic-and-PIT-Tag Pacific Lamprey Approach and Passage 19
4.5.4. Entrance Efficiency 20
4.5.5. Reservoir Speeds and Fishway Ascension Times 21
4.5.6. Low Statistical Power 21
5. Results 21
5.1. Tag Detections 21
5.2. Detection Efficiency 24
5.3. General Reservoir Movements 24
5.4. Upstream Movements 24
5.4.1. Wells Fishway Interaction and Passage 34
5.4.2. Fishway comparisons 38
5.4.3. Assumption that a Pool 68 detection is a signifier of successful passage 38
5.4.4. Effectiveness of fishway maintenance activities to prevent mid-fishway exit events 38
5.5. Movements Upstream of Wells Dam 38
5.6. Downstream Movements 39
6. Discussion 40
7. Conclusions 43
8. Acknowledgements 43
9. Literature Cited 43
Appendices 46

List of Tables

Table 1. Numbers of Pacific Lamprey released by date, location, and tag type 7
Table 2. Acoustic receivers that were in place for tracking lamprey, 2022-23 17
Table 3. Mobile tracking surveys for acoustic-tagged lamprey, 2022-23 18
Table 4. Most upstream PIT array detection locations, by tagging type 22
Table 5. Most upstream detection locations for lamprey released with both PIT and acoustic tags 23
Table 6. Acoustic-tagged lamprey detected at and known to have passed each acoustic detection zone, and the corresponding detection efficiency 25
Table 7. PIT-tagged lamprey detected at and known to have passed each fish ladder PIT detection array, and the corresponding detection efficiency 26
Table 8. Mean and median travel speeds by river reach in the Rocky Reach Reservoir 27
Table 9. Spearman rank correlation coefficients for all possible pairwise comparisons of ranked travel times among river reaches 30
Table 10. Statistical results of regressions, testing for effects of total length or weight on travel speed, by river reach 32
Table 11. Numbers of acoustic-and-PIT-tagged and of PIT-only-tagged lamprey that were released, that approached Wells Dam, that were detected in the fishways, and that passed Wells Dam, by release location 34

List of Figures

Figure 1. Flows measured in the Wells Dam tailrace 4
Figure 2. Annual lamprey counts at Rocky Reach and Wells dams, and conversion factor 5
Figure 3. Photo of the surgical set-up 7
Figure 4. Weights of Pacific Lamprey released in 2022, by tag type and release location 8
Figure 5. Lengths of Pacific Lamprey released in 2022, by tag type and release location 9
Figure 6. Girths of Pacific Lamprey released in 2022, by tag type and release location 10
Figure 7. Tag burden values for Pacific Lamprey released in 2022, by tag type and release location 12
Figure 8. Location map of the Rocky Reach Reservoir 13
Figure 9. Acoustic receiver locations in the Wells Dam forebay and tailrace 14
Figure 10. Acoustic receiver locations in the Rocky Reach Reservoir, downstream of the Wells array 15
Figure 11. Acoustic receiver locations in the Wells Reservoir 16
Figure 12. The farthest upstream distances reached by acoustic-tagged lamprey 27
Figure 13. Upstream travel speeds by river reach 28
Figure 14. Upstream travel speeds by the hour of the first detection at the downstream end of the reach 29
Figure 15. Timing of first detection event at each acoustic receiver zone for upstream-migration lamprey 29
Figure 16. Upstream travel speeds by river km of the starting point 32
Figure 17. Upstream travel speeds in each river reach by fish length 33
Figure 18. Timing of Wells fishway interaction events, by release location 35
Figure 19. Dates of fishway passage initiation events, by release location 35
Figure 20. Aproach of Wells Dam for acoustic-tagged lamprey, by fish length and release date 36
Figure 21. Passage into the forebay for acoustic-tagged lamprey, by condition factor 36
Figure 22. PIT tags detected in the Wells Dam fish ladders, by fish length 37
Figure 23. Acoustic-tagged lamprey that made directed downstream movements in 2023. 39

1. Introduction

Pacific Lamprey (*Entosphenus tridentatus*) are anadromous and semelparous: after an initial freshwater phase, they feed and grow in the ocean and return to freshwater to spawn and die. Upon their return to freshwater, they travel upriver to areas in low-gradient stream reaches, spawning over gravel or cobble substrates in pool-tailouts or glides and riffles (Jackson et al. 1997, Gunkle et al. 2009). In the Upper Columbia River, Pacific Lamprey are known to occur in the Methow, Wenatchee, Entiat and Okanogan rivers (BioAnalysts 2000). Abundance declines, which have been observed for Columbia River Pacific Lamprey populations over the last 40 years, have been attributed to juvenile and adult dam passage issues, degradation of spawning and rearing habitats, pollution, reduction of ocean food sources, and predation by introduced species (Close et al. 2002). However, the mechanisms of decline are poorly understood and highly speculative. Nevertheless, conservation of Pacific Lamprey in the Columbia River Basin is being promoted given their cultural and ecological importance (Close et al. 2002).

Leading up to the relicensing of the Wells Hydroelectric Project (Wells Project), several studies were conducted to address Pacific Lamprey passage issues at Wells Dam. Telemetry studies were conducted in 2004 and 2007-2008 to determine migration and passage characteristics of lamprey entering the Project area (Nass et al. 2005, Robichaud et al. 2009). Following these initial studies, and during the relicensing process, a Pacific Lamprey Management Plan (PLMP) was developed for the Wells Project, in collaboration with federal, state, and tribal relicensing participants, and in support of a comprehensive Aquatic Settlement Agreement.

Based on PLMP requirements, studies were planned for 2016 to test the efficacy of prototype lamprey boxes to assist with fishway entrance, but the trials were not conducted because the numbers of lamprey being counted at Wells Dam did not meet sample size requirements. Indeed, the low counts of lamprey at Wells Dam raised questions about the degree of motivation of wild, non-philopatric (Spice et al. 2012) lamprey to pass the dam. Previous lamprey tracking studies had shown that no more than about half of radio-tagged translocated lamprey that were released in the Wells Dam tailrace interacted with the dam (Robichaud et al. 2009, Robichaud and Kyger 2014). Thus, in 2016, instead of testing the efficacy of the fishway entrance boxes, an acoustic telemetry tracking study was conducted to determine the distribution and behavior of lamprey in the Rocky Reach Reservoir and to estimate the proportions of those lamprey that approached Wells Dam. In that study, 17% of tracked fish interacted with Wells Dam fishways, three study fish were detected upstream of the entrances of the Wells Dam fishways (within the ladder), and only one fish was known to have passed Wells Dam (Robichaud and Kyger 2018).

In light of the results of the acoustic-tracking study, and at the direction of the Aquatic Settlement Work Group (Aquatic SWG), Douglas PUD began in 2018 a four-year Pacific Lamprey translocation program, in which adults were captured at Priest Rapids Dam and released at locations upstream of Wells Dam. The intent of the translocation program was to reestablish or enhance the existing pheromone signal from Pacific Lamprey occupying habitats upstream of Wells Dam, which would ideally result in increased proportions of Pacific Lamprey within the Rocky Reach Reservoir that choose to approach and interact with the Wells Project.

During the translocation study period, fishway maintenance activities occurred that could improve lamprey passage. From 2019 to 2021, at the direction of the Aquatic SWG, areas in the fishways were covered with aluminum plating to eliminate any gaps greater than 1 inch between diffuser grating and concrete. Areas that received new plating included the collection gallery, Pool Nos. 1 and 2, Nos. 5 and 6, Nos. 8 and 9, Nos. 11 and 12, Nos. 14 and 15, Nos. 17 and 18, Nos. 20, 21, and 22, and upper ladder Pool Nos. 56. These maintenance activities were completed in both the right and left fishways.

Following four years of translocations, Douglas PUD implemented from 2022 to 2023 an acoustic tracking study, similar to that conducted in 2016 to 2017. The goal was to assess lamprey distributions in the Rocky Reach Reservoir, and the proportions that approached and passed Wells Dam. Results were compared to those from the 2016 tracking study in order to assess the effectiveness of the fishway maintenance and translocation activities. This report details the design, methods, and results from the tracking study.

2. Goal, Objectives, and Hypotheses

The goals of the study were to determine if Wells Dam approach rates in 2016 were different from those in 2022 (i.e., following 4 years of translocation), and to further evaluate if the recent in-ladder improvements have affected upstream passage behavior through the Wells Dam fishways.

The two specific objectives of the study included:

1. *Adult Pacific Lamprey Upstream Passage Evaluation (PLMP Section 4.1.6).*
    A. Determine the proportion of acoustic-and-PIT-tagged lamprey released in Rocky Reach Reservoir that approach and interact with the Wells Project. Test whether this proportion is different from the proportion measured in 2016.
    B. Where possible, compare lamprey passage metrics (i.e., passage efficiency, travel time, and behavior) in 2022 to those measured in 2016.

2. *Wells Dam Adult Pacific Lamprey Passage Evaluation (PLMP Section 4.1.6)*
    A. Evaluate Wells Dam upstream passage rates of acoustic-and-PIT-tagged Pacific Lamprey that approach Wells Dam and are detected by an acoustic receiver located within the Wells Dam tailrace. Acoustic-and-PIT tagged fish will be deemed to have successfully passed Wells Dam if there is an acoustic or PIT tag detection anywhere upstream of the Wells Dam Ladder Pool 67.
    B. Passage rates encountered in 2022 will be compared to those reported in previous acoustic and radio tag studies.

Null and alternative hypotheses for Objectives 1 and 2 are as follows:

Objective 1:

H_o: The proportion of acoustic-and-PIT-tagged Pacific Lamprey released in the Rocky Reach Reservoir that approach and interact with the Wells Project is equal to the proportion of acoustic-tagged Pacific Lamprey released into the Rocky Reach Reservoir that approached and interacted with the Wells Project during the 2016 Pacific Lamprey Passage Study.

H_{alt}: The proportion of acoustic-and-PIT-tagged Pacific Lamprey released in the Rocky Reach Reservoir that approach and interact with the Wells Project is greater than the proportion of acoustic-tagged Pacific Lamprey released in the Rocky Reach Reservoir that approached and interacted with the Wells Project during the 2016 Pacific Lamprey passage study.

Objective 2:

H_o: The number of acoustic tagged lamprey detected outside of the fish ladders of Wells Dam is equal to the number of fish detected at Wells Dam Ladder Pool 68 or above.

H_{alt}: The number of acoustic tagged lamprey detected outside of the fish ladders of Wells Dam is dissimilar to the number of fish detected at Wells Dam Ladder Pool 68 or above.

3. Study Area

The core acoustic tracking study area included the Wells fishway entrances, the Wells Dam tailrace and reservoir, and the Rocky Reach Reservoir. Passive Integrated Transponder (PIT) tag detectors were present in the Rocky Reach and Wells fishways, and in the Wenatchee, Entiat, Methow, and Okanogan rivers.

3.1. Wells Hydroelectric Project

The Wells Project is located at river mile (RM) 515.6 on the Columbia River in the State of Washington. Wells Dam is located approximately 30 river miles downstream from the Chief Joseph Hydroelectric Project, owned and operated by the United States Army Corps of Engineers (Seattle District); and 42 miles upstream from the Rocky Reach Hydroelectric Project owned and operated by Chelan PUD. The nearest town is Pateros, Washington, which is located approximately 8 miles upstream from Wells Dam. The Wells Project Area extends 1 mile downstream of Wells Dam.

The Wells Project is the chief generating resource for Douglas PUD. It includes ten generating units with a nameplate rating of 832,320 kW and a peaking capacity of approximately 840,000 kW. The design of the Wells Project is unique in that the generating units, spillways, switchyard, and fish passage facilities were combined into a single structure referred to as the hydrocombine. The hydrocombine is 1,130 feet long, 168 feet wide, with a top of dam elevation of 795 feet above mean sea level (msl). There are fish passage facilities (the combination of collection gallery and fish ladder, termed 'fishways') on both ends of the hydrocombine.

3.2. Rocky Reach Reservoir

The Rocky Reach Reservoir is formed by Rocky Reach Dam (river mile 473) and extends 42 miles upstream to Wells Dam. Two tributaries enter the reservoir from the west including the Entiat (RM 483) and Chelan (RM 503) rivers. Habitat types in the reservoir transition from high water velocities and riverine conditions in the Wells Dam tailrace to low water velocities and lake-like conditions in the Rocky Reach Dam forebay. Over the past 10 years, discharge through the reservoir has ranged from a mean monthly low of 1,700 m^3/s (60 kcfs) in autumn to a mean monthly high of 5,100 m^3/s (180 kcfs) in spring; and water temperatures have typically ranged from 3 to 19°C.

3.3. Environmental Conditions

Over the past 21 years from 2002 to 2022, mean daily flow measured in the Wells Dam tailrace has varied widely from a low of 1,702 m^3/s (60 kcfs) in the fall (on 19 Sep) to a high of 5,267 m^3/s (186 kcfs) in the early summer (on 28 Jun; Figure 1a). During the main upstream migratory period for study fish (August and September; see Appendix C), flows in 2022 were generally higher than the long-term mean (mean difference = 15.4 kcfs), more so until mid-September; whereas flows during the same period for the 2016 study fish were below average (mean difference = -5 kcfs; Figure 1b), again mainly before mid-September.

3.4. Lamprey Counts and Conversion Factors

Lamprey counts at Rocky Reach and Wells dams have varied widely since 2000 (Figure 2). At Rocky Reach, counts have ranged from a low of 268 (in 2010) to a high of 23,986 (in 2017). At Wells Dam values ranged from zero (in 2015) to 1,684 (in 2022). Conversion factors (the proportion of the Rocky Reach count that is counted at Wells Dam) ranged from 0 to 56% (Figure 2). For the purposes of comparison, the times series was divided into two periods – pre-translocation years (up to and including 2016), and translocation years (2017 and onward). Excluding a biased period in 2007-2008, a comparison between the two periods' conversion factors (means of 15.4% and 5.5%, respectively), conducted using logistic regression (i.e., generalized linear model with quasibinomial error structure), was not statistically significant ($F = 2.2$, $P = 0.15$).

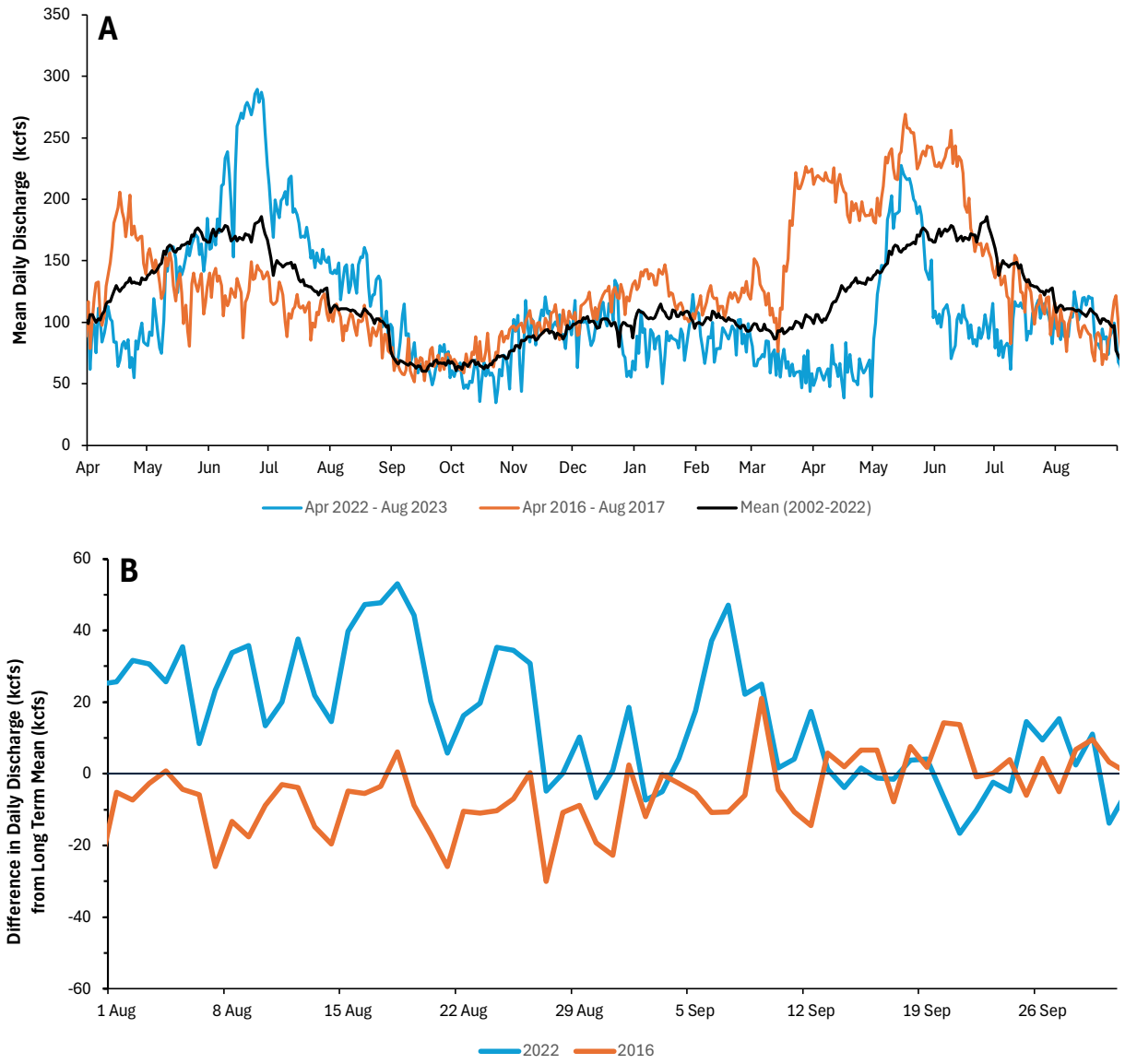


Figure 1. **Flows measured in the Wells Dam tailrace. A) Seventeen-month time series starting in April 2016 (orange) or April 2022 (blue), along with the long term (2000-2022) daily average (black). B) difference between recorded 2016 (orange) or 2022 (blue) values from the long-term daily average for the study fish's main migratory period (August and September).**

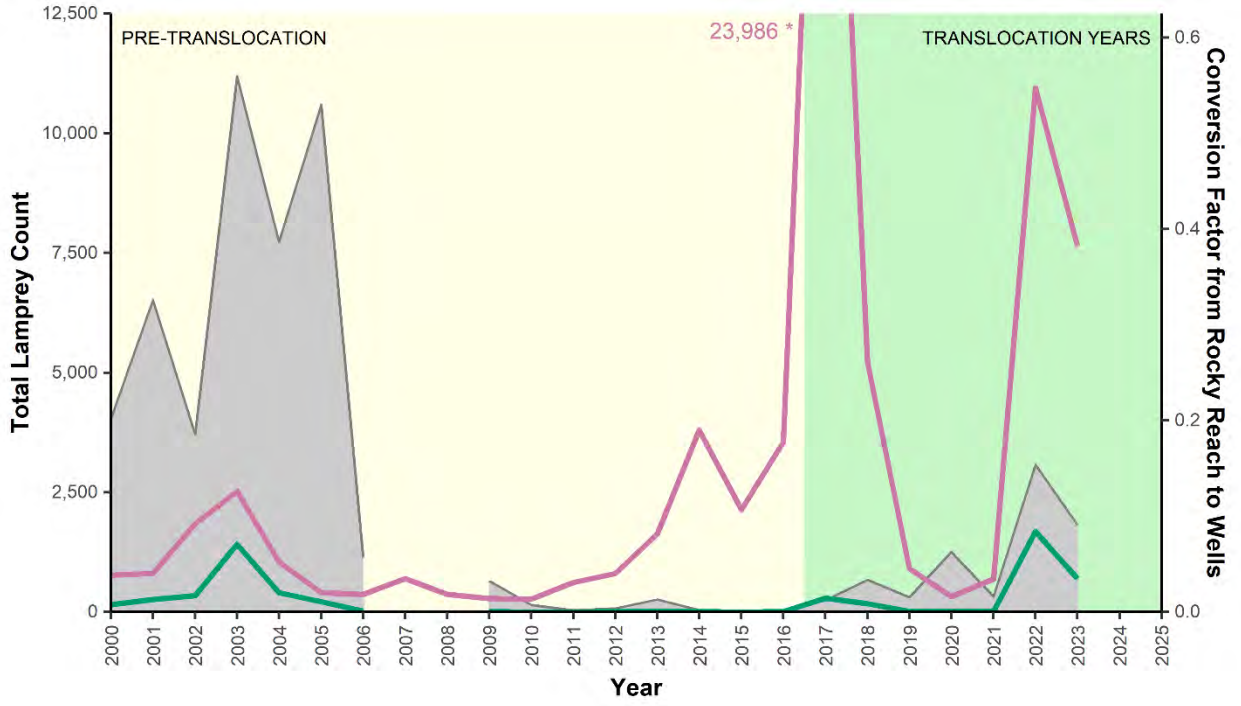


Figure 2. Annual lamprey counts at Rocky Reach (magenta) and Wells (green) dams, and conversion factor (gray area, plotted on right axis). Background colors identify two temporal periods within the time series: the period prior to translocation (up to and including 2016), and the translocation years (from 2017 onward). Wells count data from 2007 and 2008 are excluded due to a known bias.

4. Methods

To meet the objectives of the study, Pacific Lamprey were collected at Priest Rapids Dam in fish ladder traps fished at night, transported to and tagged (acoustic transmitters and PIT tags) at Wells Hatchery, and released into the Rocky Reach Reservoir. The movements of the tagged fish were tracked within Rocky Reach Reservoir, in the Wells Dam fishways, in the Wells Reservoir, and in local tributaries using a combination of fixed-station acoustic and PIT receivers and by mobile tracking. Details are provided below.

4.1. Fish Collection and Transport

Adult Pacific Lamprey were collected in traps located within Priest Rapids Dam fishways. Trapping occurred weekly over the five-week period from 22 July to 19 August 2022, coincident with peak run timing, to maximize the probability that the study fish were representative of the full run at large.

Since most fish losses from hauling stress are caused by poor water quality and improper handling (Wynne and Wurts 2011), the handling and transport protocols that were developed for the 2016 Pacific Lamprey passage study (i.e., those that ensured that study fish were delivered to the Wells Fish Hatchery in good health) were employed again in 2022.

Only adult Pacific Lamprey in healthy condition (e.g., no signs of injury, disease, etc.) were collected for transport. All captured fish were immediately placed in covered hauling tanks via nets. No anesthetics were used during

trapping or transportation operations. This is because anesthesia during transportation in fish may produce a biological response similar to that caused by stress (Wynne and Wurts 2011), and because Pacific Lamprey translocated by Douglas PUD in past years have not shown an adverse response to translocation in waters that contained no anesthetic.

Covered tanks were stocked at low densities (no less than one gallon per adult) to avoid stressors and disease transmission related to overcrowding. Each tank was filled with well or river water, and water temperature and dissolved oxygen were measured prior to and during transport. Pacific Lamprey were not placed into a tank for transportation unless dissolved oxygen levels were greater than 90%. Upon arrival at Wells Fish Hatchery, water temperature and dissolved oxygen were measured again, and total transport times recorded.

Pacific Lamprey were collected from outside the Wells Project area primarily because lamprey counts at Wells Dam in recent years have been too low to reliably expect to be able to capture a sufficient number of fish at the Wells Project for the study.

4.2. Tagging and Releases

Acoustic tagging procedures followed methods described in previous lamprey radio-telemetry studies (e.g., Moser et al. 2002, Robichaud and Kyger 2014, 2018). An effort was made to minimize impacts to the biological and physiological condition of the study fish (as outlined in Liedtke et al. 2012). Specific attention was made to minimize incision length, possibility of infection, handling time, water temperature stressors, and air exposure.

All lamprey were anesthetized using 110 mg/L buffered tricaine methanesulfonate (MS-222) for 5-8 minutes. Once the fish lost equilibrium, the surgeon screened the lamprey for fungus, disease, injury, or any obvious abnormalities (no fish were rejected during the screening process, although one fish was rejected prior to screening because it was dead upon arrival at Wells Hatchery). Healthy anesthetized fish were transferred to a scale and weighed to the nearest 0.1 g. All lamprey were then measured for total length (to the nearest mm) and girth (to the nearest 0.25 cm). The girth measurement was taken anterior to the first dorsal fin.

Lamprey were then placed head-first into a 5 cm (2 inch) diameter polyvinyl chloride (PVC) pipe, sealed on one end with a removable cap. A portion of the pipe was cut away to allow access to the ventral surface of the lamprey for surgery. During the procedure, the head and gills of the fish were submerged in (and/or flushed with) a 35 mg/L concentration of MS-222 (Figure 3). To surgically implant the tags, a 3 cm incision was made approximately 1 cm off the ventral midline, with the posterior end of the incision in line with the origin of the first dorsal fin. The PIT tag was inserted into the body cavity through the incision using a MK-25 implant gun (Biomark Boise, ID). Then, the acoustic tag was inserted. The incision was closed using a 17 mm tapered needle to make at least two individual stitches of 5-0 absorbable surgical suture. For fish that only received a PIT tag, the tag was injected subdermally using a MK-25 implant gun (Biomark; Boise, Idaho), with no incision or suturing required. All tags were disinfected in a diluted chlorhexidine solution. The tags remained in disinfectant for up to an hour and were rinsed with distilled water prior to insertion.

Figure 3. Photo of the surgical set-up, taken in 2016, including a modified PVC pipe that cradled the lamprey during surgery.

Table 1. Numbers of Pacific Lamprey released by date, location, and tag type.

	Daroga State Park		*Rocky Reach Forebay*		
Release Date	***Acoustic + PIT***	***PIT only***	***Acoustic + PIT***	***PIT only***	***Total***
22 July				23	23
29 July			44		44
5 August	25	50	60	70	205
12 August	25	74	16	83	198
19 August		17		158	175
Total	**50**	**141**	**120**	**334**	**645**

All Pacific Lamprey transported to Wells Hatchery were tagged and released. Of the collected fish, 170 were implanted with both an acoustic tag (Vemco Model V8-4H) and a PIT tag (Table 1; Appendix A). The remaining 475 fish were released with a PIT tag (no acoustic tag). The weights of the tagged fish ranged from 197.0 to 677.2 g (Figure 4), and corresponding lengths ranged from 38.8 to 77.7 cm (Figure 5). The girths of the tagged fish ranged from 8.5 to 13.5 cm (Figure 6). Two-way ANOVA showed no significant differences in fish weight between the two release sites ($F_{1,637} = 3.3$, $P = 0.07$), but the acoustic tagged fish were significantly heavier (4% difference; mean = 413.6 g) on average than the fish that received only a PIT tag (396.4 g; $F_{1,637} = 6.7$, $P = 0.01$), despite a random selection process for tag type allocation. In terms of fish lengths, there were no significant differences between

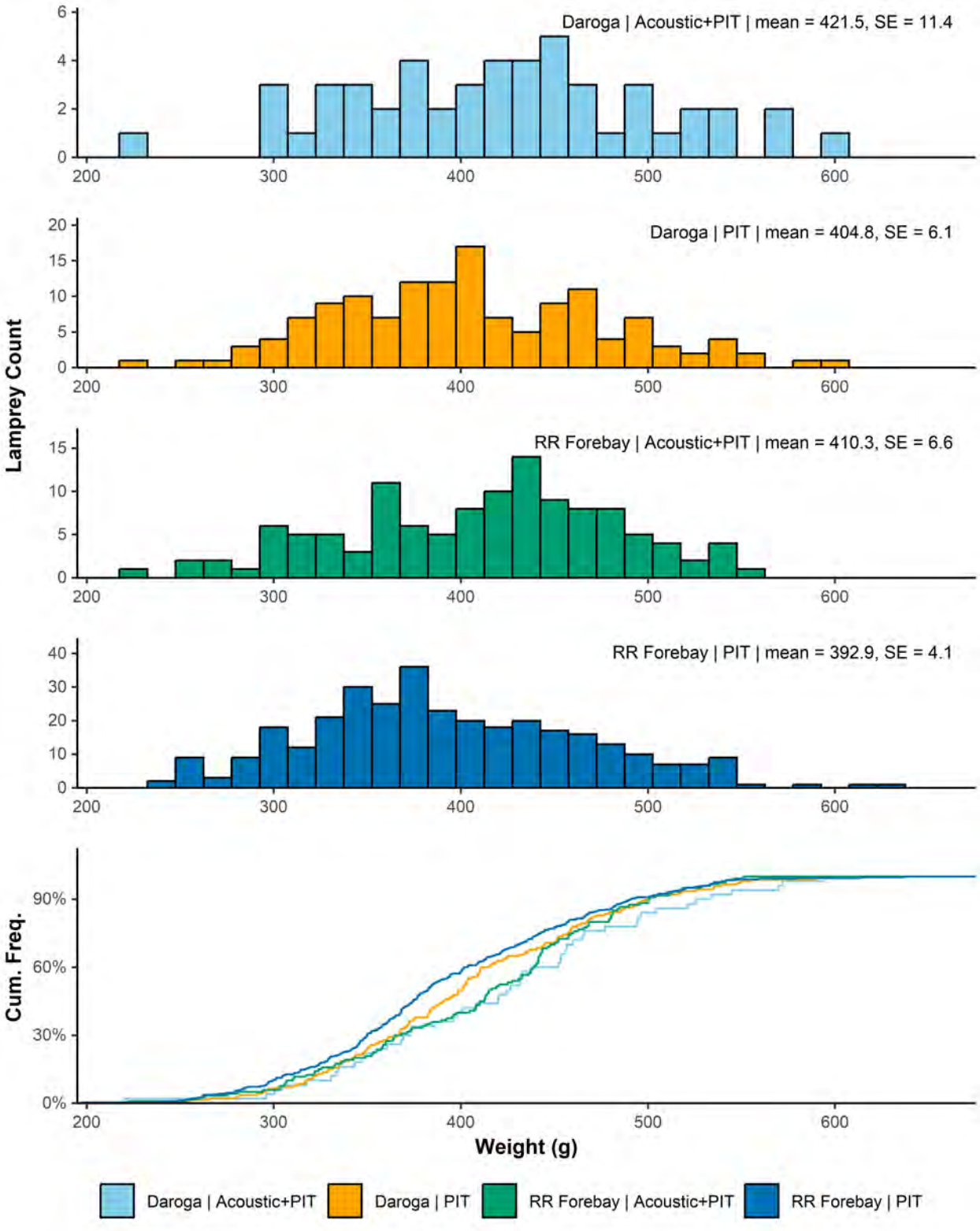


Figure 4. **Frequency distributions of weight measurements for Pacific Lamprey released in 2022, by tag type and release location. Top panels show histograms, and bottom panel compares the four distributions by showing cumulative frequency lines on a single panel.**

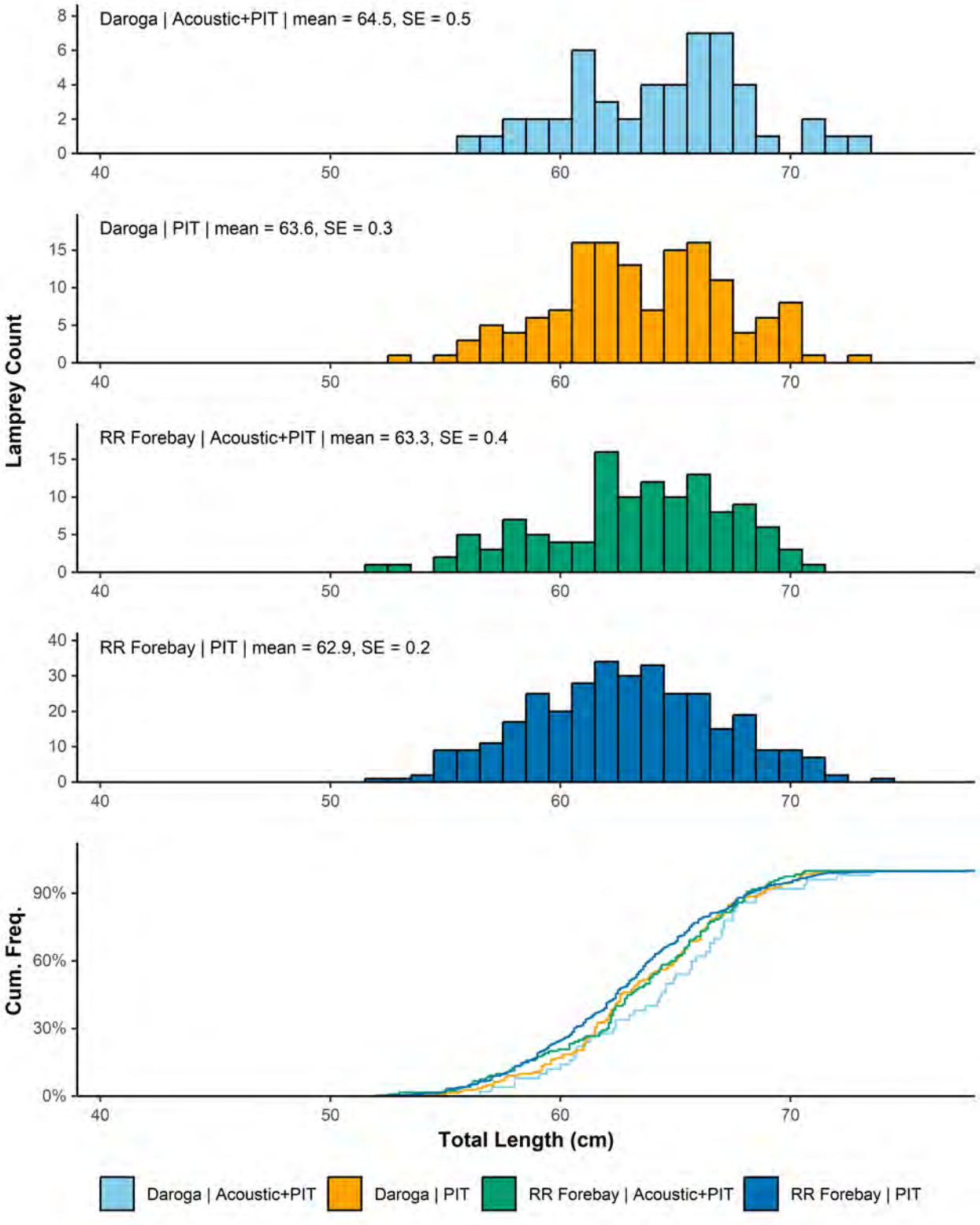


Figure 5. **Frequency distributions of length measurements for Pacific Lamprey released in 2022, by tag type and release location. Top panels show histograms, and bottom panel compares the four distributions by showing cumulative frequency lines on a single panel.**

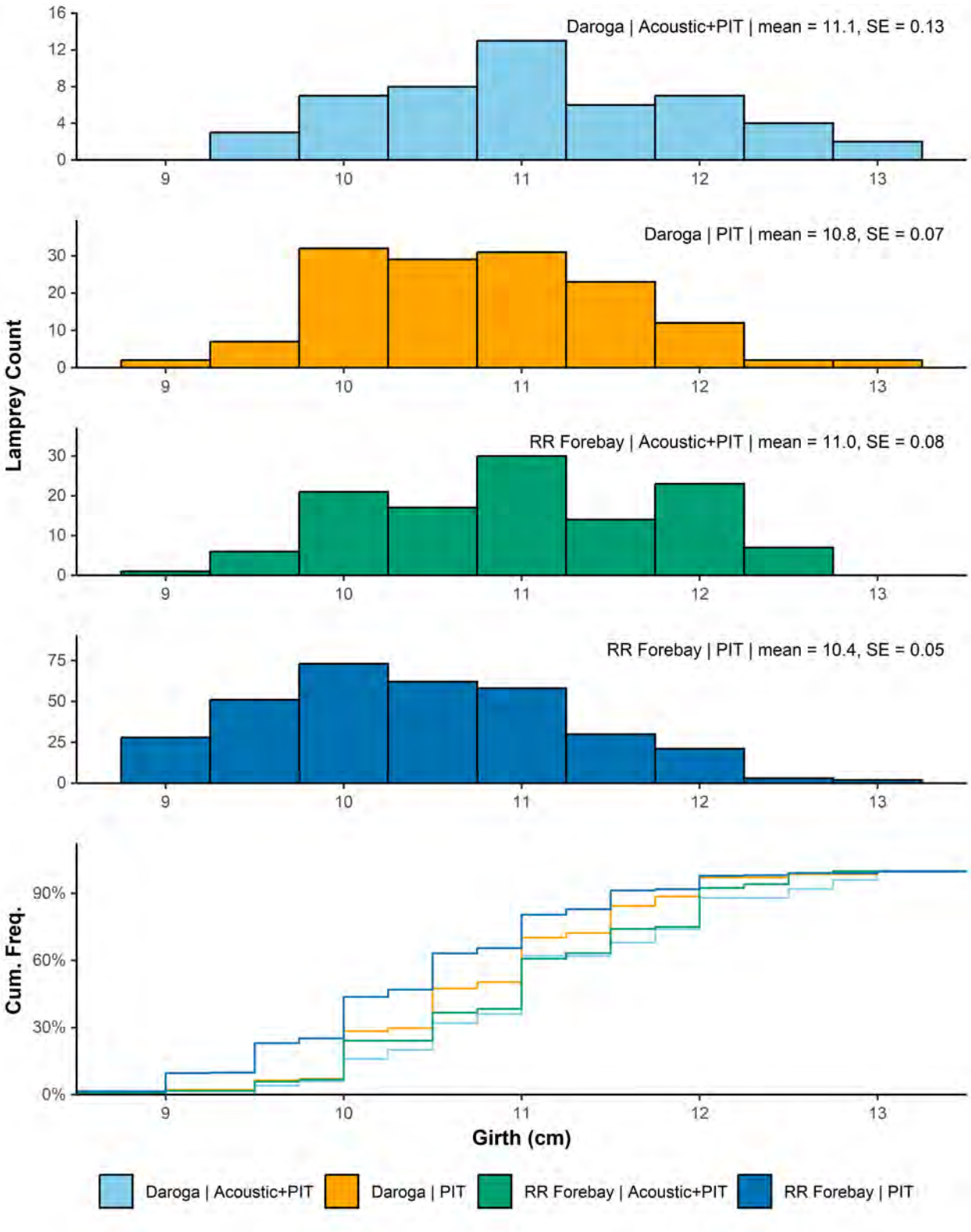


Figure 6. **Frequency distributions of girth measurements for Pacific Lamprey released in 2022, by tag type and release location. Top panels show histograms, and bottom panel compares the four distributions by showing cumulative frequency lines on a single panel.**

the two tag types ($F_{1,641}$ = 2.7, P = 0.10), and although there was a statistically significant difference in fish lengths between the release sites (1% difference: releases at Daroga State Park being significantly longer on average than the Rocky Reach forebay releases; $F_{1,641}$ = 5.5, P = 0.02), the effect size (63.8 vs 63.0 cm) was small enough to be biologically meaningless. Similarly for girth measurements, the differences between tag types (11.0 cm for acoustic vs 10.5 cm for PIT) and between release sites (10.9 cm for Daroga vs 10.6 cm for the forebay were small and likely biologically irrelevant but were nevertheless highly statistically significant (tag type; $F_{1,641}$ =41.2, P < 0.0001; release site: $F_{1,641}$ = 16.5, P < 0.0001).

All acoustic transmitters were uniquely coded to allow for the identification of individual fish. Acoustic tags had an expected battery life of at least 370 days and were programmed to transmit more actively during the warmer months. Tags transmitted with a pulse rate interval of 80-160 seconds for the first 97 days (until October or November, depending on the release date), then transmitted at an interval of 400-500 seconds for the next 120 days, before resuming (in February or March 2023) the 80-160 second pulse rate, which they maintained until the battery failed (expected in July or August 2023). Tag dimensions were 20.5 mm (length) by 8 mm (diameter) and weighed 2 g in air. In addition, each fish was given a full-duplex PIT tag with dimensions of 12 mm by 2.12 mm, weighing 0.1 g. Total combined weight of both tags, 2.1 g, represented a tag burden of <1% (mean 0.53%) of the total body mass (Figure 7). Tag burden for acoustic-tagged fish did not differ significantly between release sites ($F_{1,639}$ =0.07, P = 0.79). The tag burden of the fish that received only PIT tags was negligible (max 0.05%).

After being tagged, fish were transferred to a covered storage tote with holes drilled on all sides to allow water exchange with flow-through river water for recovery. Fish were allowed to recover overnight at Wells Hatchery, where the lamprey holding containers were submerged in fish rearing troughs with continuous water supply. To reduce post-tagging handling, the containers used for post-release holding were the same ones used for transport and release. Douglas PUD staff transported all recovered fish to the release sites. During transport, the fish remained in their covered tanks, and air stones connected to commercial oxygen bottles with submerged diffusers were used to maintain oxygen levels. The fish were released in the lower reaches of Rocky Reach Reservoir (approximately 1 mile upstream of Rocky Reach Dam, n=120) or at Daroga State Park (n=50, Figure 8). The use of the Rocky Reach forebay release site permitted for a more precise replication of the 2016 Pacific Lamprey study, and provided a sample of Pacific Lamprey that must choose to ascend the entirety of the Rocky Reach Reservoir in order to interact with Wells Dam (i.e., similar to what the untagged population of Pacific Lamprey exiting Rocky Reach Dam would have to experience). The second release location was upstream of and theoretically less likely to be influenced by Pacific Lamprey pheromone or bile acid signals emanating from the Entiat River. Some members of the Aquatic SWG assumed that a higher proportion of the Daroga sample might be likely to approach and interact with Wells Dam due to the shorter distance and faster reservoir flow conditions. Daroga State Park is nevertheless far enough downstream, and it was assumed that detection of these fish in the vicinity of Wells would justifiably represent individuals that are attempting to pass the dam.

4.3. Tracking

Acoustic receiver array — An array of acoustic receivers (Vemco model VR2W) was deployed within the study area, with the number of active receivers varying (due to loss or novel deployments) over the course of the study period from a low of 39 to a high of 42 (Appendix B). The array included six receivers at Wells Dam or in the immediate Wells Dam tailrace (Figure 9, Table 2), and 13-14 receivers located farther downstream, including ten deployed evenly throughout the Rocky Reach Reservoir between Wells and Rocky Reach dams, one receiver in the Entiat River upstream from the mouth, and 2-3 receivers (one was lost after the April 2023 download) in the Rocky Reach tailrace (Figure 10, Table 2). In addition, the array included 20-22 receiver locations (the number deployed at the CJ Tailrace/Hatchery River Right ranged from 1-3, and there was 1-2 functional receivers at the Chief Joseph State Park gate) in the Wells Reservoir or within the Okanogan River to collect data on tagged lamprey that passed

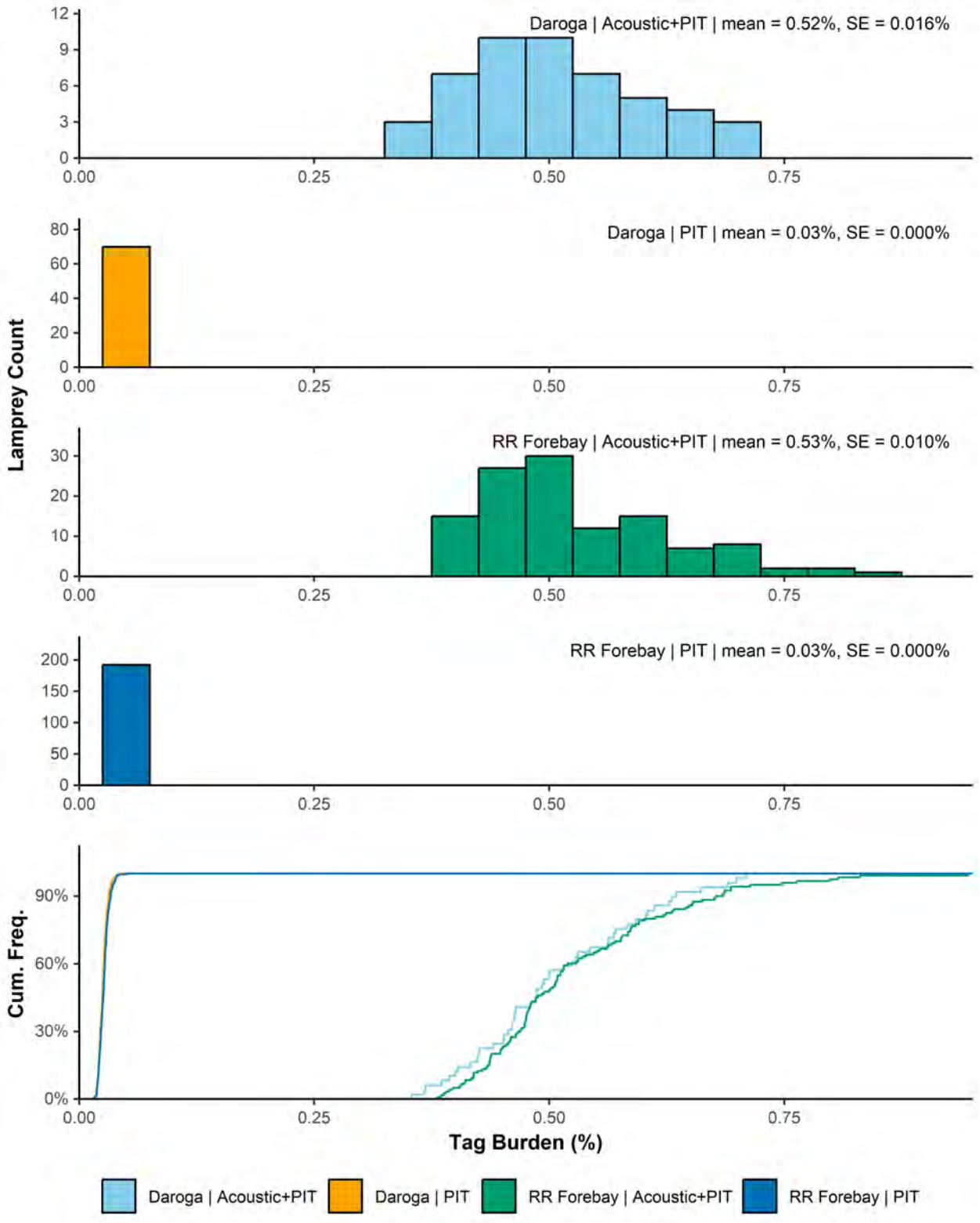


Figure 7. **Frequency distributions of tag burden values for Pacific Lamprey released in 2022, by tag type and release location. Top panels show histograms, and bottom panel compares the four distributions by showing cumulative frequency lines on a single panel.**

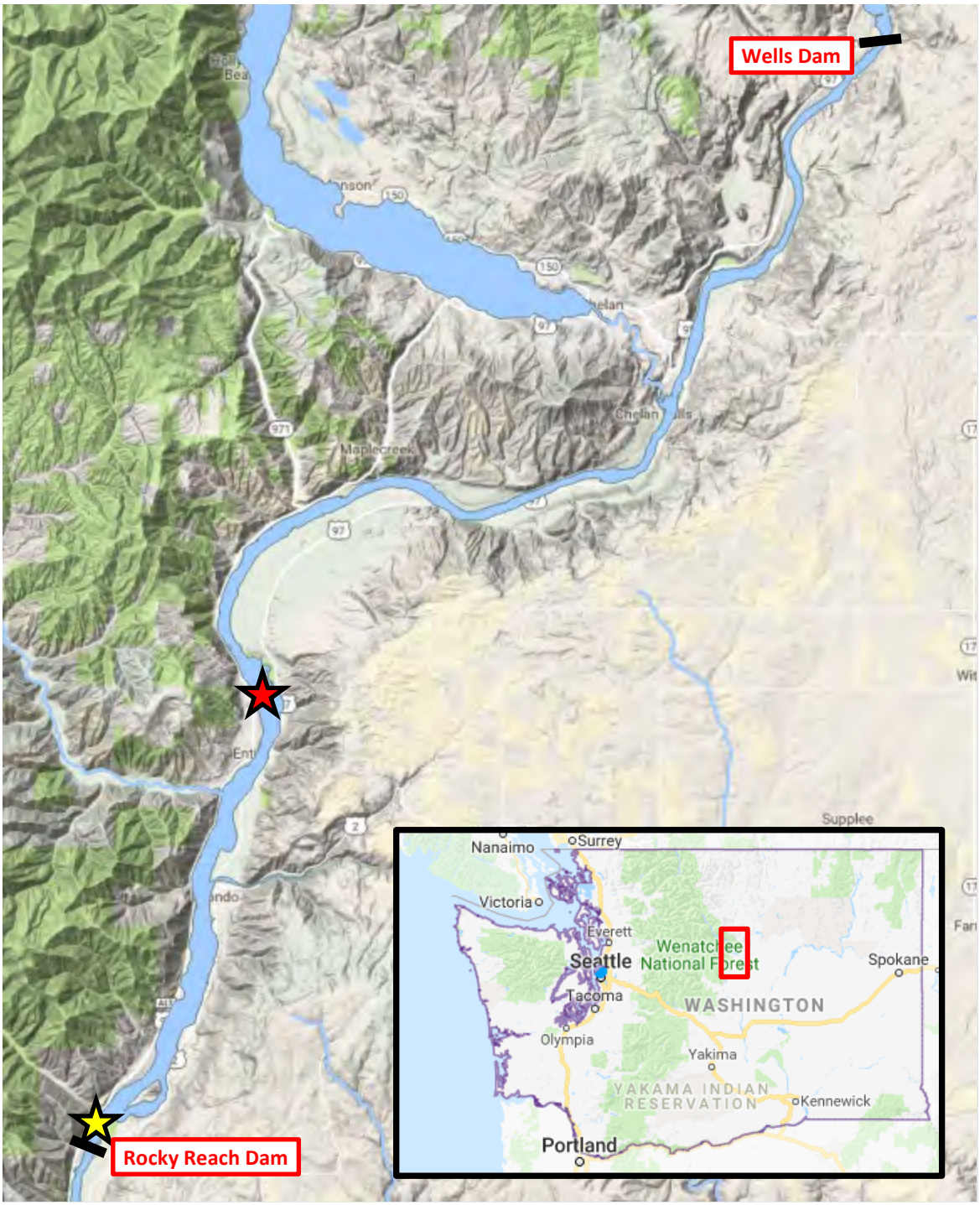


Figure 8. **Location map of the Rocky Reach Reservoir, which spans from Rocky Reach Dam to Wells Dam. Acoustic-tagged lamprey were released at Daroga State Park (red star, n=50) and in the Rocky Reach Forebay (yellow star, n=120).**

Figure 9. **Acoustic receiver locations in the Wells Dam forebay and tailrace. Acoustic receivers placed within the collection gallery are marked with a star. Pacific Lamprey detected by the acoustic receivers marked by a triangle were determined to have approached and interacted with the Wells Project.**

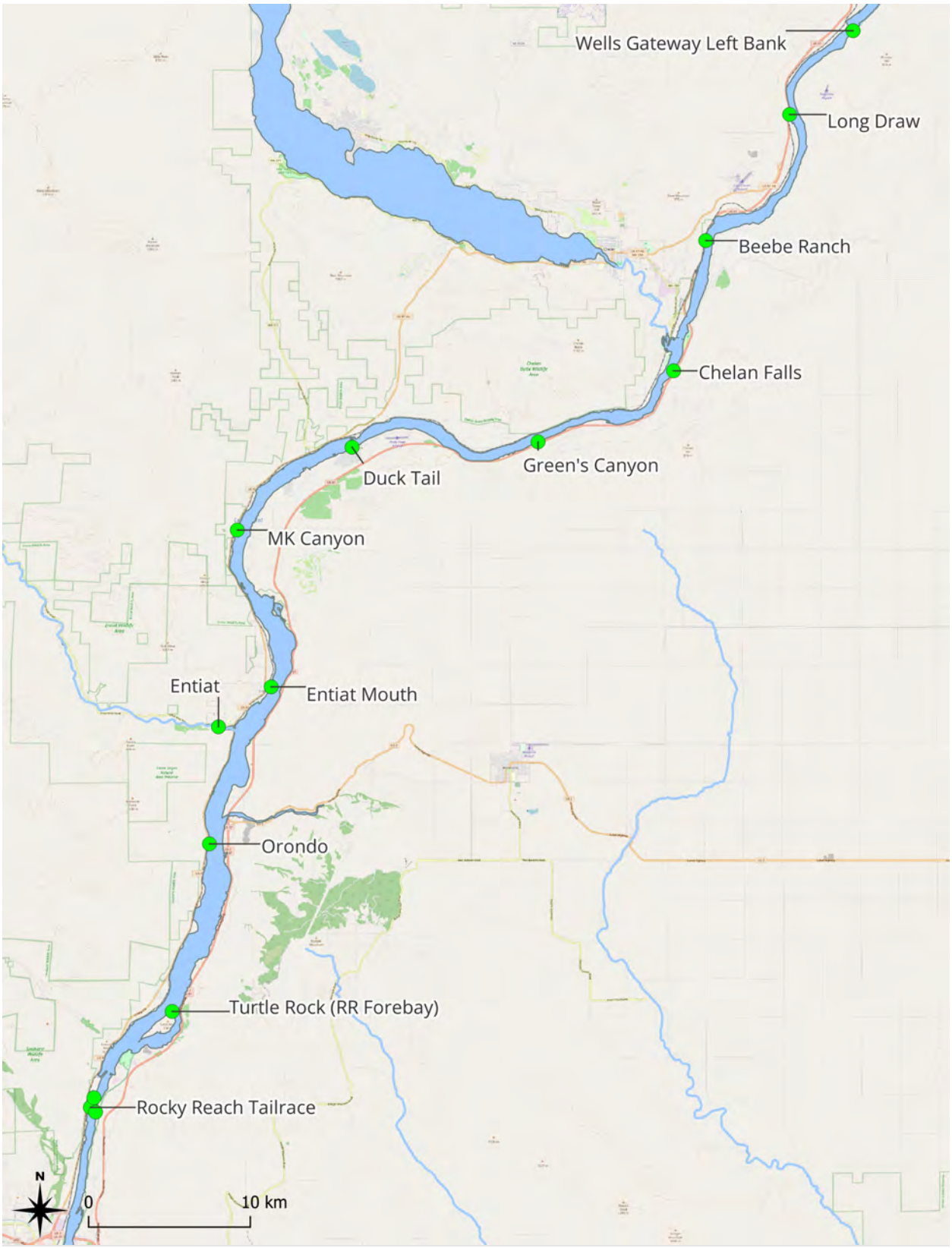


Figure 10. Acoustic receiver locations in the Rocky Reach Reservoir, downstream of the Wells array.

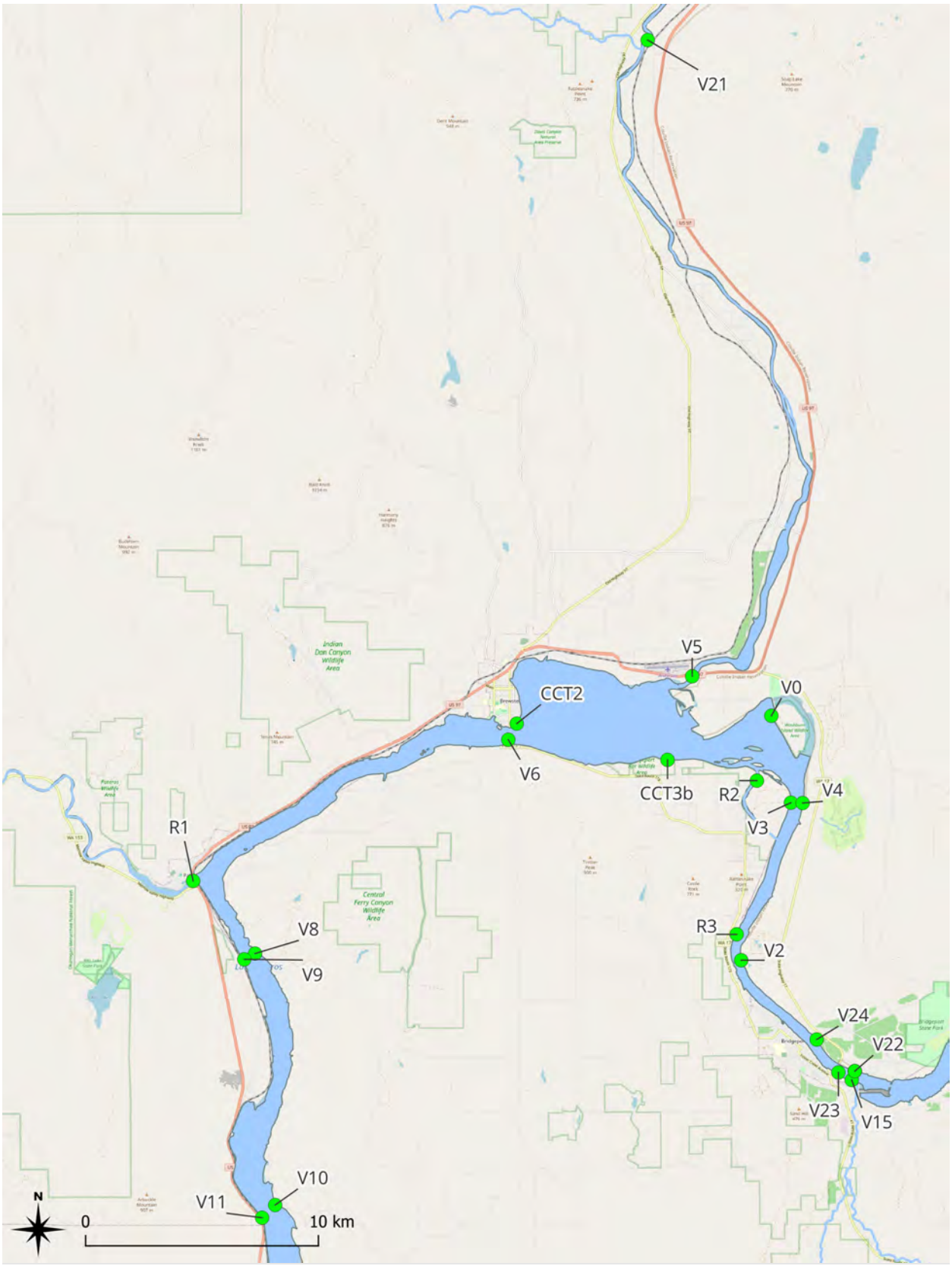


Figure 11. Acoustic receiver locations in the Wells Reservoir. See Table 2 for label abbreviations.

Table 2. Acoustic receivers that were in place for tracking Pacific Lamprey, 2022-23. Brace icons indicate where analysis 'zones' included multiple receivers pooled.

Site Name	*Location Code (see Figure 11)*	*First Included Data*	*Last Included Data*
Wells Reservoir			
Chief Joseph Dam - Foster Creek Delta	V15	22 July 2022	2 October 2023
CJ Tailrace/Hatchery River Right	V22	22 July 2022	23 October 2023
'The Rock' (CJ Tailrace Island)	V23	22 July 2022	2 October 2023
Bridgeport Beach River Right	V24	22 July 2022	5 October 2023
Colville Resident Fish Hatchery River Right	V2	22 July 2022	2 October 2023
Colville Resident Fish Hatchery River Left	R3	22 July 2022	2 October 2023
Chief Joseph State Park East	V3	22 July 2022	2 October 2023
Chief Joseph State Park Gate	V4	1 November 2022 †	2 October 2023
Washburn Island	V0	22 July 2022	2 October 2023
Resident Fish Backwater Receiver	R2	22 July 2022	5 October 2023
Bridgeport Bar Wildlife Area River Left	CCT3b	22 July 2022	2 October 2023
Okanogan Mouth	V5	22 July 2022	3 October 2023
Malott (Okanogan R.)	V21	22 July 2022	4 October 2023
Brewster Community Dock	CCT2	22 July 2022	3 October 2023
Brewster Bridge	V6	22 July 2022	3 October 2023
Resident Fish Methow Mouth Receiver	R1	22 July 2022	5 October 2023
Starr Access 1	V8	22 July 2022	3 October 2023
Starr Access 2	V9	22 July 2022	3 October 2023
Wells Forebay East	V10	22 July 2022	3 October 2023
Wells Forebay West	V11	22 July 2022	3 October 2023
Tailrace of Wells Dam			
Right (West) Fishway Collection Gallery		22 July 2022	4 October 2023
Wells Tailrace East Fish Point		22 July 2022	4 October 2023
Left (East) Fishway Collection Gallery		22 July 2022	4 October 2023
Wells Tailrace Hatchery		22 July 2022	4 October 2023
Wells Tailrace River Left		22 July 2022	4 October 2023
CPUD Top Reservoir Receiver		22 July 2022	14 November 2023
Areas Downstream of Wells Dam Tailrace			
Wells Gateway Left Bank		22 July 2022	14 November 2023
Long Draw		22 July 2022	14 November 2023
Beebe Ranch		22 July 2022	14 November 2023
Chelan Falls		22 July 2022	14 November 2023
Green's Canyon		22 July 2022	14 November 2023
Duck Tail		22 July 2022	14 November 2023
MK Canyon		22 July 2022	14 November 2023
Entiat Mouth		22 July 2022	14 November 2023
Entiat		22 July 2022	14 November 2023
Orondo		22 July 2022	14 November 2023
Turtle Rock (RR Forebay)		22 July 2022	14 November 2023
Rocky Reach Tailrace (3 receivers)		22 July 2022	14 November 2023 *

* one of three receivers lost between 2 August and 14 November; † July to October data not retrieved

Table 3. Mobile tracking surveys for acoustic-tagged Pacific Lamprey, 2022-23.

Date Range	*# Days*	*Survey Area / Type*
23 – 24 Aug 2022	2	Systematic survey of Rocky Reach Reservoir (CCPUD)
30 Aug – 7 Sep 2022	3	Systematic survey of Rocky Reach Reservoir
9 – 10 Nov 2022	2	Systematic survey of Rocky Reach Reservoir (CCPUD)
9 – 16 Nov 2022	3	Wells Reservoir and tailrace
25 Apr – 3 May 2023	4	Systematic survey of Rocky Reach Reservoir (CCPUD)
9 – 10 Jun 2023	2	Systematic survey of Rocky Reach Reservoir (CCPUD)
14 – 26 Jun 2023	5	Wells and Chief Joseph dam tailraces
7 – 24 Jul 2023	2	Wells tailrace, and in the upper parts of the Wells Reservoir
1 – 2 Aug 2023	2	Systematic survey of Rocky Reach Reservoir (CCPUD)
14 – 15 Nov 2023	2	Systematic survey of Rocky Reach Reservoir (CCPUD)

upstream of Wells Dam (Figure 11, Table 2). All receivers were deployed prior to the release of study fish and were still in place after the last tag battery was expected to expire. Two minor data loss events occurred, including one lost receiver (of three) in the Rocky Reach tailrace, and one data download failure at the Chief Joseph State Park Gate (Table 2).

There were two methods of receiver deployment: (a) mounted to a steel or concrete anchor built for the purpose of positioning telemetry equipment on the riverbed; or (b) direct deployment on a line using an anchor with floats to keep the line upright in the water column. The gear was secured to the shoreline with steel cable or polypropylene line. All receivers were inspected and downloaded at least twice per year, with batteries changed annually.

Prior to the release of acoustic tagged lamprey, range testing of acoustic telemetry receivers was conducted using tags identical in size and strength to those to be implanted in study fish. The tag was provided by the same vendor that issued the study tags to allow for routine testing in advance of the study. Range testing did not reveal any areas where tagged fish could easily pass a receiver gate undetected.

Mobile tracking — Six systematic mobile tracking surveys were conducted by CCPUD contractors in the Rocky Reach Reservoir (Table 3), including one each in August and November of 2022, one survey that spanned from late-April into early May 2023, one in mid-June 2023, one in August 2023, and one in November 2023 (the last survey occurred after the tag batteries were expected to have expired, and the survey did not detect any lamprey). A similar systematic transect was surveyed by DPUD biologists in late-August/early-September 2022. Each survey lasted multiple days and comprised a single continuous transect down the center of the reservoir (i.e., coverage of the reservoir was not assumed to be complete) and was performed using a mobile-tracking receiver (Vemco Model VR100) and an omnidirectional hydrophone (Vemco Model VH165) deployed throughout the transect. Detection ranges were variable as sources of noise (flow conditions, wind, etc.) varied daily, and over the reservoir within and among sessions, thus the detection of all active transmitters throughout reservoir was not expected.

Other mobile tracking work, using the same gear and general methods, included 1) a survey of the Wells Reservoir and tailrace in November 2022; 2) tracking in the Wells and Chief Joseph dam tailraces in June 2023; and 3) tracking in the Wells tailrace and upper parts of the Wells Reservoir in July 2023 (Table 3).

In all cases, the individual detections during mobile surveys were time stamped and the geographic position (latitude and longitude) of the boat was logged by the VR100 software whenever tags were detected by the receiver.

PIT tag array — PIT tag antenna arrays were deployed within the Wells Dam fishways at Pools 19, 67, and 68 (both right and left fishways). Multiple instream PIT arrays were also in place in the Entiat, Methow, and Okanogan basins.

4.4. Data Processing

Data downloaded from fixed-station acoustic receivers and from mobile tracking surveys were processed using custom database software, *Telemetry Manager*. Detection data for the 645 PIT tagged Pacific Lamprey were queried from PTAGIS, summarized, and used for all subsequent analysis of PIT tagged fish.

PIT tag detections from PTAGIS that were associated with the 170 fish that also bore an acoustic tag were included as part of their detection history by uploading the detections into the *Telemetry Manager* database and treating them as mobile detections (timestamps were adjusted from PST to UTC prior to upload into *Telemetry Manager*). When processing detections, individual sites (either acoustic receivers or PIT tag arrays) were all treated as "zones", each defining pivotal areas of interest (see Table 2).

Telemetry Manager facilitates data organization, record validation and analysis through the systematic application of user-defined criteria. By using *Telemetry Manager*, temporal or spatial resolution and noise filtering criteria could be changed at any time without altering the raw data (English et al. 2012). False records (e.g., non-study tags; detections before release) and records that we suspected were the result of electronic noise (e.g., single acoustic detections in each 60-minute period; those that occurred in a sequence which was not probable) were identified, and the remaining records were compressed into a manageable database of sequential detections for each fish. Each record included the tag number, detection location, and the first and last date and time of any sequential detections in that location. QAQC was performed to determine if user-defined filters needed adjustment, and if so, the adjustments were made, and the compression algorithm was re-run. The final compressed database was used for all subsequent analyses of acoustic-tagged fish.

4.5. Data Analysis

4.5.1. Tag Detections

The compressed database was used to determine the complete detection history for each acoustic tagged fish. The data returned from the PTAGIS query was used to generate PIT-based tracking histories for all fish. Z-tests were used to compare PIT-based detection proportions between fish that bore just a PIT tag vs. those that bore both PIT and acoustic tags. The same tests were used to compare PIT-based and acoustic-based detection proportions between release sites. Z-tests were performed without the Yates continuity correction.

4.5.2. Detection Efficiency

For each zone, the detection efficiency was calculated as 1 minus the proportion of the total number of 'movements past the zone' that were missed. The total number of 'movements past the zone' was equal to the number of fish that reached or passed the detection zone in question. A fish that was detected upstream of the zone in question, but not at the zone itself, was known to have been missed. The number of fish detected at each zone included only fish moving in the upstream direction (detection efficiencies would be artificially inflated if they included fish that were missed as they passed a receiver in the upstream direction, but which were subsequently detected as they dropped back past the receiver in a downstream direction). The detection efficiency of certain zones could not be calculated where there were no appropriate upstream detection zones.

4.5.3. Acoustic-and-PIT-Tag Pacific Lamprey Approach and Passage

Acoustic telemetry data was used to estimate the proportion of acoustic tagged lamprey that migrated upstream and approached Wells Dam. The proportion of Pacific Lamprey that approached Wells Dam was calculated as the

total number of unique acoustic-tagged Pacific Lamprey that were detected by one of the four acoustic receivers in the immediate tailrace area (see Figure 9) divided by the total number of acoustic tagged lamprey that were released. It should be noted that the effective listening range of acoustic telemetry receivers may exceed 400 m. Therefore, a detection at the receivers near the fishway entrances may not imply that an acoustic tagged lamprey interacted with the collection gallery entrance. Regardless, for the purpose of this study, a detection at the receivers near the fishway entrances was considered an approach to Wells Dam.

Any acoustic-tagged lamprey that approached Wells dam became part of the denominator for the calculation of passage success. For each fish that approached Wells Dam and was not subsequently detected at or upstream of Pool 68, a failed passage attempt was tallied. Any detection at or upstream of Pool 68 was considered a successful passage attempt.

The approach and passage rates were compared between the release locations using z-tests. Logistic regression (i.e., generalized linear model with binomial error structure) was used to explore the effects of fish size (e.g., tag burden, total length, weight, or girth), condition (i.e., $100 \times W/L^{2.6}$), release location, and release date (as a categorical variable) on approach and passage success. A full logistic model (with all factors included) was compared in a stepwise manner to sequentially simpler models by removing one factor at a time until further removals resulted in a significantly poorer model-fit. Since the four size parameters were highly correlated with each other (absolute values of Pearson's correlation coefficients ranged from 0.78 to 0.97, all highly significant, $P < 0.0001$), only one (i.e., total length) was used in the modelling analyses. Comparisons with results from 2016 were made using z-tests, or, when sample sizes were limited (i.e., when one of the expected values was < 5), using Fisher's Exact Test.

Passage information was also calculated for PIT tagged fish using the in-ladder PIT tag detection array, including the lamprey entrances, fishway Pools 19 and 68, and in-stream arrays in the Methow or Okanogan basins. Indices of in-ladder travel time were calculated as the time between first detection in Pool 19 and last detection in Pool 68. A test for differences in index travel times between ladders was made by comparing the fit of a generalized linear model (with Poisson error structure) including 'ladder' as a factor to a model with no factors.

Detection histories of Pacific Lamprey fitted with acoustic tags and PIT tags were used to evaluate the assumption that a PIT detection at Pool 68 constitutes a successful ladder ascension. For example, an acoustic-and-PIT-tagged Pacific Lamprey with a PIT detection at Pool 68 that does not have a subsequent detection from an acoustic receiver upstream of Wells Dam would count as a violation of that assumption.

Lastly, detection histories of Pacific Lamprey fitted with both an acoustic tag and a PIT tag were used to investigate the effectiveness of fishway maintenance activities that aimed to prevent fishway exit at a site other than the up-stream exit or downstream entrances. Any lamprey detected by the PIT array in Pool 19 and subsequently on a tailrace acoustic receiver should have been detected leaving the fishway (either moving downstream at Pool 19 or in the collection gallery acoustic array), otherwise suggesting exit via diffuser grating or auxiliary water supply.

4.5.4. Entrance Efficiency

Entrance efficiency (movement of fish into the collection gallery) could not be reliably determined from the acoustic detection data because high levels of acoustic noise in the fishways causes ineffectiveness of in-ladder acoustic receivers. Additionally, the potentially large detection ranges of acoustic receivers can also result in false detections whereby fish that are located outside of the fishway entrances can be detected by in-fishway receivers. For this reason, a fish was not determined to have successfully entered the fishway until they were detected within the fish ladder PIT arrays or at a receiver upstream of Wells Dam.

4.5.5. Reservoir Speeds and Fishway Ascension Times

The compressed database was used to estimate minimum travel speeds between fixed-station receivers. Travel speeds (S) were assessed for all acoustic-tagged individuals (i) in all river reaches (r; 'reaches' were the areas between fixed-station receivers) between the Rocky Reach Forebay and the Wells Dam Gateway, and between the Wells Dam Forebay and Starr Access, as $S_{i,r} = D_r/T_{i,r}$, where D_r was the distance between the receivers that bounded reach r, and $T_{i,r}$ was the time that individual i took to travel between the receivers that bounded reach r, measured by subtracting the first detection at the upstream boundary from that at the downstream boundary. Speeds were measured only when the fish was detected at both receivers, and only when it was moving in the upstream direction. In the immediate tailrace area of Wells Dam, receivers were close together with some overlap in detection zones, which meant that travel times between receiver pairs could not be accurately determined. Since the fish's path of movement between receivers was not known and may not have been a direct path between sites, travel speeds should be considered minima.

Reservoir-wide trends were assessed using generalized linear regression (with quasipoisson error structure) to look for changes in travel speed with distance from Rocky Reach Dam. Similar models were used to test for relationships between travel speed and fish size (total length, weight). To test whether individuals were consistently fast or slow, ranked travel speeds were compared among reaches using Spearman's correlation, with the false discovery rate controlled using the Benjamini–Hochberg procedure (Benjamini and Hochberg 1995).

Detection histories of any Pacific Lamprey detected within the Wells Dam fishways (i.e. acoustic receivers inside the collection galleries, PIT arrays in ladder Pools 19, 67, and 68) were used to determine whether the time required for fishway ascension for Pacific Lamprey had changed following the fishway maintenance and translocation activities. Travel times were calculated for Pacific Lamprey that bore both acoustic and PIT tags and were detected by the acoustic receiver inside the collection gallery and by the PIT arrays in Pools 19 and 68. Travel times were also calculated for Pacific Lamprey that bore only PIT tags and were detected by the PIT arrays in Pools 19 and 68. Speeds and travel times were compared to those documented in previous Pacific Lamprey passage studies at Wells Dam, and at other Columbia River projects.

4.5.6. Low Statistical Power

Low statistical power has been an ongoing challenge at the Wells Project for identifying approach and upstream passage issues involving Pacific Lamprey. Recognizing these sample size challenges, the Aquatic SWG stated that the qualitative data collected during this study could nevertheless provide valuable insights and could help to inform subsequent study plans.

5. Results

5.1. Tag Detections

A query of PTAGIS, performed in January 2024, resulted in a return of 2,706 detection events. These included 2,081 detections belonging to 203 of the 475 (42.7%) fish that were released with only a PIT tag, and 625 detections belonging to 50 of the 170 (29.4%) fish released with both a PIT and an acoustic tag (Table 4). This difference between tag types was statistically significant ($\chi^2_1 = 9.3$, $P = 0.002$), and might initially suggest an effect of tag burden on subsequent detection, but the reality was that all but five of the 170 acoustic tagged fish (97.1%) were detected at least once post release on the combined PIT and acoustic arrays (Table 5), suggesting very high post release survival for acoustic-tagged fish.

Table 4. **Most upstream PIT array detection locations for tagged Pacific Lamprey released in 2022 at Daroga State Park (DAR) or in the Rocky Reach Forebay (RRH), by tagging type (either PIT tags alone, or a combination of acoustic and PIT tags). Tributary locations are color-coded. River km (rkm) values for each PIT array are shown in PTAGIS notation and in total km from the estuary. Fish that were never detected are shown in grey-shaded rows indicating the release location.**

	Most Upstream Detection Location			*PIT only*			*Acoustic+PIT*			*All Study fish*		
	Zone Name	*PTAGIS rkm*	*rkm*	*DAR*	*RRH*	*TOTAL*	*DAR*	*RRH*	*TOTAL*	*DAR*	*RRH*	*TOTAL*
Upstream of Wells Dam	OBF - Omak Creek below Mission Falls	858.052.011	921	1		1	1		1	2		2
	OMK - Omak Creek Instream Array	858.052.000	917									
	SA0 - Salmon Creek below OID Div.	858.041.006	905		1	1					1	1
	SA1 - Salmon Creek Instream Array	858.041.002	901	1	1	2				1	1	2
	OKL - Lower Okanogan Instream Array	858.025	890	5	5	10	1		1	6	5	11
	CRU - Upper Chewuch Instream Array	843.080.028	957.5	4	11	15	2	2	4	6	13	19
	CMU - Chewuch River Middle Upper	843.080.008	937.5	6	14	20		5	5	6	19	25
	CML - Chewuch River Middle Lower	843.080.007	930	1	1	2				1	1	2
	CRW - Chewuch River above Winthrop	843.080.001	930.5	3	1	4				3	1	4
	MRW - Methow River at Winthrop	843.085	928	1	1	2				1	1	2
	MRC - Methow River at Carlton	843.045	895	9	23	32	2	5	7	11	28	39
	LMR - Lower Methow River at Pateros	843.008	858	7	12	19	2	4	6	9	16	25
	WEA - DCPUD Adult Ladder - Pool 68	830	836	14	27	41	1	15	16	15	42	57
	WEA - DCPUD Adult Ladder - Pool 67	830	836									
	WEA - DCPUD Adult Ladder - Pool 19	830	836	2	5	7				2	5	7
Downstream of Wells Dam	WEH - Wells Dam Hatchery	830	835	4	9	13	3	1	4	7	10	17
	Rls: Daroga		*790*	77		77	37		37	114		114
	ENA - Upper Entiat River at rkm 17.1	778.017	795		6	6					6	6
	ENL - Lower Entiat River	778.002	788	4	18	22	1	5	6	5	23	28
	Rls: Rocky Reach Forebay		*773*		195	195		83	83		278	278
	Rocky Reach Dam	763	763		3	3					3	3
	LWE - Lower Wenatchee River	754.003	757	1		1				1		1
	Rock Island Dam	730	730	1	1	2				1	1	2
	TOTALS			**141**	**334**	**475**	**50**	**120**	**170**	**191**	**454**	**645**

Table 5. Most upstream detection locations on the combined PIT and acoustic receiver array network for 170 Pacific Lamprey released with both PIT and acoustic tags in 2022 at Daroga State Park or in the Rocky Reach (RR) Forebay. Tributary locations are color-coded. River km (rkm) values are shown for each location, including PTAGIS notations for the PIT arrays. Fish that were never detected are shown in grey-shaded rows indicating the release location.

	Most Upstream Detection Location			*Release Location*		
	Zone Name	***PTAGIS rkm***	***rkm***	***Daroga***	***RR Forebay***	***TOTAL***
Upstream of Wells Dam	PIT: OBF - Omak Creek below Mission Falls	858.052.011	921	1		1
	PIT: OKL - Lower Okanogan Instream Array	858.025	890	1		1
	Malott		890		2	2
	Okanogan River Mouth		865	1	3	4
	Brewster Community Dock		860		2	2
	PIT: CRU - Upper Chewuch Instream Array	843.080.028	958	2	2	4
	PIT: CMU - Chewuch River Middle Upper	843.080.008	938		5	5
	PIT: MRC - Methow River at Carlton	843.045	895	2	5	7
	PIT: LMR - Lower Methow River at Pateros	843.008	858	2	4	6
	Methow River Mouth		849		7	7
	Starr Access		846		1	1
	Wells Forebay					
Wells Fish Ladders	PIT: WEA: Left Ladder Pool 68	830	836			
	PIT: WEA: Left Ladder Pool 67	830	836			
	PIT: WEA: Left Ladder Pool 19	830	836			
	PIT: WEA: Right Ladder Pool 68	830	836			
	PIT: WEA: Right Ladder Pool 67	830	836			
	PIT: WEA: Right Ladder Pool 19	830	836			
Wells Tailrace	West Fishway Collection Gallery		836	21	28	49
	East Fishway Collection Gallery		836	2	8	10
	Wells Tailrace East Fish Point		836	6	26	32
	Wells Tailrace Hatchery		835	1	5	6
	Wells Tailrace		835	2		2
	Wells Gateway		834	1	1	2
Rocky Reach Reservoir	MOB: Below Gateway		831		1	1
	Long Draw		829		3	3
	Ghallagher (Bebee Ranch)		821		1	1
	Greens Canyon		809		1	1
	Duck Tail		800	1	1	2
	MK Canyon		794	1		1
	Rls: Daroga		*790*			
	MOB: MK Canyon to Entiat		791	2		2
	Entiat		787	3	2	5
	Orondo		780	1		1
	Rls: RR Forebay		*773*		5	5
	MOB: Rocky Reach Forebay		773		5	5
	Rocky Reach Tailrace		761		2	2
	TOTAL			**50**	**120**	**170**

The differences between release locations in the proportions detected on PIT arrays (Daroga 45.4%, Rocky Reach forebay 41.6%; Table 4) were not statistically significant ($\chi^2_1 = 0.4$, $P = 0.53$) for the fish that bore only PIT tags. The result was similar for PIT-based detections of fish that bore an acoustic tag (Daroga 26.0%, Rocky Reach forebay 30.8%;Table 4; $\chi^2_1 = 0.6$, $P = 0.45$). Once the acoustic detections were included, all of the Daroga releases were detected, as were 95.8% of the forebay releases ($\chi^2_1 = 1.5$, $P = 0.22$), which again suggested similar detection performance between release locations.

5.2. Detection Efficiency

Detection efficiencies (a measure of receiver performance) of the fixed-station acoustic receiver arrays (Table 6) ranged from 79% to 100%. The detection efficiency of the receivers in the collection galleries were 85%, detecting 76 of 89 fish on the right (west) side, and 63 of 74 fish on the left (east) side. The detection efficiency of the East Fish Point receiver was 96%, and that of the hatchery outflow receiver was 90%. The two other tailrace receivers, acting together as a gate, had a combined detection efficiency of 85%. Receivers farther downstream in the Rocky Reach Reservoir had detection efficiencies that ranged from 79% to 100%, and the receiver gates in the Wells Reservoir had detection efficiencies that ranged from 79% to 98% (Table 6). The detection efficiencies of the individual PIT antennas in the Wells Dam fish ladders ranged from 62% (Right Ladder Pool 19) to 100%[1]. All fish that moved through the fish ladders were detected on at least one of the three antenna arrays, giving the fish ladders an overall detection efficiency of 100% (Table 7).

5.3. General Reservoir Movements

The complete tracking histories of all acoustic-tagged fish are shown in Appendix C. In general, fish in the Rocky Reach Reservoir moved quickly in the upstream direction after release. At least 48.2% (82 of 170) of the fish appeared to pause, and then resume their movements after the winter. For the fish that exhibited this behavior, the median pause duration was 260 days (95% of durations were between 160 and 308 days). The last detection location before the pause was in the Wells Tailrace area for 54% of the fish and was between the Duck Tail and Green's Canyon receivers for another 9% of the fish. Detections after the pause showed continued upstream movement for 27% of the fish, a maintained position for 30%, and a reversal downstream for 43% of the fish.

5.4. Upstream Movements

Approach towards Wells Dam was significantly higher in 2022 than in 2016. In 2016, fish dropped off gradually, such that there was a distinct and gradual decline throughout the Rocky Reach Reservoir in the cumulative distribution of fish's most-upriver locations (Figure 12), and only 25.3% (21 of 83 fish) of the fish in the reservoir travelled far enough to be detected at or upstream of the Wells Dam tailrace. In 2022, movement throughout the whole of the Rocky Reach Reservoir was achieved for most of the fish, with 139 of the fish (81.8%) having been detected at least as far upstream as the Wells Dam tailrace (Figure 12; $\chi^2_1 = 76.5$, $P < 0.0001$).

Upstream travel speeds for acoustic-tagged lamprey did not vary notably among reaches (Table 8, Figure 13), and reach-specific median speeds ranged from 39.3 km/d (Green's Canyon - Chelan Falls) to 69.4 km/d (Rocky Reach Forebay to Orondo). The bimodal distributions shown in Figure 13 indicated that travel speeds varied widely among individuals, with some animals moving quickly through the reservoir reaches, and others going considerably slower. Some of the fastest speeds (>3 km/h) likely involved lamprey that entered a reach early enough in the night to arrive at the end without having reduced their movements during daylight hours, and a quasipoisson-distributed generalized linear model showed significant differences in travel speed as function of the hour at which the fish entered the reach (Figure 14; $F_{5,1220} = 56.3$, $P < 0.0001$). Most first reach entry times were at night (Figure 15).

When individual's travel speeds were ranked within each reach, the ranks were sometimes correlated among reaches (Table 9), indicating that in certain cases, individuals that moved slowly in a given reach were more likely to have also moved slowly through other reaches. Spearman correlations of the ranked speeds among reaches were statistically significant for 20 of the 45 possible pairs of reaches (Table 9), with fewest significant correlations

[1] PIT arrays in Ladder Pool 19 can detect passage through the floor orifices, but not the overflow weirs. Because Pacific Lamprey may pass through Ladder Pool 19 through the overflow weirs, they may escape detection at these PIT arrays.

Table 6. Number of acoustic-tagged Pacific Lamprey detected at and known to have passed each acoustic detection zone, and the corresponding detection efficiency (Det. Eff.), for fish released at Daroga State Park or in the Rocky Reach Forebay in 2022. Shaded rows are receivers where detection indicated interaction with Wells Dam.

	Daroga State Park			*Rocky Reach Forebay*			*ALL LAMPREY*		
	Lamprey Numbers		*Det.*	*Lamprey Numbers*		*Det.*	*Lamprey Numbers*		*Det.*
Detection Zone	***Detected***	***Passed***	***Eff.***	***Detected***	***Passed***	***Eff.***	***Detected***	***Passed***	***Eff.***
Okanogan River Mouth	2	3	67%	5	5	100%	7	8	88%
Brewster Community Dock	2	3	67%	7	7	100%	9	10	90%
Brewster Bridge	2	3	67%	7	7	100%	9	10	90%
Methow River Mouth	6	9	67%	25	30	83%	31	39	79%
Starr Access (1 and 2)	8	9	89%	31	31	100%	39	40	98%
Wells Forebay (East and West)	7	9	78%	31	31	100%	38	40	95%
Right (West) Fishway Collection Gallery	26	30	87%	50	59	85%	76	89	85%
Left (East) Fishway Collection Gallery	21	24	88%	42	50	84%	63	74	85%
Wells Tailrace East Fish Point	35	37	95%	85	88	97%	120	125	96%
Wells Tailrace Hatchery	35	39	90%	88	98	90%	123	137	90%
Wells Tailrace (2 receivers)	38	41	93%	80	98	82%	118	139	85%
Wells Gateway Left Bank	38	42	90%	74	99	75%	112	141	79%
Long Draw	36	42	86%	88	103	85%	124	145	86%
Beebe Ranch	42	42	100%	101	104	97%	143	146	98%
Chelan Falls	41	42	98%	103	104	99%	144	146	99%
Green's Canyon	42	42	100%	104	105	99%	146	147	99%
Duck Tail	43	43	100%	106	106	100%	149	149	100%
MK Canyon	44	44	100%	106	106	100%	150	150	100%
Entiat Mouth				108	108	100%	108	108	100%
Orondo				108	108	100%	108	108	100%
Rocky Reach Forebay				107	108	99%	107	108	99%

Table 7. Number of PIT-tagged Pacific Lamprey detected at and known to have passed each fish ladder PIT detection array, and the corresponding detection efficiency (Det. Eff.), for fish released at Daroga State Park or in the Rocky Reach Forebay in 2022.

	Daroga State Park			*Rocky Reach Forebay*			*ALL LAMPREY*		
	Lamprey Numbers		*Det.*	*Lamprey Numbers*		*Det.*	*Lamprey Numbers*		*Det.*
Detection Zone	*Detected*	*Passed*	*Eff.*	*Detected*	*Passed*	*Eff.*	*Detected*	*Passed*	*Eff.*
Left Ladder Pool 68	7	7	100%	18	19	95%	25	26	96%
Left Ladder Pool 67	7	7	100%	18	19	95%	25	26	96%
Left Ladder Pool 19	6	7	86%	16	19	84%	22	26	85%
Left Ladder Overall	**7**	**7**	**100%**	**19**	**19**	**100%**	**26**	**26**	**100%**
Right Ladder Pool 68	2	2	100%	13	13	100%	15	15	100%
Right Ladder Pool 67	2	2	100%	13	13	100%	15	15	100%
Right Ladder Pool 19	2	2	100%	8	13	62%	10	15	67%
Right Ladder Overall	**2**	**2**	**100%**	**13**	**13**	**100%**	**15**	**15**	**100%**
Wells Dam, DCPUD Adult Ladders	**9**	**9**	**100%**	**31***	**31***	**100%**	**40***	**40***	**100%**

* one fish, released at the Rocky Reach forebay, was detected in both fish ladders, thus the total is one less than the sum of the totals shown for the two separate fish ladders

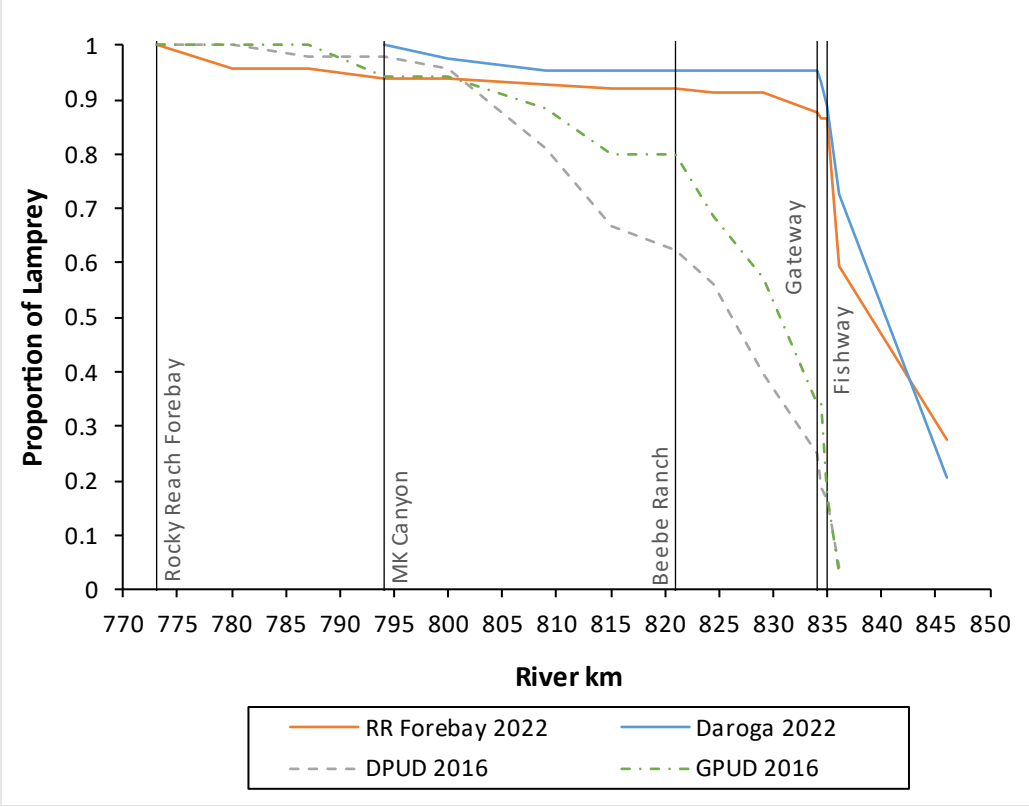


Figure 12. **The farthest upstream distances reached by acoustic-tagged lamprey (plotted by the river km of the detection receivers) for releases at Daroga State Park and in the Rocky Reach (RR) Forebay. Also shown are the results from 2016 for fish released by Douglas or Grant PUD.**

Table 8. **Mean and median travel speeds by river reach in the Rocky Reach Reservoir.**

River Reach	*Start rkm*	*End rkm*	*n*	*Mean (km/h)*	*Median (km/h)*
Wells Forebay – Starr Access	822	826	39	2.0	2.5
Long Draw – Gateway	829	833	102	1.9	2.1
Beebe Ranch - Long Draw	821	829	129	2.1	2.6
Chelan Falls – Beebe Ranch	815	821	152	1.9	2.3
Green's Canyon – Chelan Falls	809	815	156	1.5	1.6
Duck Tail - Green's Canyon	800	809	153	2.2	2.6
MK Canyon – Duck Tail	794	800	158	1.7	2.0
Entiat Mouth - MK Canyon	787	794	112	2.1	2.5
Orondo – Entiat Mouth	780	787	111	2.1	2.3
Rocky Reach Forebay - Orondo	773	780	110	2.8	2.9

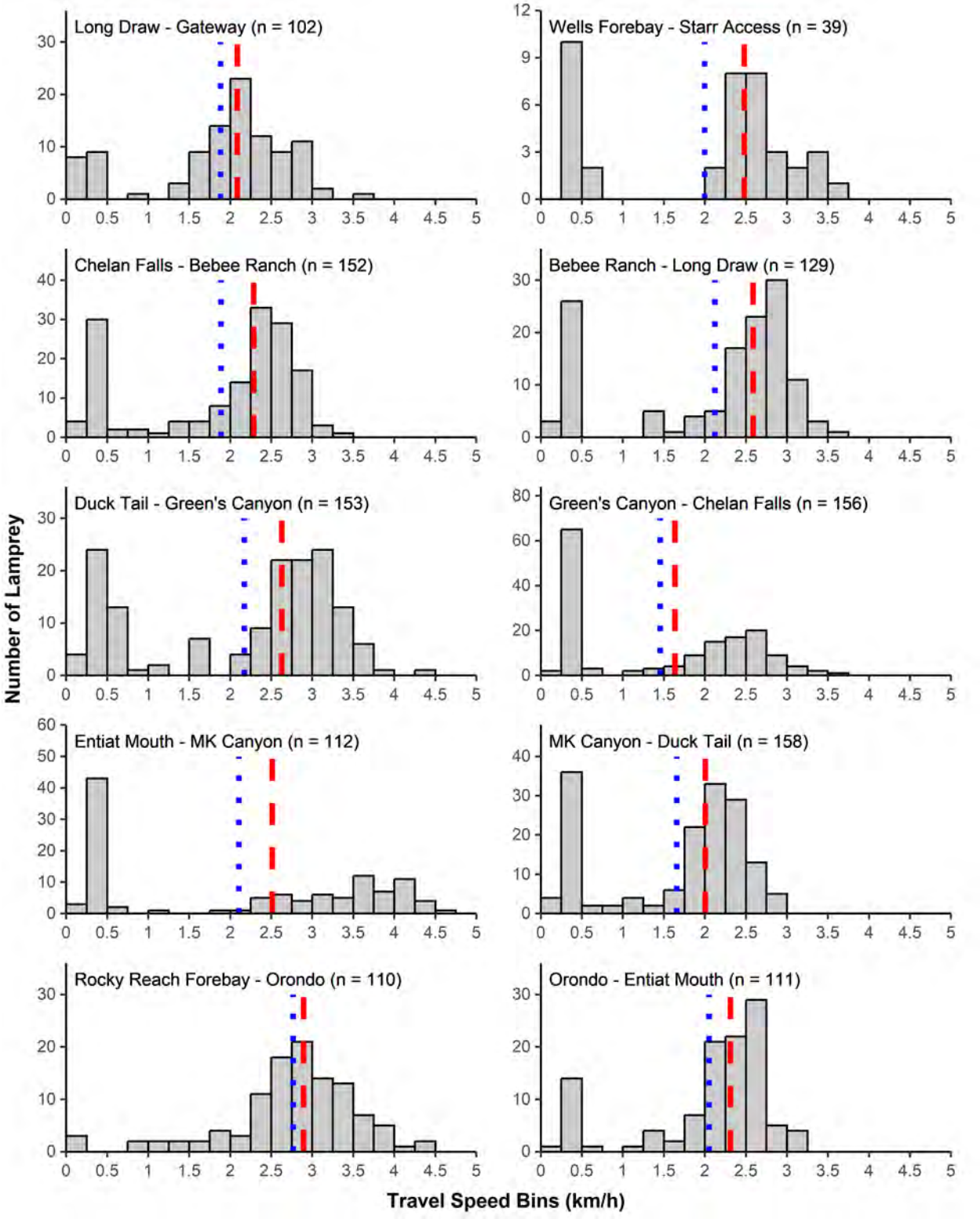


Figure 13. Distributions of travel speeds by river reach in the Rocky Reach and Wells reservoirs. Vertical blue and red lines show the mean and median values, respectively.

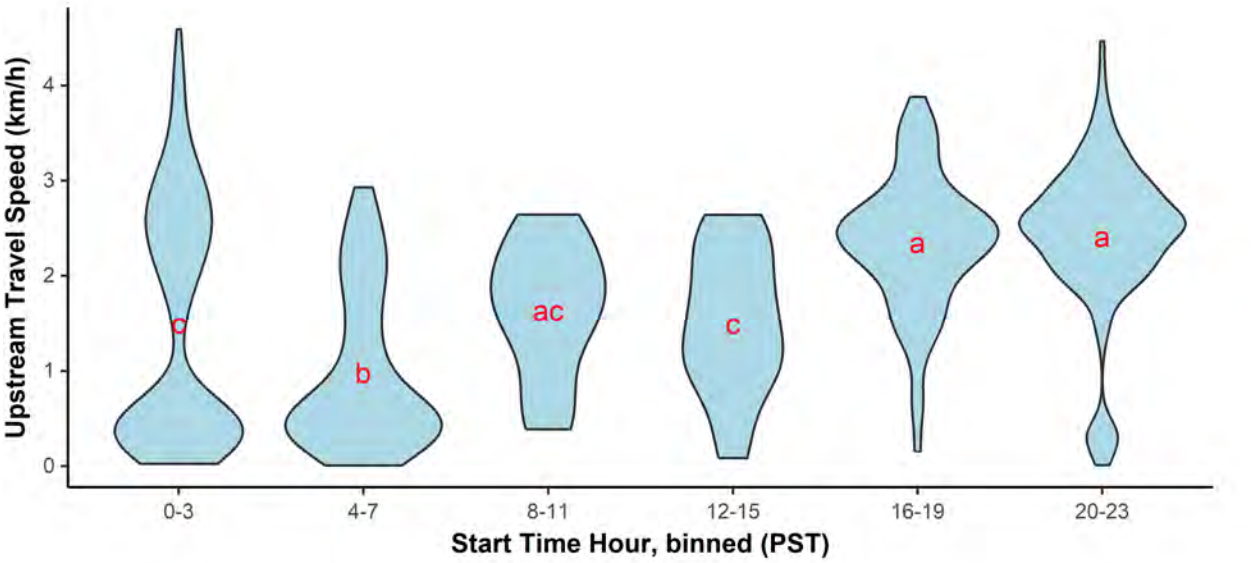


Figure 14. **Upstream travel speed distributions for Pacific Lamprey in river reaches shown in Figure 13, by the hour (PST) of the first detection at the downstream end of the reach. Times for this study were recorded in Pacific Standard Time (PST) regardless of Daylight Savings Time status. Polygons (blue) are mirrored density plots and are wider where there are more observations. Letters (in red), plotted on the distribution mean, correspond to the results of Tukey HSD tests (means that share a letter are not significantly different).**

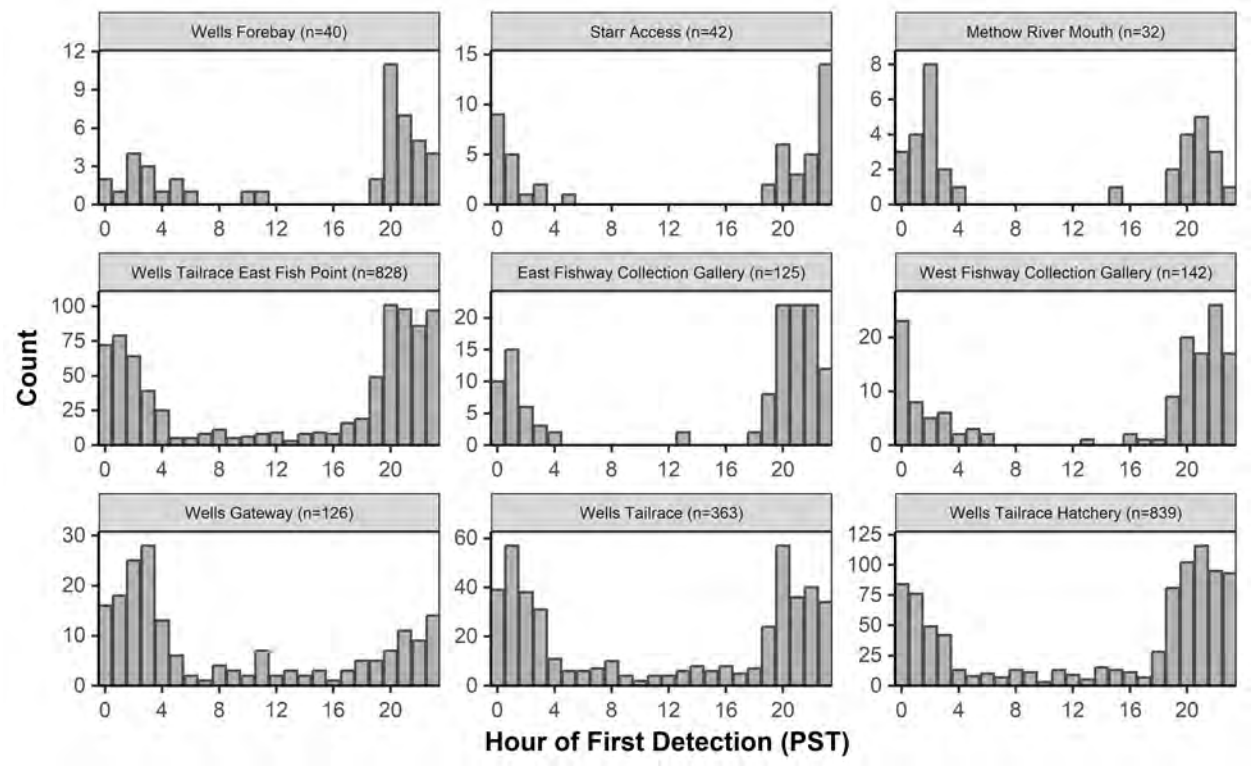


Figure 15. **Frequency distribution of the timing of acoustic-tagged upstream-moving Pacific Lamprey's first detection event at each acoustic receiver zone, where samples sizes were > 25. Times for this study were recorded in Pacific Standard Time (PST) regardless of Daylight Savings Time status.**

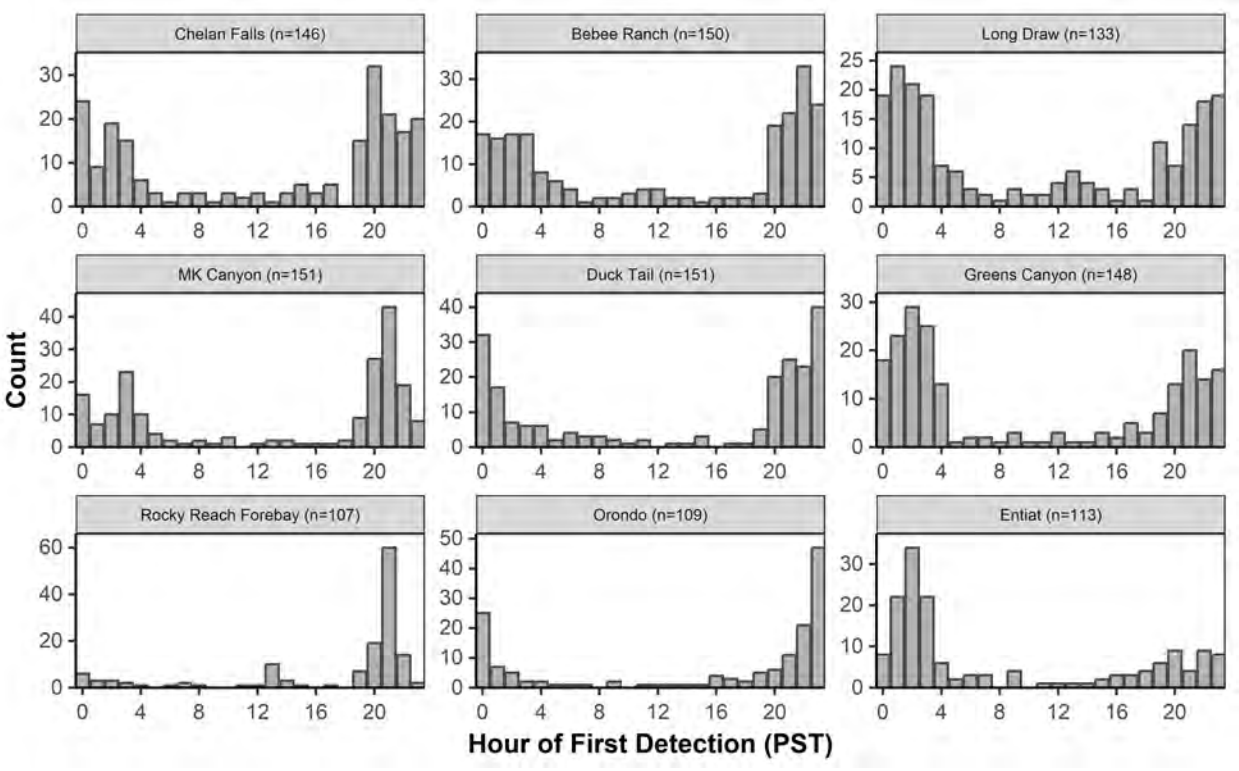


Figure 15 continued.

Table 9. Spearman rank correlation coefficients for all possible pairwise comparisons of ranked travel times among river reaches. *P*-values in bold were significant after controlling the rate of false positives.

River Reach 1	*River Reach 2*	*Spearman ρ*	*P*
Long Draw - Gateway	Wells Forebay - Starr Access	0.26	0.26
Bebee Ranch - Long Draw	Wells Forebay - Starr Access	0.05	0.80
Bebee Ranch - Long Draw	Long Draw - Gateway	0.53	**< 0.0001**
Chelan Falls - Bebee Ranch	Wells Forebay - Starr Access	0.07	0.67
Chelan Falls - Bebee Ranch	Long Draw - Gateway	0.34	**0.0009**
Chelan Falls - Bebee Ranch	Bebee Ranch - Long Draw	0.39	**< 0.0001**
Green's Canyon - Chelan Falls	Wells Forebay - Starr Access	-0.16	0.35
Green's Canyon - Chelan Falls	Long Draw - Gateway	0.03	0.77
Green's Canyon - Chelan Falls	Bebee Ranch - Long Draw	0.10	0.28
Green's Canyon - Chelan Falls	Chelan Falls - Bebee Ranch	-0.07	0.42
Duck Tail - Green's Canyon	Wells Forebay - Starr Access	0.00	0.98
Duck Tail - Green's Canyon	Long Draw - Gateway	0.41	**< 0.0001**
Duck Tail - Green's Canyon	Bebee Ranch - Long Draw	0.48	**< 0.0001**
Duck Tail - Green's Canyon	Chelan Falls - Bebee Ranch	0.13	0.13
Duck Tail - Green's Canyon	Green's Canyon - Chelan Falls	-0.05	0.54

Continued on next page

Table 9 continued.

Reach 1	*Reach 2*	*Spearman ρ*	*P*
MK Canyon - Duck Tail	Wells Forebay - Starr Access	0.35	0.03
MK Canyon - Duck Tail	Long Draw - Gateway	0.41	**< 0.0001**
MK Canyon - Duck Tail	Bebee Ranch - Long Draw	0.37	**< 0.0001**
MK Canyon - Duck Tail	Chelan Falls - Bebee Ranch	0.46	**< 0.0001**
MK Canyon - Duck Tail	Green's Canyon - Chelan Falls	-0.14	0.10
MK Canyon - Duck Tail	Duck Tail - Green's Canyon	0.17	0.04
Entiat - MK Canyon	Wells Forebay - Starr Access	-0.08	0.69
Entiat - MK Canyon	Long Draw - Gateway	0.33	**0.006**
Entiat - MK Canyon	Bebee Ranch - Long Draw	0.33	**0.001**
Entiat - MK Canyon	Chelan Falls - Bebee Ranch	0.25	**0.01**
Entiat - MK Canyon	Green's Canyon - Chelan Falls	0.54	**< 0.0001**
Entiat - MK Canyon	Duck Tail - Green's Canyon	0.29	**0.002**
Entiat - MK Canyon	MK Canyon - Duck Tail	-0.09	0.35
Orondo - Entiat	Wells Forebay - Starr Access	-0.02	0.93
Orondo - Entiat	Long Draw - Gateway	0.22	0.09
Orondo - Entiat	Bebee Ranch - Long Draw	0.43	**< 0.0001**
Orondo - Entiat	Chelan Falls - Bebee Ranch	0.24	**0.02**
Orondo - Entiat	Green's Canyon - Chelan Falls	0.26	**0.008**
Orondo - Entiat	Duck Tail - Green's Canyon	0.44	**< 0.0001**
Orondo - Entiat	MK Canyon - Duck Tail	0.03	0.77
Orondo - Entiat	Entiat - MK Canyon	0.27	**0.005**
Rocky Reach Forebay - Orondo	Wells Forebay - Starr Access	0.09	0.64
Rocky Reach Forebay - Orondo	Long Draw - Gateway	0.12	0.34
Rocky Reach Forebay - Orondo	Bebee Ranch - Long Draw	0.12	0.28
Rocky Reach Forebay - Orondo	Chelan Falls - Bebee Ranch	0.09	0.36
Rocky Reach Forebay - Orondo	Green's Canyon - Chelan Falls	0.11	0.28
Rocky Reach Forebay - Orondo	Duck Tail - Green's Canyon	0.32	**0.001**
Rocky Reach Forebay - Orondo	MK Canyon - Duck Tail	0.04	0.69
Rocky Reach Forebay - Orondo	Entiat - MK Canyon	0.15	0.13
Rocky Reach Forebay - Orondo	Orondo - Entiat	0.33	**0.0006**

involving the reaches from the Rocky Reach Forebay to Orondo, from Green's Canyon to Chelan Falls, or from the Wells Forebay to Starr Access. The fastest observed upstream travel speed was for an individual that traveled 7 km in 1.52 hours (4.6 km/h). In general, the fastest reach-specific travel speeds were in the lowest parts of the reservoir, and despite great variability (Figure 16) there was a statistically significant downward trend in reach-specific upstream travel speeds from lower to uppermost reaches ($F_{1,1220} = 22.5$; $P < 0.0001$).

Within reaches, there were statistically significant effects of total length (or of weight) on reach-specific travel speeds (Table 10; Figure 17) observed in three of the ten reaches. In each of the three cases, the larger fish had higher estimated upstream travel speeds.

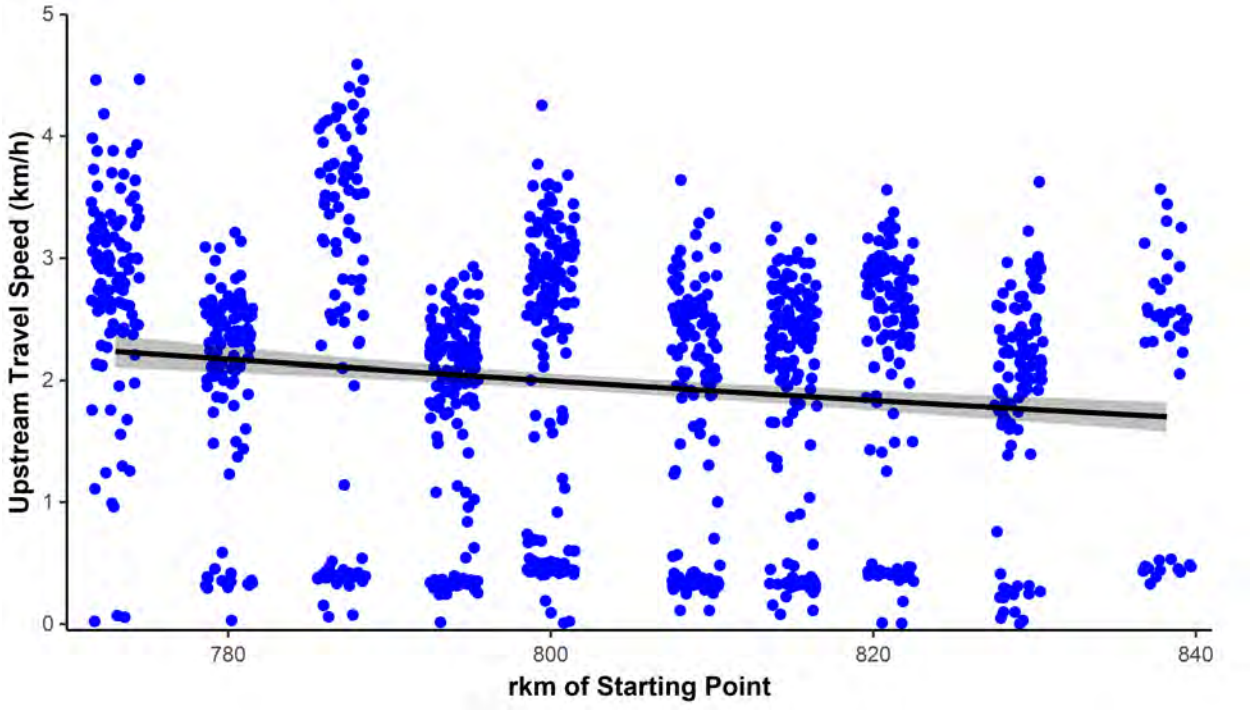


Figure 16. **Upstream travel speeds by river reach in the Rocky Reach and Wells reservoirs, plotted as a function of the river km of the starting point of the river reach through with the fish travelled. Line shows the best-fit prediction for a generalized linear model, with shaded areas bounding the 95% confidence intervals.**

Table 10. **Statistical results of regressions, testing for effects of total length or weight on travel speed, by river reach in the Rocky Reach and Wells reservoirs.**

	Effect of Total Length		*Effect of Weight*	
River Reach	***F***	***P***	***F***	***P***
Wells Forebay – Starr Access	1.1	0.29	1.8	0.19
Long Draw – Gateway	1.1	0.29	0.1	0.72
Beebe Ranch - Long Draw	7.7	**0.01**	4.1	**0.04**
Chelan Falls – Beebe Ranch	3.6	0.06	3.9	0.05
Green's Canyon – Chelan Falls	0.1	0.70	0.3	0.56
Duck Tail - Green's Canyon	16.7	**0.0001**	11.1	**0.001**
MK Canyon – Duck Tail	2.0	0.16	1.3	0.25
Entiat Mouth - MK Canyon	5.2	**0.02**	5.8	**0.02**
Orondo – Entiat Mouth	0.9	0.35	0.1	0.74
Rocky Reach Forebay - Orondo	0.7	0.39	0.0	0.95

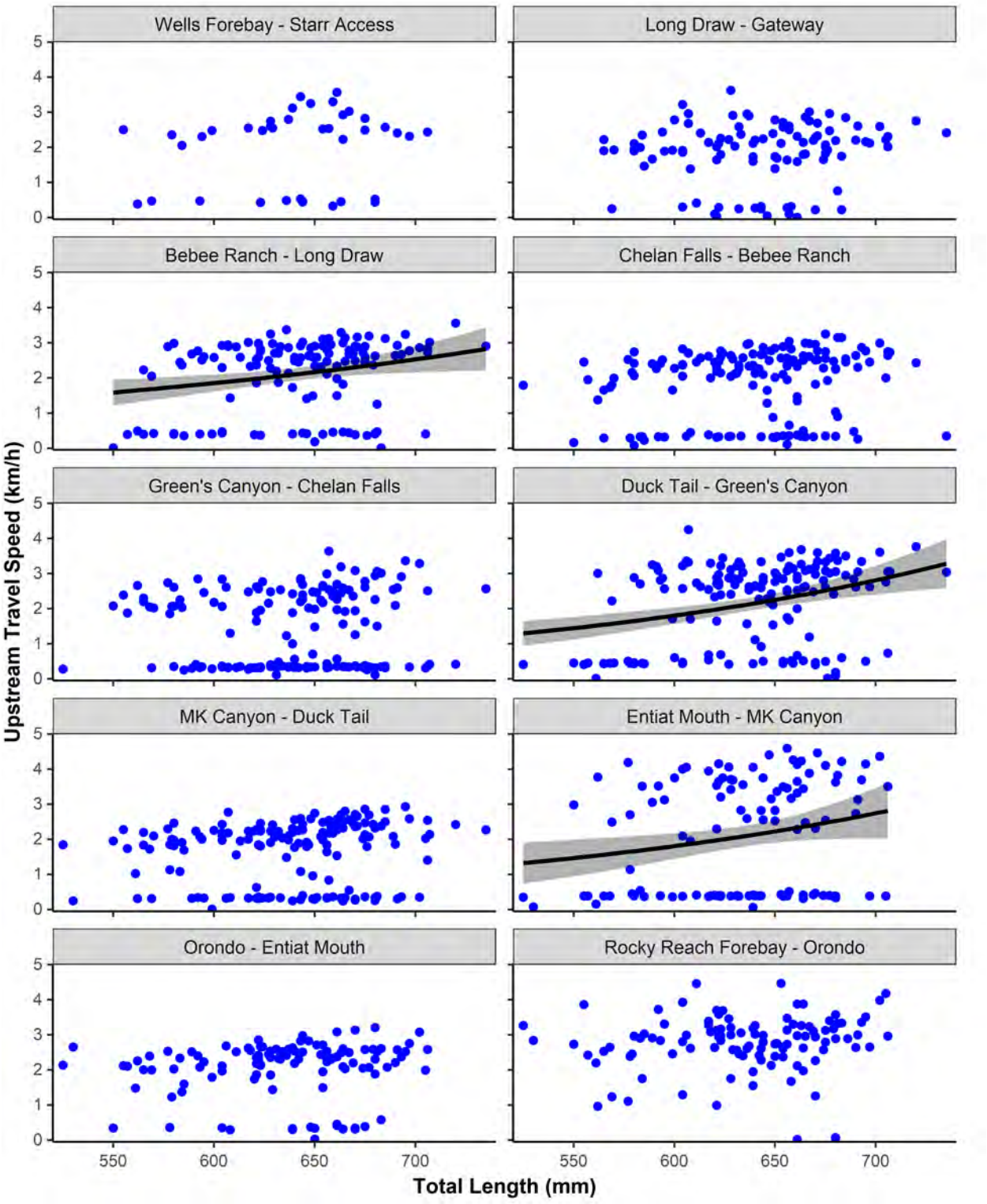


Figure 17. Upstream travel speeds in each river reach within the Rocky Reach and Wells reservoirs, plotted as a function of the total length of the Pacific Lamprey. Where they were statistically significant, best-fit prediction lines from a generalized linear model are drawn, with shaded areas bounding the 95% confidence intervals.

5.4.1. Wells Fishway Interaction and Passage

A total of 39 and 98 acoustic-tagged fish, released at Daroga State Park and in the Rocky Reach forebay, respectively, were counted as having interacted with Wells Dam (Table 11). Interaction events were overwhelmingly at night (Figure 18) and did not appear to be strongly associated with discharge or spill (Figure 19). These events represent an interaction proportion of 78.0% for Daroga fish, 81.7% for forebay releases, and 80.6% overall. The overall interaction rate of 80.6% (137 of 170) was significantly higher than that observed in 2016 (16.9%, 14 of 83 fish, $\chi^2_1 = 94.1$, $P < 0.0001$). The z-test showed that the difference in approach rate between 2022 release locations was not statistically significant ($\chi^2_1 = 0.3$, $P = 0.58$). The best-fit logistic regression model included length (Dev = 11.3, df = 1, $P = 0.0008$) and release date (Dev = 6.3, df = 2, $P = 0.04$) as significant predictors of approach proportion. Fish with greater lengths were more likely to approach Wells Dam, and fish released on 28 July (earliest release group) were more likely to approach than fish from the other two release dates (Figure 20). Release location (Dev = 0.2, df = 1, $P = 0.69$) and fish condition (Dev = 1.7, df = 1, $P = 0.20$) were not significant predictors of approach proportion in the logistic regression model.

Of the acoustic-tagged lamprey that interacted with Wells Dam, a total of 9 fish from Daroga (23.1%) and 31 fish released in the Rocky Reach forebay (31.6%) were later detected in the forebay of Wells Dam or farther upstream (Table 11). The z-test showed that the difference in passage success between release locations was not statistically significant ($\chi^2_1 = 1.0$, $P = 0.32$). The logistic regression model indicated fish condition was an important predictor of passage success (Dev = 10.5, df = 1, $P = 0.001$), whereas release date (Dev = 2.9, df = 2, $P = 0.24$), fish length (Dev = 0.5, df = 1, $P = 0.48$) and release location (Dev = 0.3, df = 1, $P = 0.55$) were not. Fish with higher condition factors were more likely to successfully pass into the forebay (Figure 21). Combined, the overall successful ascent rate was assessed at 29.2% in 2022, which was notably higher than that in 2016 (1 of 14; 7.1%) but the result was not statistically significant (Fisher's Exact Test, $P = 0.11$).

Table 11. Numbers of acoustic-and-PIT-tagged and of PIT-only-tagged Pacific Lamprey that were released, that approached Wells Dam (for acoustic-tagged fish), that were detected in the ladders (data from in-ladder PIT arrays), and that passed Wells Dam, by release location.

	Fish with Acoustic + PIT Tags			
Release Site	***Released***	***Interacted with Wells***	***In Wells Fish Ladders***	***Passed Wells***
Daroga SP	50	39	9	9
RR Forebay	120	98	31	31
Total	**170**	**137**	**40**	**40**

	Fish with only PIT Tags		
Release Site	***Released***	***In Wells Fish Ladders***	***Passed Wells ****
Daroga SP	141	54	52
RR Forebay	334	102	97
Total	**475**	**156**	**149**

* Includes fish that reached Pool 68.

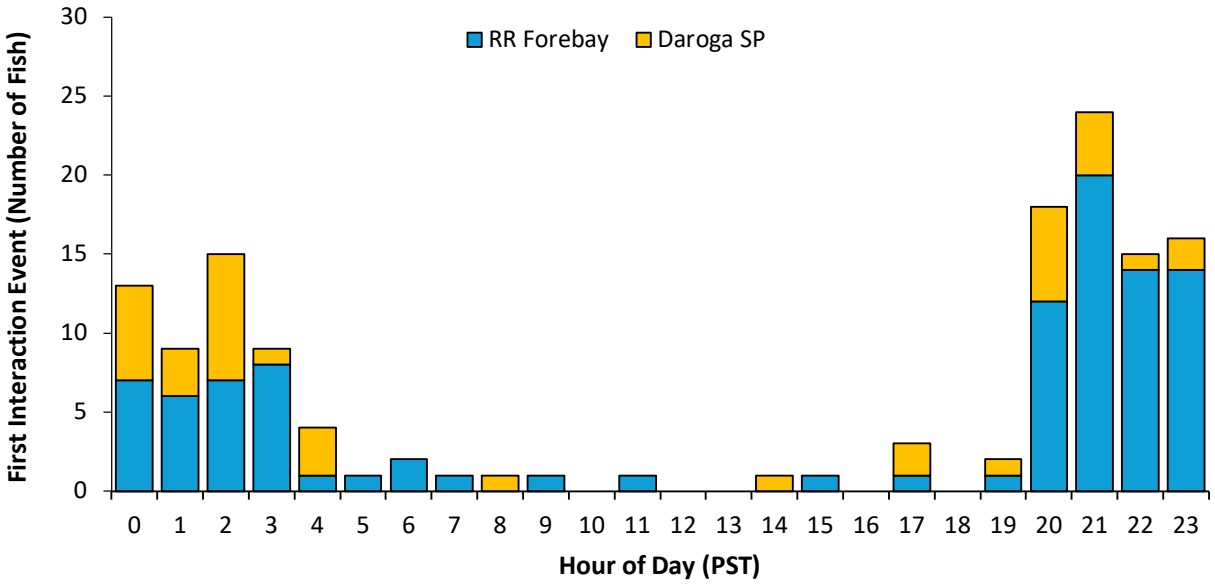


Figure 18. **Frequency distribution of the timing of 137 acoustic-tagged Pacific Lamprey's first Wells fishway interaction event, by release location. Times for this study were recorded in Pacific Standard Time (PST) regardless of Daylight Savings Time status.**

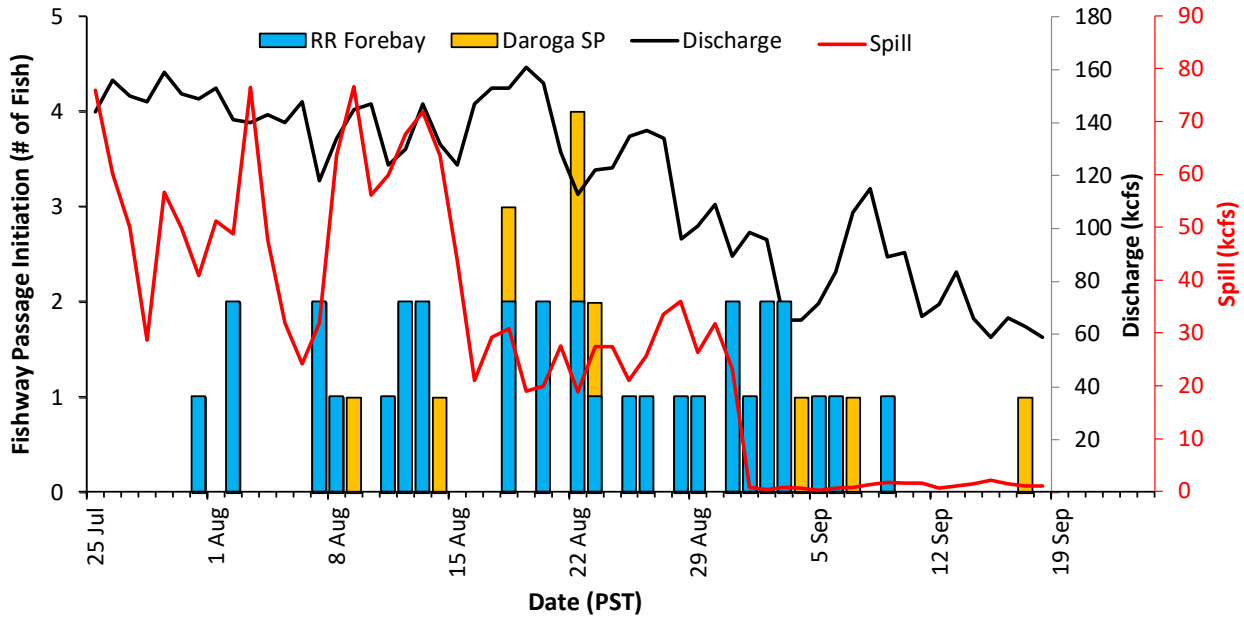


Figure 19. **Frequency distribution of the dates of 41 fishway passage initiation events by 40 acoustic-tagged Pacific Lamprey, by release location with mean daily discharge and spill (as recorded in the Wells Dam tailrace). Timestamps for this study were recorded in Pacific Standard Time (PST) regardless of Daylight Savings Time status.**

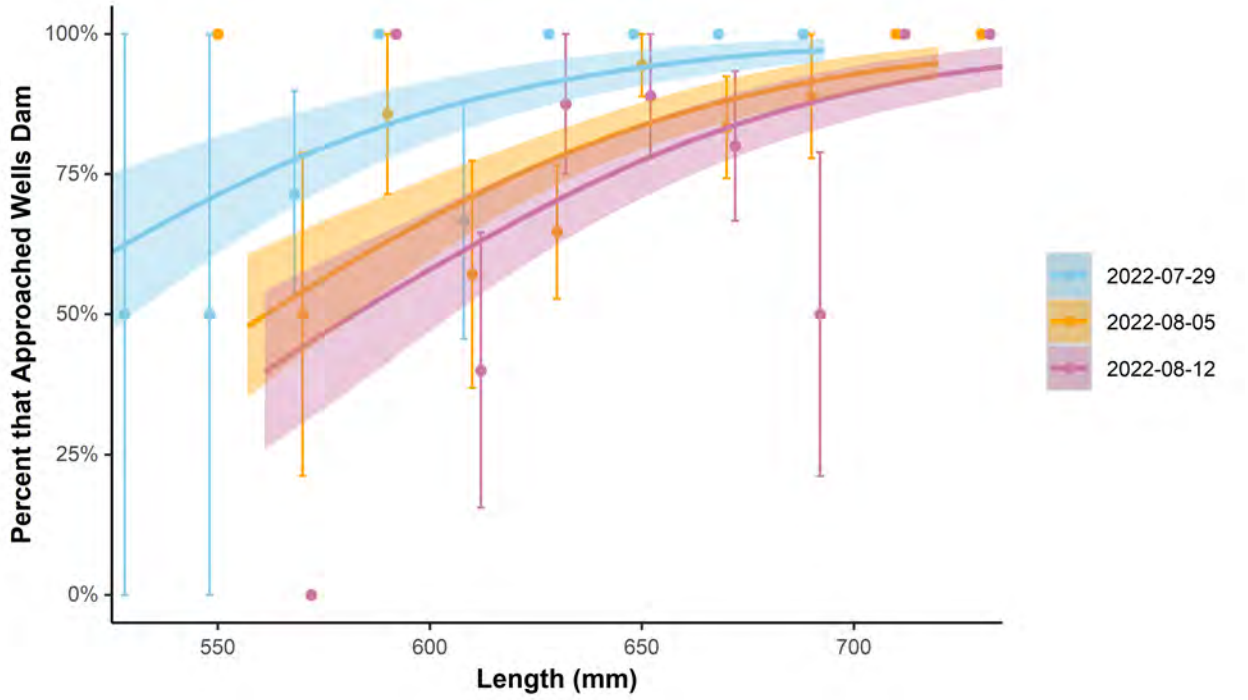


Figure 20. **Percent of acoustic-tagged fish that approached Wells Dam, as a function of fish length (total length, mm) and release date. Lines represent the best fit prediction (with one standard error). Points represent the mean (with error bars to one standard error) for 20 mm size bins (means are plotted at the midpoint of the size bin and are plotted with a slightly randomized position along the x-axis to prevent the three dates from overwriting each other).**

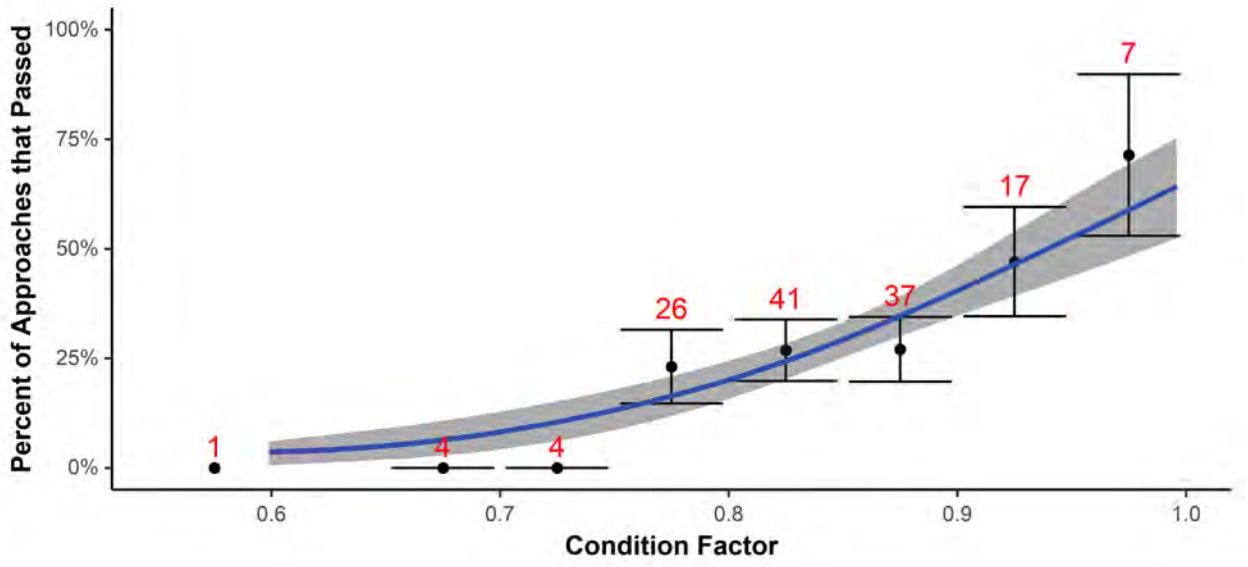


Figure 21. **Percent of the acoustic-tagged fish that approached Wells Dam that subsequently successfully passed into the forebay, as a function of condition factor. The line represents the best fit prediction (with one standard error). Points represent the mean (with error bars to one standard error) for condition factor bins (means are plotted at the midpoint of the bin). Sample sizes are shown adjacent to each point.**

Passage information for fish that bore a PIT only (no acoustic tag) was calculated from the in-ladder PIT arrays and in-stream arrays in the Methow or Okanogan basins. For PIT-only fish released at Daroga, 54 of the 141 fish (38.3%) were detected in the Wells fish ladders. Of the 54 fish, two (3.7%) made it no farther than Pool 19, 14 (25.9%) were last seen at Pool 68 and are assumed to have passed into the forebay, and another 38 (70.4%) were detected in the Methow or Okanogan basins. For the 334 PIT-only fish released in the Rocky Reach forebay, 102 (30.5%) were detected in the Wells fish ladders. Of the 102 fish, five (4.9%) made it no farther than Pool 19, 27 (26.5%) were last seen at Pool 68 and are assumed to have passed into the forebay, and 70 (68.6%) were detected in the Methow or Okanogan basins (Tables 4 and 11). Z-tests showed that differences between release sites were not statistically significant for fish ladder detections ($\chi^2_1 = 2.7$, $P = 0.10$; combined proportion = 32.8%) or for successful exits ($\chi^2_1 = 0.1$, $P = 0.73$; combined proportion = 95.5%). The best-fit logistic regression model predicting detection of PIT-tagged lamprey in the Wells fish ladders included length as a significant factor (Dev = 4.0, df = 1, $P = 0.047$), but not fish condition (Dev = 0.6, df = 1, $P = 0.43$), release location (Dev = 1.8, df = 1, $P = 0.18$), or release date (Dev = 1.1, df = 3, $P = 0.78$). Larger PIT-tagged lamprey were more likely to be detected in the fish ladder (Figure 22). The best-fit logistic regression model predicting the proportion of PIT tagged lamprey in the fish ladder that pass into the forebay (including fish last at Pool 68) included no significant factors (length: Dev = 0.7, df = 1, $P = 0.41$; fish condition: Dev = 0.9, df = 1, $P = 0.33$; release date: Dev = 1.3, df = 3, $P = 0.72$; release location: Dev = 0.04, df = 1, $P = 0.84$).

Fish ladder ascent times were calculated from acoustic and PIT detections of 39 acoustic-tagged fish that made 40 fishway ascents. Lower fishway (inside collection gallery to Pool 19) travel times ranged from 0.6 to 19.0 hours (median 1.8 hours, n=29). Upper fishway (Pool 19 to Pool 68) travel times ranged from 3.2 to 145.7 hours (median 4.8 hours, n=31). Whole fishway (inside collection gallery to Pool 68) travel times ranged from 4.0 to 148.0 hours (median 7.6 hours, n=37).

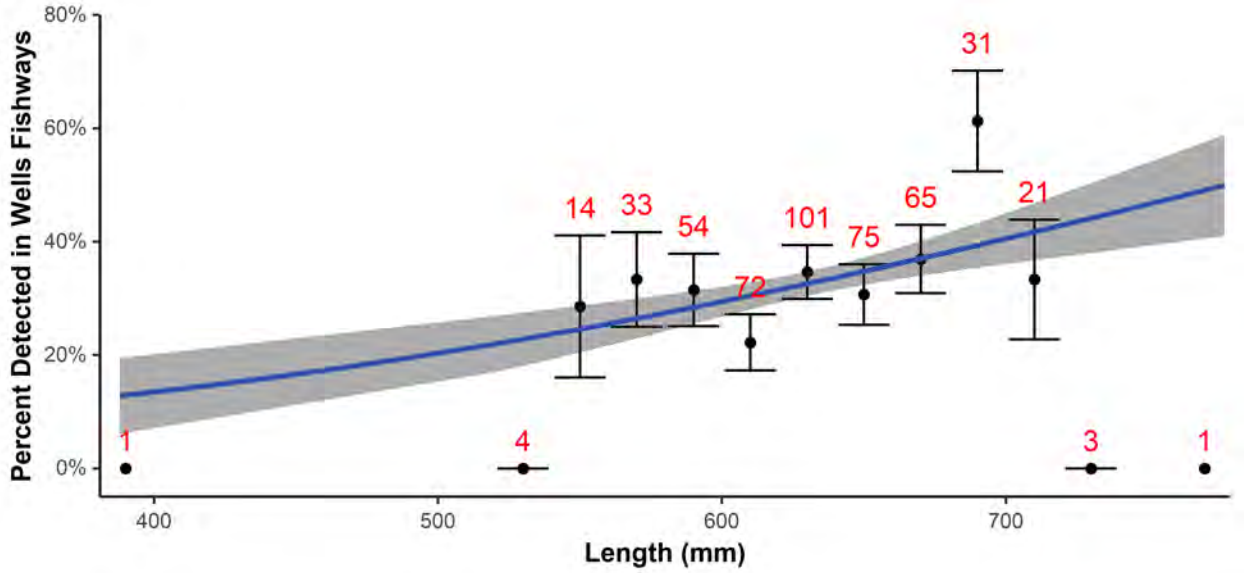


Figure 22. Percent of fish that bore only a PIT tag that were detected in the Wells Dam fish ladders, as a function of fish length (total length, mm). The line represents the best fit prediction (with one standard error). Points represent the mean (with error bars to one standard error) for 20 mm size bins (means are plotted at the midpoint of the size bin). Sample sizes are shown above each point.

5.4.2. Fishway comparisons

Lamprey were more likely to ascend the left (east) fishway. For acoustic + PIT tagged fish, 40 fish made 41 ascents (one fish ascended Wells Dam, fell back, and reascended), including 26 of the left ladder, and 15 of the right. Also, 156 ascent attempts were documented for PIT-only fish, including 100 events in the left ladder, and 56 in the right. Overall, study fish used the left fishway for 64% of the ascent attempts detected in 2022. Indices of within-fish ladder travel times (for lamprey detected at both Pool 19 and Pool 68) did not differ statistically (Dev = 0.4, P = 0.53) between the two Wells Dam fishways. In the left fish ladder, 95% of travel time indices ranged from 3.0 to 27.0 hours (median 5.0, n=90), whereas in the right ladder 95% of travel time indices ranged from 3.4 to 25.6 hours (median 5.1, n = 52). Passage success in the right ladder (93%, 52 of 56 attempts) did not differ significantly from that in the left ladder (97%, 97 of 100 attempts, $\chi^2_1 = 1.4$, $P = 0.23$).

5.4.3. Assumption that a Pool 68 detection is a signifier of successful passage

To evaluate the assumption that a PIT detection at Pool 68 constitutes a successful fishway ascension, the detection histories of 39 acoustic-tagged fish detected in Pool 68 were examined (one acoustic-tagged fish ascended without being detected in Pool 68 and was excluded from this analysis). For 37 of the fish (94.9%), including 14 that ascended the right ladder and 23 that ascended the left, their immediate next detection was either on the acoustic array in the forebay of Wells Dam (n=35) or farther upstream (Starr Access array, n = 1; Omak PIT array, n = 1). The other two fish dropped back after their first detection in Pool 68. One of these two fish, which had been detected in Pool 68 of the left ladder, dropped back to Pool 67, then resumed its ascent, was detected again in Pool 68, and then moved out into the forebay and to points farther upstream (this fish should also be included as a confirmation of the assumption). The second of the two fish was detected in Pool 68 of the left ladder, did a similar drop back to Pool 67, and returned to Pool 68, but its next detection was in the tailrace outside of the left bank Collection Gate. Eight days later, it ascended the right bank fishway and was detected in Pool 68 immediately before being detected in the Wells Reservoir. Hence the last fish exhibited two passage attempts, one successful, and one not. Overall, there were 40 ascents that included a detection in Pool 68, of which 39 (97.5%) were followed by upstream detections that confirmed successful dam passage.

5.4.4. Effectiveness of fishway maintenance activities to prevent mid-fishway exit events

To evaluate the preponderance of 'missed downstream exit events', the detection histories of 32 acoustic-tagged fish detected in Pool 19 were examined. All 32 of the fish (100%), including 10 that ascended the right (west) ladder and 22 that ascended the left (east) ladder, had a detection history that showed a continued upstream movement into the Wells forebay.

5.5. Movements Upstream of Wells Dam

For acoustic-tagged fish that passed Wells Dam, 22 (12.9% of all acoustic tagged fish) had a most upstream detection in the Methow Basin, eight (4.7%) had a most upstream detection in the Okanogan Basin, and 10 (5.9%) were never detected outside of the mainstem Columbia River. For the fish that were never detected outside of the Wells Reservoir, eight were never detected above the Methow River Confluence, and two were detected in Brewster (Table 5).

Examining all study fish, but restricting queries to the PIT arrays, the majority that passed Wells Dam had a most upstream detection in the Methow Basin (116 fish; 18.0% of all study fish). Fifteen study fish had a most upstream detection in the Okanogan Basin (2.3%; Table 4). There were also 57 (8.8%) study fish that were last detected in Pool 68 (and presumed to have passed the dam; see Section 5.4.3), but were never detected at additional arrays indicating either that they stayed in the Columbia River or were able to pass in-tributary arrays without detection (Table 4).

5.6. Downstream Movements

Of the 40 fish that passed Wells Dam in 2022, five (12.5%) later moved downstream through Wells, one in August 2022, and four in June 2023 (possibly post-spawning drift). The fish that passed downstream in August 2022 (Acoustic tag 1604-8036) had a complex detection history pattern (see Appendix C): during its tracking period, the fish made six nearly complete laps of the Rocky Reach Reservoir, approached Wells Dam three times (August 2022, September 2022, and June 2023), passed both Wells and Rocky Reach dams once in each direction, and made a foray into the Entiat River. The other four fish that moved downstream through Wells Dam either continued quickly downstream past Rocky Reach Dam (Acoustic tags 1064-8032 and 1064-8108) or continued downstream to a location in the Rocky Reach Reservoir where they stopped until the tag expired (Acoustic tags 1064-8075 to Long Draw, and 1064-8112 to Chelan Falls; see Appendix C).

A portion (57%) of the fish were observed, after pausing in the Rocky Reach Reservoir overwinter, to make directed movements downstream toward Rocky Reach Dam in the spring or summer of 2023. Of the 81 fish that were tracked into mid-2023, 21 certainly moved quickly to Rocky Reach Dam, another 7 probably did but last detections were at the start of the downward portion of the track, and seven more fish moved quickly downstream but stopped short of Rocky Reach Dam. Another 11 of the 81 fish made rapid downstream movements that included detections in the Entiat River. Overall, 35 of the 81 fish (43%) were not detected making a rapid downstream movement in 2023, but these were overwhelmingly fish that had passed Wells Dam: 27% of fish that passed Wells and that were detected in mid-2023 (4 of 14) made rapid downstream movements, whereas the proportion for fish that did not pass Wells Dam was 64% (42 of 66; $\chi^2_1 = 6.8$, $P = 0.009$). Downstream

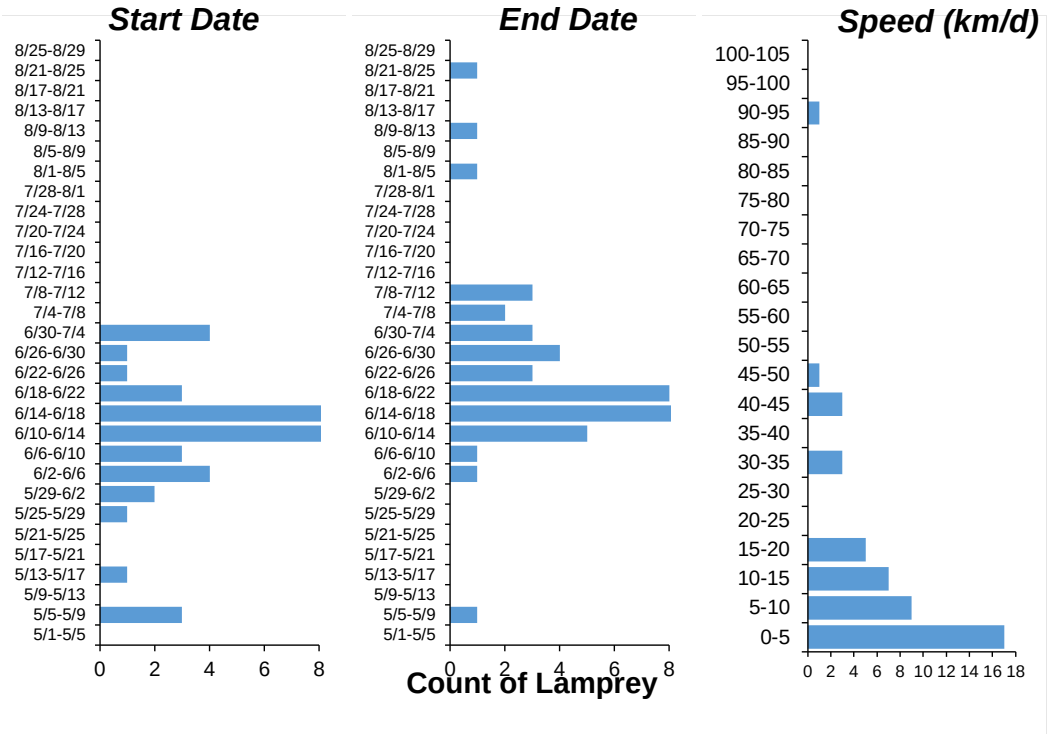


Figure 23. Frequency distributions for 46 acoustic-tagged Pacific Lamprey that made directed downstream movements in the summer of 2023.

movements occurred with start dates ranging from 5 May to 3 July (91% between 28 May and 3 July), with end dates ranging from 6 May to 24 August (91% between 5 June and 10 July), and with speeds ranging from 0.4 to 92.6 km/d (median 7.4 km/d; 97% moved slower than 50 km/d; 82% were slower than 20 km/d; Figure 23).

6. Discussion

In the Rocky Reach Reservoir, upstream movements of Pacific Lamprey were initially quick and in a targeted upstream direction, at least for a portion of the acoustic-tagged fish. The bimodal distribution of travel times suggested that travel speeds varied widely among individuals, where some individuals moved quickly through the reaches, while others moved more slowly. Median travel speeds did not vary notably among reaches, yet individual within-reach speeds showed a statistically significant trend for fastest travel speeds in the lowest parts of the Rocky Reach Reservoir. Travel speeds showed a similar pattern in 2016, having declined as the fish moved upstream in the Rocky Reach Reservoir (Robichaud and Kyger 2018). Median reach-specific upstream travel speeds in the Rocky Reach Reservoir in 2022 ranged from 39.3 to 69.4 km/d and were similar to some of those reported in 2016 (medians for six of the reaches ranged from 32.2 to 66.1 km/d). Whereas four reaches in 2016 had lower median upstream travel speeds (ranging from 6.0 to 24.7 km/d), similarly low median speeds were not observed in 2022. Upstream travel speeds in other Columbia River reservoirs (22.9-29.6 km/d; Moser et al. 2013) were notably lower than those observed in 2022, as were those reported in the unimpeded Fraser River in Canada (upstream travel speeds ranged from 6.5 to 18.3 km/d with a median of 10.1 km/d; unpublished data).

One of the striking results from the 2016-17 Rocky Reach Reservoir lamprey telemetry study (Robichaud and Kyger 2018) was the gradual attrition of fish as they moved upstream in the reservoir, whereby a smaller and smaller proportion of the tagged population passed each successive acoustic receiver, and only 25% reached the Wells tailrace. Moreover, many of the fish that stopped their upstream progression in the fall of 2016 later performed directed downstream movements out of the Rocky Reach Reservoir the following spring (observed for 82-94% of the tracked fish, regardless of how far up the Rocky Reach Reservoir the fish was located at the time). Limited conversion through the Rocky Reach Reservoir had been observed at least as early as 2006 (Figure 2). In 2004, only 12% of the 150 radio-tagged adult lamprey released at or below Rocky Reach Dam were detected in the Wells Dam Tailrace within the 45-day battery life of the tags (Nass et al. 2005). By contrast, approach towards Wells Dam was much higher in 2022, successful passage through the whole of the Rocky Reach Reservoir was achieved for most of the fish, a gradual attrition was not observed, and 81.8% of the acoustic-tagged fish were detected at or upstream of the Wells Dam tailrace.

The reasons for the slower travel speeds and the infrequent approach toward Wells Dam that were observed in 2016-17 were unknown. Flows in 2016 were lower than average, and the authors of the 2016-17 study report hypothesized that pheromone levels may be related to Pacific Lamprey travel speed and Wells Dam approach rate (Robichaud and Kyger 2018). Other lamprey species are known to use conspecific odors to identify suitable spawning habitat, search for mates, and avoid risk (Teeter 1980, Fine et al. 2004, Bals and Wagner 2012). For example, Sea Lamprey (*Petromyzon marinus*) are attracted to spawning tributaries that have been successful in the past, by cueing in on the pheromones released by ammocetes (Moore and Schleen 1980, Li et al 1995, Polkinghorne et al. 2001), which stay in the tributaries for years before migrating to sea. Initial studies suggest that Pacific Lamprey employ a pheromone communication system that is similar to that of Sea Lamprey (Robinson et al. 2009, Sang-Seon et al. 2014, Byford et al. 2016). At Wells Dam specifically, adult lamprey passage appeared to have declined over the past decade (based on adult counts at Wells Dam and rotary screw trap data from the Methow and Okanogan Rivers; unpublished data). In the Okanogan River basin, Pacific Lamprey were functionally extirpated, based on larval abundance, eDNA analysis, and rotary screw trap observation, and, in the Methow

River basin, larval abundance estimates had greatly decreased prior to 2020 (Grote 2020). It is unknown as to what caused the reduced numbers of lamprey in the Methow and Okanogan but previous theories have included effects from large scale fires (Robichaud and Kyger 2016) or the cumulative impacts of Columbia River dams on overall abundance of returning adults.

To address the potential dearth of pheromone attractions upstream of Wells Dam, Douglas PUD and the Aquatic SWG have been translocating lamprey past Wells Dam since 2018. The intent of the translocation program was to reestablish or enhance the existing pheromone signal from Pacific Lamprey occupying habitats upstream of Wells Dam, which would ideally result in increased proportions of Pacific Lamprey within the Rocky Reach Reservoir that choose to approach and interact with the Wells Project. Pheromone levels were not monitored, and numbers of spawning adults were not assessed. Nevertheless, after four years of translocation efforts, the attractiveness of areas upstream of Wells Dam, as measured by the proportions of fish that moved all the way through the Rocky Reach Reservoir into the Wells tailrace, was higher than the 2016 study result. Of course, other underlying causes or environmental factors that may have influenced Pacific Lamprey approach and passage (e.g., Columbia River discharge, Columbia River water temperature, size of Pacific Lamprey returning to the Columbia River, timing of study fish release, etc.) cannot yet be ruled out, and the present study was not designed as a controlled experiment. Nevertheless, our results are consistent with the hypothesis that translocations above Wells Dam could have increased the motivation of migrating lamprey to approach Wells Dam.

Other indications of an increased attractiveness of areas upstream of Wells Dam include the proportion of fish that interacted with Wells Dam fishways, and the probability of successful lamprey fishway ascent. Fishway interactions were significantly more prevalent after the translocation years as compared to before. In 2016, a total of 14 acoustic-tagged lamprey interacted with Wells Dam fishways, which represented 16.9% of the number tagged and released into the Rocky Reach Reservoir, and 66.7% of the number that reached the tailrace. In 2022, there were 137 acoustic-tagged lamprey that interacted with the fishways, which was 80.6% of the number tagged and released into the reservoir, and 98.7% of the number of acoustic-tagged fish that reached the tailrace. The 2022 results are similar to those from radio-telemetry studies at Wells Dam. In 2013, 92 radio-tagged lamprey were released near the Gateway site, of which, 58% were detected at antennas on the outside of the fishway entrances, which had a detection efficiency of 70% (Robichaud and Kyger 2014). Radio-tagged lamprey were released much closer to Wells Dam in 2007 and 2008 (in the east and west alcoves), and 18 of the 21 (86%) 'active' lamprey approached a fishway entrance (LGL and DPUD 2008, Robichaud et al. 2009). At other Columbia River dams, the general pattern is that 65-92% of lamprey re-approach hydroelectric projects after being radio-tagged and released downstream (Moser et al. 2002, Johnson et al. 2009a,b). Whereas the 2016 fishway interaction rates were lower than desired, the results from 2022 were closer to historical or basin-wide rates.

Successful fishway ascent was observed for 40 acoustic-tagged lamprey in 2022, which was 100% of the number known to have entered the collection gallery, 29.2% of fish that interacted with fishway collection areas, and 23.5% of all released fish. Successful ascent in 2022 was noted for another 149 fish that bore only PIT tags, which was 95.5% of the number detected in the fish ladders, and 31.4% of all released PIT-only lamprey. These ascent rates were notably greater than in 2016, when only one of three (33%) study fish detected beyond the entrances of fishways passed into the forebay, although the between-year difference (albeit limited by very small sample sizes in 2016) was not statistically significant. In 2004, Nass et al. (2005) reported a Wells Dam fishway passage efficiency of 25%. In 2007-8, it was 33% (LGL and DPUD 2008, Robichaud et al. 2009), and it was 10% in 2013 (Robichaud and Kyger 2014). The 2022 rates of successful fishway ascent approached those at other mid-Columbia (55.5% to nearly 100%; Nass et al. 2002, Stevenson et al. 2005, Chelan PUD unpublished data, Grant PUD unpublished data) and lower-Columbia (41.3% to 88.7%; Keefer et al. 2012) dams. Bonneville Dam had the lowest passage efficiencies of the lower-Columbia dams, ranging from 41.3% to 57.7% (Keefer et al. 2012).

Wells Fish ladder ascent times (inside collection gallery to Pool 68) in 2022 ranged from 4.0 to 148.0 hours (median 7.6 hours). These times spanned the values recorded in 2004, when three radio-tagged Pacific Lamprey had fishway travel times of 4.3, 7.4 and 7.7 hours (Nass et al. 2005). In 2007-2008, complete fishway ascents were recorded for two radio-tagged lamprey, taking 5.5 and 32.6 hours (LGL and DPUD 2008, Robichaud et al. 2009). In 2013, four radio-tagged fish provided total fish passage times, ranging from 9.8 to 57.9 hours (Robichaud and Kyger 2014). Fishway ascent times at Wells Dam were comparable with those recorded by Grant County PUD: at Wanapum Dam, left and right median fishway ascent times, from ladder entrance to exit, from 2010-2019 were 51.9 and 21.2 hours, respectively, and those for Priest Rapids Dam were 71.0 and 6.2 h (Wright et al. 2023).

Previous telemetry studies at Wells Dam (e.g., Nass et al. 2005, Robichaud et al. 2009, Robichaud and Kyger 2014) made the assumption that the majority of the lamprey in the Rocky Reach Reservoir would approach Wells Dam and be motivated to pass it. This assumption was based on the lack of data to suggest mainstem spawning of lamprey in the Rocky Reach Reservoir and the small proportion of tagged lamprey observed entering the Entiat River, the only major tributary between Rocky Reach and Wells dams. The corollary of this assumption is that fish that do not pass Wells Dam had made an attempt that failed for some reason (e.g., poor water quality, barriers to movement, etc.) that can potentially be addressed by public works or by making use of novel fishway design elements. Moreover, a mass downstream movement of Pacific Lamprey was observed in spring/summer of 2017, which was made by fish in the Rocky Reach Reservoir that never even approached Wells Dam. Together, these results suggested that fish were not motivated to move into the upper parts of the Rocky Reach Reservoir. While it is not possible to measure a lamprey's motivation, the telemetry tracks revealed that 'failures' were occurring a long distance away from areas where Wells Dam entryway modifications could potentially have had any influence. Translocation efforts by Douglas PUD, Yakama Nation, and the Confederated Tribes of the Colville Reservation, ongoing since 2016, sought to increase lamprey 'motivation' by creating or amplifying the pheromone plume coming from upstream of Wells Dam. Indeed, the approach towards Wells Dam was much higher in 2022, as was the proportions interacting with the fishway entrances, and the fishway ascent success rate. Since 2022, increases in the Rocky Reach to Wells conversion rates for lamprey may also serve as a clue that more fish are becoming motivated to pass Wells Dam relative to years that included the 2016 study. And while we will never know whether lamprey were more motivated in 2022 than in 2016, these results are consistent with the notion that they were.

One limitation of this study was the lack of information produced about entrance efficiency to the collection gallery from the tailrace. Previous lamprey studies at Wells Dam (e.g., Nass et al. 2005) were able to make inferences about entrance rates because radio telemetry methods were employed in a manner that permitted detection of finer-scale movements in the collection galleries and throughout the fishways. The same radio telemetry equipment could not be used in the current study because of the need to measure in-reservoir movements, which required the study fish to be detected by the Vemco (Innovasea) acoustic telemetry arrays deployed throughout the Rocky Reach and Wells reservoirs. The acoustic gear is not perfectly suited for use in the acoustically noisy fishways. The receivers deployed inside the collection galleries had a combined detection efficiency of only 85% and were unable to detect all collection gallery entrance events. Furthermore, the collection gallery acoustic receivers were unable to distinguish with certainty whether detected fish were inside or outside of the entrances. Nevertheless, the data collected in this study suggested that lamprey may have had difficulty entering the collection galleries or possibly moving from the Collection Gallery to Pool 19 in the fish ladder. However, once fish reached ladder Pool 19, they were able to ascend the fish ladders successfully.

7. Conclusions

The paucity of lamprey approaching the Wells Dam tailrace has precluded the ability to effectively evaluate potential passage problem areas within the Wells Dam fishways. Without these data, it is difficult to identify specific problem areas within the fishways and implement modifications to address them. A better understanding of the factors influencing lamprey upstream migration, and evidence of sufficient numbers of lamprey approaching Wells Dam to satisfy study assumptions, are both needed before passage evaluations can be carried out effectively. To that end, work has been done to increase the attractiveness of Wells Dam passage by increasing pheromone cues above the dam, with results to date that appear promising. In 2022 (after lamprey translocation) the approach of acoustic tagged lamprey towards Wells Dam was higher than it was in 2016 (before lamprey translocation), as was the proportions interacting with the fishway entrances, and the fishway ascent success rate. If further study continues to suggest that the attractiveness of areas upstream of Wells Dam has improved and that lamprey motivation to pass Wells Dam has increased, then a next step may be to investigate methods to improve fishway entrance success.

Coupled with the increased number of fish in the fishway in 2022, came an opportunity to evaluate the effectiveness of fishway maintenance activities (done from 2019-21) which sought to eliminate any gaps greater than 1 inch between diffuser grating and concrete. The 2022 tracking results suggested that the modifications may have been successful: every acoustic-tagged lamprey that was detected in a fishways exited via a known route. Since no fish disappeared mid route, later seen in the tailrace, there was no evidence in 2022 for exits via the diffuser grating or auxiliary water supply.

8. Acknowledgements

We thank the many Douglas PUD employees at Wells Dam for their support throughout the study. Douglas PUD staff deployed, maintained, and downloaded the Wells Dam PIT detection array, and the acoustic receivers in the Wells Reservoir and in the Wells Dam tailrace. Staff of Blue Leaf Environmental deployed, maintained, and downloaded the acoustic receivers throughout the rest of the Rocky Reach Reservoir. We thank Mike Clement at Grant PUD for access to study fish, and Barb Wolfe and others at Douglas PUD for transporting lamprey from Priest Rapids Dam. Corey Wright (Blue Leaf) managed and performed all tagging operations under the supervision of Anita Blakley (LGL).

9. Literature Cited

Bals, J.D., and C.M. Wagner. 2012. Behavioral responses of Sea Lamprey (*Petromyzon marinus*) to a putative alarm cue derived from conspecific and heterospecific sources. *Behaviour* 149: 901-923.

Benjamini, Y., and Y. Hochberg. 1995. Controlling the false discovery rate: a practical and powerful approach to multiple testing. *Journal of the Royal Statistical Society Series B* 57: 289-300.

BioAnalysts. 2000. A status of Pacific Lamprey in the Mid-Columbia Region. Report for Public Utility District No. 1 of Chelan County. Wenatchee, Washington.

Byford, G.J., C.M. Wagner, J.B. Hume, and M.L. Moser. 2016. Do native Pacific Lamprey and invasive Sea Lamprey share an alarm cue? Implications for use of a natural repellent to guide imperiled Pacific Lamprey into fishways. *North American Journal of Fisheries Management* 36: 1090-1096.

Close, D.A., M.S. Fitzpatrick, and H.W. Li. 2002. The ecological and cultural importance of a species at risk of extinction, Pacific Lamprey. *Fisheries* 27(7): 19-25.

English, K.K., D. Robichaud, and P. Wainwright. 2012. Database Management and "Real-Time" Data Analysis Systems for Fish Telemetry Studies. Chapter 9.4 in Telemetry Techniques: A User Guide for Fisheries Research. N.S. Adams, J.W. Beeman, and J.H. Eiler, editors. American Fisheries Society, Bethesda, MD.

Fine, J.M., L.A. Vrieze, and P.W. Sorensen. 2004. Evidence that petromyzontid lampreys employ a common migratory pheromone that is partially comprised of bile acids. *Journal of Chemical Ecology* 30: 2091-2110.

Grote, A. 2020. Pacific Lamprey 2020 Regional Implementation Plan for the Upper Columbia Regional Management Unit. Report for the Pacific Lamprey Conservation Team, August 19, 2020. Available at: https://www.pacificlamprey.org/wp-content/uploads/2022/02/2020-Upper-Columbia-RIP.pdf

Gunckel, S.L., K.K. Jones, and S.E. Jacobs. 2009. Spawning distribution and habitat use of adult Pacific and Western Brook Lampreys in Smith River, Oregon. *American Fisheries Society Symposium* 72: 173-189.

Jackson, A.D., D.R. Hatch, B.L. Parker, M.S. Fitzpatrick, D.A. Close, and H.W. Li. 1997. Pacific Lamprey research and restoration: Annual report, 1997. Report for Bonneville Power Administration, Division of Fish and Wildlife.

Johnson, E.L., C.A. Peery, M.L. Keefer, C.C. Caudill, and M.L. Moser. 2009a. Effects of lowered nighttime velocities on fishway entrance success by Pacific Lamprey at Bonneville Dam and fishway use summaries for lamprey at Bonneville and The Dalles dams, 2007. Idaho Cooperative Fish and Wildlife Research Unit Technical Report 2009-2.

Johnson, E.L., T.S. Clabough, M.L. Keefer, C.C. Caudill, C.A. Peery, and M.L. Moser. 2009b. Effects of lowered nighttime velocities on fishway entrance success by Pacific Lamprey at Bonneville Dam and fishway use summaries for lamprey at Bonneville and The Dalles dams, 2008. Idaho Cooperative Fish and Wildlife Research Unit Technical Report 2009-10.

Keefer, M.L., T.C. Clabough, M.A. Jepson, E.L. Johnson, C.T. Boggs and C.C. Caudill. 2012. Adult Pacific Lamprey passage: Data synthesis and fishway improvement prioritization tools. Idaho Cooperative Fish and Wildlife Research Unit, Technical Report 2012-8-DRAFT.

LGL and Douglas County PUD (DPUD). 2008. Adult Pacific Lamprey passage and behavior study for Wells Hydroelectric Project – FERC No. 2149. Report for Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.

Li, W., P.W. Sorensen, and D.G. Gallaher. 1995. The olfactory system of adult Sea Lamprey (*Petromyzon marinus*) is specially and acutely sensitive to unique bile acids released by conspecific larvae. *Journal of General Physiology* 105: 569-587.

Liedtke, T.L., J.W. Beeman, and L.P. Gee. 2012. A standard operating procedure for the surgical implantation of transmitters in juvenile salmonids: U.S. Geological Survey Open-File Report 2012-1267.

Moore, H.H., and L.P. Schleen. 1980. Changes in spawning runs of Sea Lamprey (*Petromyzon marinus*) in selected streams of Lake Superior after chemical control. *Canadian Journal of Fisheries and Aquatic Sciences* 37: 1851-1860.

Moser, M.L., P.A. Ocker, L.C. Stuehrenberg, and T.C. Bjornn. 2002. Passage efficiency of adult Pacific Lampreys at hydropower dams on the lower Columbia River, U.S.A. *Transactions of the American Fisheries Society* 131: 956-965.

Moser, M.L., M.L. Keefer, C.C. Caudill, and B.J. Burke. 2013. Migratory behavior of adult Pacific Lamprey and evidence for effects of individual temperament on migration rate. Pages 130-149 *in* H. Ueda and K. Tsukamoto, editors. Physiology and ecology of fish migration. CRC Press, Boca Raton, Florida.

Nass, B., C. Sliwinski, K.K. English, L. Porto, and L. Hildebrand. 2002. Assessment of adult lamprey migratory behavior at Wanapum and Priest Rapids Dams using radio-telemetry techniques, 2001-2002. Report for Public Utility District No. 2 of Grant County, Ephrata, Washington.

Nass, B.L., C. Sliwinski, and D. Robichaud. 2005. Assessment of adult Pacific Lamprey migratory behavior at Wells Dam using radio-telemetry techniques, 2004. Report for Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.

Polkinghorne, C.A., J.M. Olson, D.G. Gallaher, and P.W. Sorensen. 2001. Larval Sea Lamprey release two unique bile acids to the water at a rate which is sufficient to produce a detectable pheromonal plume. *Fish Physiology and Biochemistry* 24: 15-30.

Robichaud, D., and C. Kyger. 2014. Adult lamprey passage and enumeration study, Wells Dam, 2013: The effects of head differential on entrance efficiency, and of picketed leads on count window enumeration efficiency. Report for Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.

Robichaud, D., and C. Kyger. 2018. Adult lamprey approach and passage study, Wells Dam, 2016-17. Report for Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.

Robichaud, D., B. Nass, and Douglas PUD. 2009. Adult Pacific Lamprey passage and behavior study (adult lamprey passage study). Second Year Final Report. Report for Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.

Robinson, T.C., P.W. Sorensen, J.M. Bayer, and J.G. Seelye. 2009. Olfactory sensitivity of Pacific Lampreys to lamprey bile acids. *Transactions of the American Fisheries Society* 138: 144-152.

Sang-Seon, Y., A. Szeitz, A. Wildbill, M. Siefkes, and D. Close. 2014. Sulfated bile acids as putative sex pheromone components in Pacific Lamprey. *Transactions of the American Fisheries Society* 143: 1455-1459.

Spice, E.K., D.H. Goodman, S.B. Reid, and M.F. Docker. 2012. Neither philopatric nor panmictic: microsatellite and mtDNA evidence suggests lack of natal homing but limits to dispersal in Pacific Lamprey. *Molecular Ecology* 21:2916-2930.

Stevenson, J.R., P. Westhagen, D.J. Snyder, J.R. Skalski, and A.E. Giorgi. 2005. Evaluation of adult Pacific Lamprey passage at Rocky Reach Dam using radiotelemetry techniques, 2004. Report for Public Utility District No. 1 of Chelan County, Wenatchee, Washington.

Teeter, J. 1980. Pheromone communication in Sea Lampreys (*Petromyzon marinus*): implications for population management. *Canadian Journal of Fisheries and Aquatic Sciences* 37: 2123-2132.

Wright, C., D. Robichaud, B. Le, E. Andersen, and M. Clement. 2023. 2022 Pacific Lamprey Management Plan Comprehensive Annual Report - Priest Rapids Hydroelectric Project (FERC No. 2114). Report for Public Utility District No. 2 of Grant County, Ephrata, WA.

Wynne, F.S. and W.A. Wurts. 2011. Transportation of Warmwater Fish: Equipment and Guidelines. SRAC Publication No. 390. January 2011.

Appendices

Appendix Table A. Biometrics for the Pacific Lamprey acoustic tagged by Douglas PUD in 2022, and released at Daroga State Park (DAR) or in the Rocky Reach Forebay (RRH).

Acoustic Code	*PIT Tag ID*	*Release Date*	*Release Site*	*Weight (g)*	*Girth (cm)*	*Total Length (cm)*	*Tag Burden*
7983	3DD.003D93772B	29 Jul	RRH	252.9	9.50	56.2	0.8%
8012	3DD.003D93772C	29 Jul	RRH	360.0	10.00	62.1	0.6%
8050	3DD.003D93772D	5 Aug	DAR	521.2	12.50	66.7	0.4%
7970	3DD.003D93772E	29 Jul	RRH	322.0	10.50	62.2	0.7%
7999	3DD.003D93772F	5 Aug	DAR	296.1	9.50	56.5	0.7%
7997	3DD.003D937730	29 Jul	RRH	306.8	10.00	58.3	0.7%
7969	3DD.003D937731	5 Aug	DAR	496.1	12.00	67.1	0.4%
8044	3DD.003D937732	5 Aug	DAR	437.3	11.50	63.7	0.5%
8009	3DD.003D937735	5 Aug	DAR	571.8	12.50	72.0	0.4%
7976	3DD.003D937738	5 Aug	DAR	317.5	11.00	60.7	0.7%
7979	3DD.003D937739	29 Jul	RRH	354.9	10.00	61.1	0.6%
8008	3DD.003D93773A	5 Aug	DAR	494.6	12.00	67.7	0.4%
7960	3DD.003D93773C	5 Aug	DAR	453.7	11.00	67.5	0.5%
8031	3DD.003D93773E	5 Aug	DAR	424.7	11.00	65.0	0.5%
7994	3DD.003D937742	29 Jul	RRH	458.7	10.00	67.7	0.5%
7966	3DD.003D937746	29 Jul	RRH	323.8	10.00	57.9	0.6%
7972	3DD.003D937747	29 Jul	RRH	416.7	11.00	62.1	0.5%
7962	3DD.003D937748	29 Jul	RRH	447.6	12.50	62.4	0.5%
7990	3DD.003D937749	29 Jul	RRH	352.6	10.00	58.5	0.6%
7984	3DD.003D93774A	5 Aug	DAR	347.3	10.50	58.0	0.6%
7955	3DD.003D93774B	29 Jul	RRH	503.9	12.00	67.0	0.4%
7982	3DD.003D93774C	29 Jul	RRH	349.1	10.00	60.4	0.6%
8010	3DD.003D93774D	29 Jul	RRH	310.8	9.50	60.4	0.7%
8005	3DD.003D93774F	29 Jul	RRH	275.2	9.50	53.0	0.8%
8011	3DD.003D937750	29 Jul	RRH	512.6	12.00	69.3	0.4%
8000	3DD.003D937751	5 Aug	DAR	420.3	11.00	64.9	0.5%
7978	3DD.003D937752	29 Jul	RRH	321.5	10.50	57.7	0.7%
7995	3DD.003D937755	29 Jul	RRH	446.3	11.00	65.3	0.5%
8016	3DD.003D937757	5 Aug	DAR	348.3	10.50	59.1	0.6%
8004	3DD.003D937758	29 Jul	RRH	368.5	10.00	65.6	0.6%
7974	3DD.003D937759	29 Jul	RRH	437.3	11.50	63.4	0.5%
7971	3DD.003D93775A	29 Jul	RRH	358.1	11.00	61.0	0.6%
8045	3DD.003D93775B	5 Aug	DAR	452.1	11.00	65.7	0.5%
8013	3DD.003D93775C	29 Jul	RRH	441.7	11.50	66.1	0.5%
7967	3DD.003D93775D	29 Jul	RRH	325.6	10.00	59.2	0.6%
7993	3DD.003D93775E	5 Aug	DAR	354.8	10.00	60.7	0.6%
7957	3DD.003D93775F	29 Jul	RRH	407.7	11.00	62.8	0.5%
7965	3DD.003D937760	29 Jul	RRH	222.0	8.50	52.5	0.9%
8002	3DD.003D937761	29 Jul	RRH	260.2	10.50	55.0	0.8%
8003	3DD.003D937762	29 Jul	RRH	415.0	11.00	62.2	0.5%
7992	3DD.003D937764	5 Aug	DAR	400.8	10.50	63.2	0.5%
7987	3DD.003D937765	29 Jul	RRH	460.3	11.50	65.4	0.5%
7964	3DD.003D937767	29 Jul	RRH	364.3	10.00	59.9	0.6%
7981	3DD.003D93776A	29 Jul	RRH	337.9	10.50	56.9	0.6%
7989	3DD.003D93776B	29 Jul	RRH	533.2	12.50	69.1	0.4%

…continued on next page

Acoustic Code	*PIT Tag ID*	*Release Date*	*Release Site*	*Weight (g)*	*Girth (cm)*	*Total Length (cm)*	*Tag Burden*
7986	3DD.003D93776C	29 Jul	RRH	545.5	12.50	68.3	0.4%
8015	3DD.003D93776D	5 Aug	DAR	419.8	11.00	65.7	0.5%
8007	3DD.003D93776F	5 Aug	DAR	330.8	10.00	59.4	0.6%
7959	3DD.003D937770	29 Jul	RRH	437.5	11.50	62.9	0.5%
7996	3DD.003D937771	29 Jul	RRH	395.9	11.00	64.7	0.5%
7956	3DD.003D937772	29 Jul	RRH	294.2	9.50	56.5	0.7%
7963	3DD.003D937774	29 Jul	RRH	332.2	10.00	55.5	0.6%
8006	3DD.003D937775	29 Jul	RRH	420.4	11.00	64.4	0.5%
7958	3DD.003D937776	29 Jul	RRH	310.2	10.00	56.2	0.7%
7954	3DD.003D937777	29 Jul	RRH	442.9	12.50	63.9	0.5%
7968	3DD.003D937778	5 Aug	DAR	476.9	12.00	68.5	0.4%
7980	3DD.003D93777C	29 Jul	RRH	384.0	10.50	60.6	0.5%
7985	3DD.003D93777E	5 Aug	DAR	544.7	12.00	70.7	0.4%
7991	3DD.003D93777F	29 Jul	RRH	317.1	10.00	58.0	0.7%
7961	3DD.003D937782	5 Aug	DAR	368.1	10.00	62.4	0.6%
7973	3DD.003D937783	29 Jul	RRH	407.4	11.00	61.7	0.5%
7998	3DD.003D937785	29 Jul	RRH	303.0	10.00	56.8	0.7%
7988	3DD.003D937788	29 Jul	RRH	352.8	10.00	58.4	0.6%
8014	3DD.003D93778A	29 Jul	RRH	408.2	11.00	64.0	0.5%
7975	3DD.003D93778D	5 Aug	DAR	220.1	9.50	57.0	1.0%
8052	3DD.003E215C1A	5 Aug	RRH	397.6	11.00	61.8	0.5%
8021	3DD.003E215C1B	5 Aug	RRH	438.5	12.00	62.8	0.5%
8039	3DD.003E215C1C	5 Aug	DAR	432.5	11.00	66.5	0.5%
8057	3DD.003E215C1D	5 Aug	RRH	441.2	11.25	66.9	0.5%
8075	3DD.003E215C1E	12 Aug	RRH	481.0	12.00	66.7	0.4%
8096	3DD.003E215C1F	5 Aug	RRH	451.9	11.75	63.2	0.5%
8022	3DD.003E215C20	5 Aug	RRH	303.0	9.75	59.5	0.7%
8086	3DD.003E215C21	12 Aug	DAR	525.5	12.75	67.1	0.4%
8059	3DD.003E215C22	5 Aug	RRH	511.5	12.25	68.1	0.4%
8087	3DD.003E215C23	12 Aug	DAR	594.2	12.75	73.5	0.4%
8122	3DD.003E215C24	12 Aug	RRH	413.9	10.75	64.4	0.5%
8063	3DD.003E215C25	5 Aug	RRH	381.4	10.50	63.9	0.6%
8077	3DD.003E215C26	12 Aug	RRH	484.9	11.50	70.5	0.4%
8017	3DD.003E215C27	5 Aug	DAR	333.2	10.00	60.4	0.6%
8080	3DD.003E215C28	5 Aug	RRH	452.3	12.00	66.1	0.5%
8051	3DD.003E215C29	5 Aug	RRH	439.2	11.00	65.6	0.5%
8100	3DD.003E215C2A	12 Aug	RRH	395.3	10.50	63.7	0.5%
8054	3DD.003E215C2B	5 Aug	RRH	551.0	12.50	68.0	0.4%
8103	3DD.003E215C2C	12 Aug	DAR	369.3	11.00	60.6	0.6%
8084	3DD.003E215C2D	12 Aug	RRH	441.1	12.00	62.3	0.5%
8068	3DD.003E215C2E	5 Aug	RRH	468.7	12.00	65.9	0.4%
8117	3DD.003E215C2F	12 Aug	DAR	533.6	13.00	67.5	0.4%
8120	3DD.003E215C30	5 Aug	RRH	359.9	10.50	58.9	0.6%
8062	3DD.003E215C31	5 Aug	RRH	364.5	11.00	62.2	0.6%
8040	3DD.003E215C32	5 Aug	RRH	336.5	10.00	59.0	0.6%
8105	3DD.003E215C33	12 Aug	RRH	373.0	10.75	62.2	0.6%
8115	3DD.003E215C34	12 Aug	DAR	431.4	11.00	64.6	0.5%
8056	3DD.003E215C35	5 Aug	RRH	432.5	11.25	63.9	0.5%

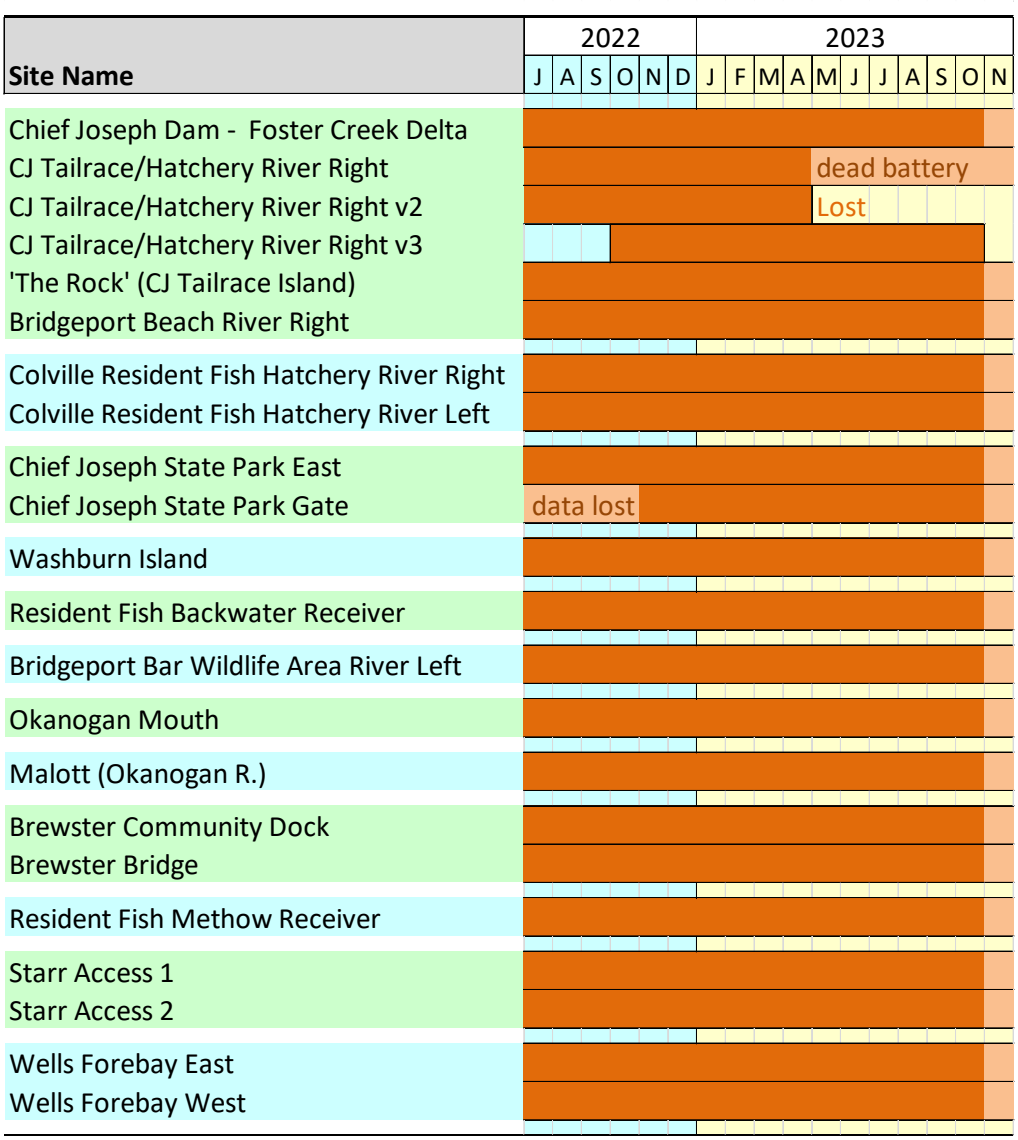
…continued on next page

Acoustic Code	PIT Tag ID	Release Date	Release Site	Weight (g)	Girth (cm)	Total Length (cm)	Tag Burden
8072	3DD.003E215C36	5 Aug	RRH	518.1	12.00	69.0	0.4%
7977	3DD.003E215C37	5 Aug	DAR	360.3	11.00	60.0	0.6%
8033	3DD.003E215C38	5 Aug	RRH	443.5	11.00	65.6	0.5%
8083	3DD.003E215C39	12 Aug	RRH	457.6	11.50	68.6	0.5%
8109	3DD.003E215C3A	12 Aug	DAR	386.1	10.75	64.6	0.5%
8119	3DD.003E215C3B	12 Aug	RRH	412.9	11.00	61.7	0.5%
8094	3DD.003E215C3C	12 Aug	RRH	427.4	11.00	68.1	0.5%
8029	3DD.003E215C3D	5 Aug	RRH	333.1	10.00	59.3	0.6%
8019	3DD.003E215C3E	5 Aug	RRH	489.7	12.00	68.0	0.4%
8048	3DD.003E215C40	5 Aug	RRH	468.7	11.50	69.5	0.4%
8073	3DD.003E215C41	5 Aug	RRH	442.3	11.25	64.0	0.5%
8053	3DD.003E215C42	5 Aug	RRH	430.9	11.00	65.0	0.5%
8035	3DD.003E215C43	5 Aug	RRH	404.7	10.50	65.8	0.5%
8113	3DD.003E215C44	12 Aug	DAR	456.6	11.75	65.9	0.5%
8026	3DD.003E215C45	5 Aug	RRH	389.4	10.00	64.2	0.5%
8106	3DD.003E215C46	12 Aug	DAR	493.9	12.00	64.2	0.4%
8027	3DD.003E215C47	5 Aug	RRH	479.7	12.00	67.6	0.4%
8110	3DD.003E215C48	12 Aug	RRH	436.4	11.50	65.1	0.5%
8081	3DD.003E215C49	5 Aug	RRH	440.2	12.00	62.1	0.5%
8065	3DD.003E215C4A	5 Aug	RRH	495.5	11.50	69.7	0.4%
8041	3DD.003E215C4B	5 Aug	RRH	263.0	9.00	55.7	0.8%
8047	3DD.003E215C4C	5 Aug	RRH	342.7	10.00	57.8	0.6%
8023	3DD.003E215C4D	5 Aug	RRH	457.3	11.50	65.0	0.5%
8030	3DD.003E215C4E	5 Aug	RRH	412.5	10.50	65.4	0.5%
8036	3DD.003E215C4F	5 Aug	RRH	538.0	12.50	66.1	0.4%
8066	3DD.003E215C50	5 Aug	RRH	357.3	10.50	65.5	0.6%
8055	3DD.003E215C51	5 Aug	RRH	409.9	11.00	62.9	0.5%
8116	3DD.003E215C52	12 Aug	RRH	480.5	12.00	67.9	0.4%
8018	3DD.003E215C53	5 Aug	RRH	501.1	12.00	68.9	0.4%
8102	3DD.003E215C54	12 Aug	DAR	464.7	11.75	67.0	0.5%
8024	3DD.003E215C55	5 Aug	RRH	443.4	12.00	62.0	0.5%
8091	3DD.003E215C56	12 Aug	DAR	570.0	13.00	70.6	0.4%
8043	3DD.003E215C57	5 Aug	RRH	305.7	10.00	62.3	0.7%
8060	3DD.003E215C58	5 Aug	RRH	358.3	10.50	60.8	0.6%
8121	3DD.003E215C59	12 Aug	DAR	465.9	11.50	68.9	0.5%
8074	3DD.003E215C5A	12 Aug	DAR	431.6	11.00	64.3	0.5%
8058	3DD.003E215C5B	5 Aug	RRH	306.2	10.00	57.2	0.7%
8032	3DD.003E215C5C	5 Aug	RRH	528.6	12.00	67.5	0.4%
8042	3DD.003E215C5D	5 Aug	RRH	479.0	12.00	67.0	0.4%
8089	3DD.003E215C5E	5 Aug	RRH	541.4	12.00	70.2	0.4%
8097	3DD.003E215C5F	5 Aug	RRH	483.7	12.00	67.5	0.4%
8064	3DD.003E215C60	5 Aug	RRH	517.2	12.25	68.0	0.4%
8123	3DD.003E215C61	12 Aug	DAR	334.6	10.25	61.1	0.6%
8020	3DD.003E215C62	5 Aug	RRH	410.1	11.00	63.6	0.5%
8069	3DD.003E215C63	5 Aug	RRH	480.2	11.00	66.4	0.4%
8061	3DD.003E215C64	5 Aug	RRH	379.4	11.00	62.4	0.6%
8067	3DD.003E215C65	5 Aug	RRH	419.0	11.00	63.3	0.5%
8001	3DD.003E215C66	5 Aug	DAR	426.5	11.00	66.3	0.5%

…continued on next page

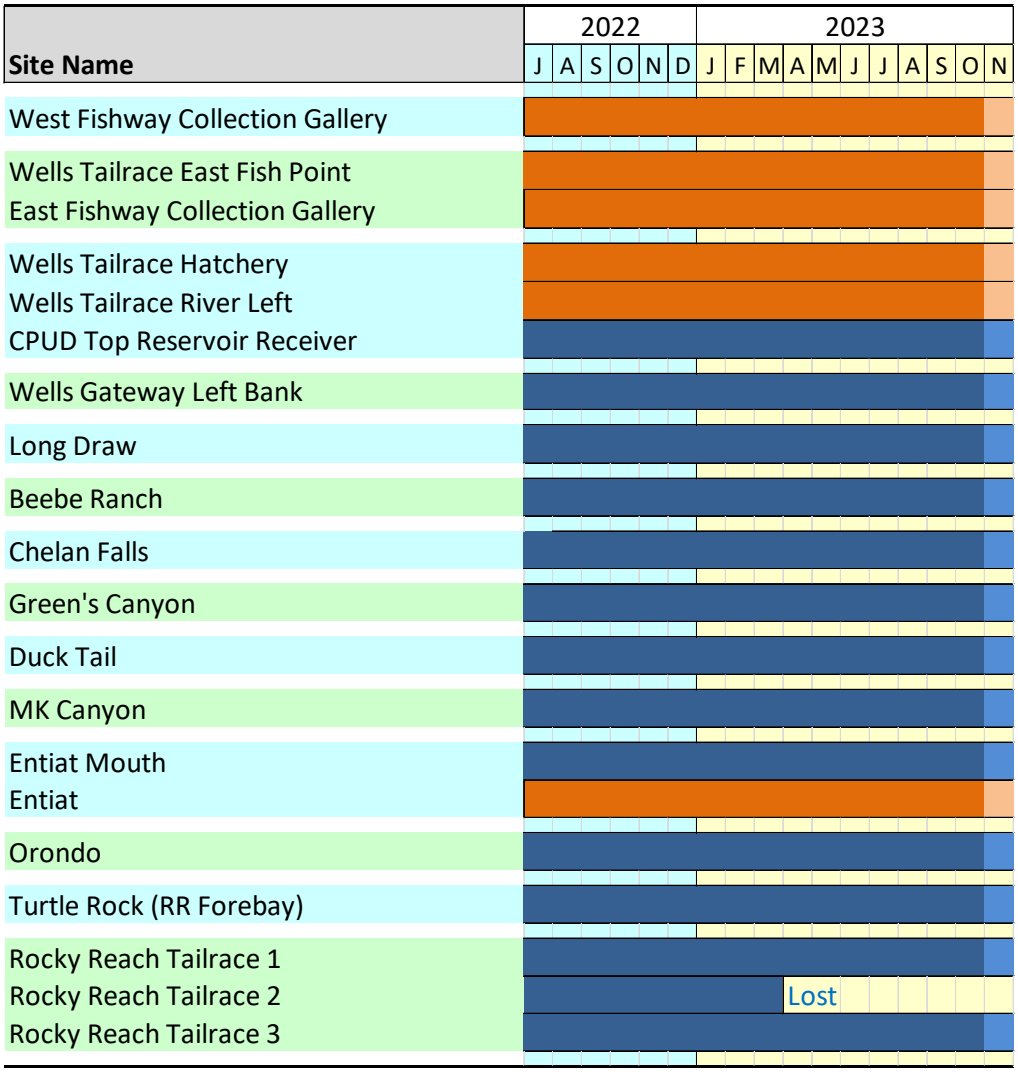
Acoustic Code	*PIT Tag ID*	*Release Date*	*Release Site*	*Weight (g)*	*Girth (cm)*	*Total Length (cm)*	*Tag Burden*
8046	3DD.003E215C67	5 Aug	RRH	424.9	11.00	63.1	0.5%
8076	3DD.003E215C68	12 Aug	DAR	460.0	11.75	64.4	0.5%
8025	3DD.003E215C69	5 Aug	RRH	441.7	11.50	66.3	0.5%
8108	3DD.003E215C6A	12 Aug	RRH	481.1	12.00	66.4	0.4%
8049	3DD.003E215C6B	5 Aug	RRH	500.3	12.00	70.6	0.4%
8037	3DD.003E215C6C	5 Aug	RRH	413.1	11.00	64.8	0.5%
8104	3DD.003E215C6D	5 Aug	RRH	465.7	11.50	65.4	0.5%
8111	3DD.003E215C6E	12 Aug	DAR	408.0	10.50	66.5	0.5%
8038	3DD.003E215C6F	5 Aug	RRH	450.2	11.00	67.0	0.5%
8088	3DD.003E215C70	5 Aug	RRH	432.5	11.00	67.4	0.5%
8095	3DD.003E215C71	12 Aug	DAR	343.1	10.25	61.5	0.6%
8078	3DD.003E215C72	12 Aug	RRH	462.7	11.50	66.4	0.5%
8118	3DD.003E215C73	12 Aug	RRH	374.1	10.50	62.8	0.6%
8071	3DD.003E215C74	5 Aug	RRH	371.2	10.50	60.4	0.6%
8082	3DD.003E215C75	12 Aug	DAR	453.2	11.50	67.6	0.5%
8070	3DD.003E215C76	5 Aug	RRH	414.9	11.00	64.3	0.5%
8114	3DD.003E215C77	12 Aug	RRH	363.5	10.50	62.3	0.6%
8090	3DD.003E215C78	12 Aug	DAR	504.5	12.00	68.5	0.4%
8028	3DD.003E215C79	5 Aug	RRH	392.3	11.00	62.7	0.5%
8092	3DD.003E215C7A	12 Aug	DAR	397.8	10.50	65.6	0.5%
8079	3DD.003E215C7B	12 Aug	RRH	281.1	9.50	56.1	0.7%
8034	3DD.003E215C7C	5 Aug	RRH	467.4	12.00	66.5	0.4%
8112	3DD.003E215C7D	5 Aug	RRH	500.3	12.75	64.3	0.4%
8101	3DD.003E215E75	12 Aug	DAR	395.9	11.00	63.0	0.5%
8099	3DD.003E215FA4	12 Aug	DAR	373.5	10.75	62.4	0.6%
8085	3DD.003E215FA6	12 Aug	DAR	304.4	10.00	61.3	0.7%
8098	3DD.003E215FD0	12 Aug	DAR	300.3	9.75	58.0	0.7%
8107	3DD.003E215FD1	12 Aug	DAR	455.9	12.00	67.0	0.5%
8093	3DD.003E216000	12 Aug	DAR	373.1	10.50	62.3	0.6%

Appendix B. **Receiver deployments over the study period, starting upstream and moving down river. Row spacing is used to show where receivers were deployed in pairs/clusters. Douglas PUD receiver deployment bars are orange, and Chelan PUD deployments are blue. Paler parts of deployment bars show months for which the receiver was deployed, but data were not included.**

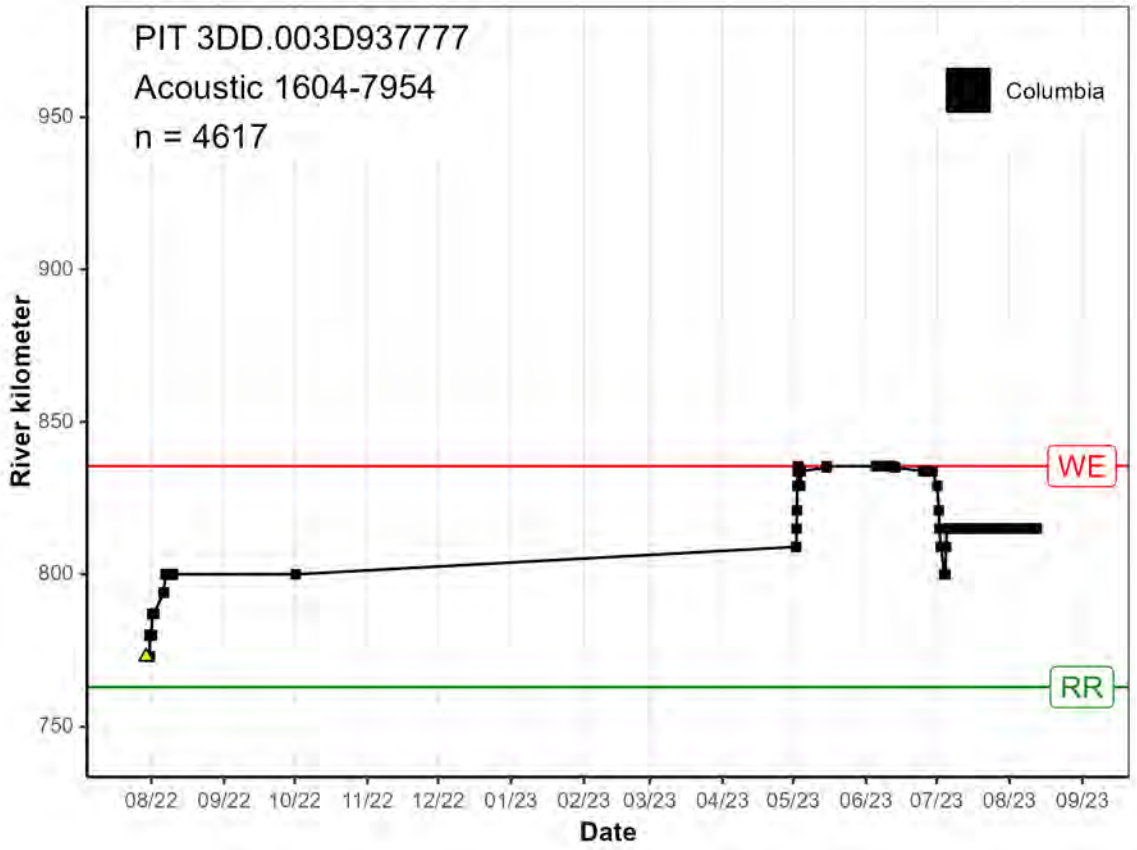


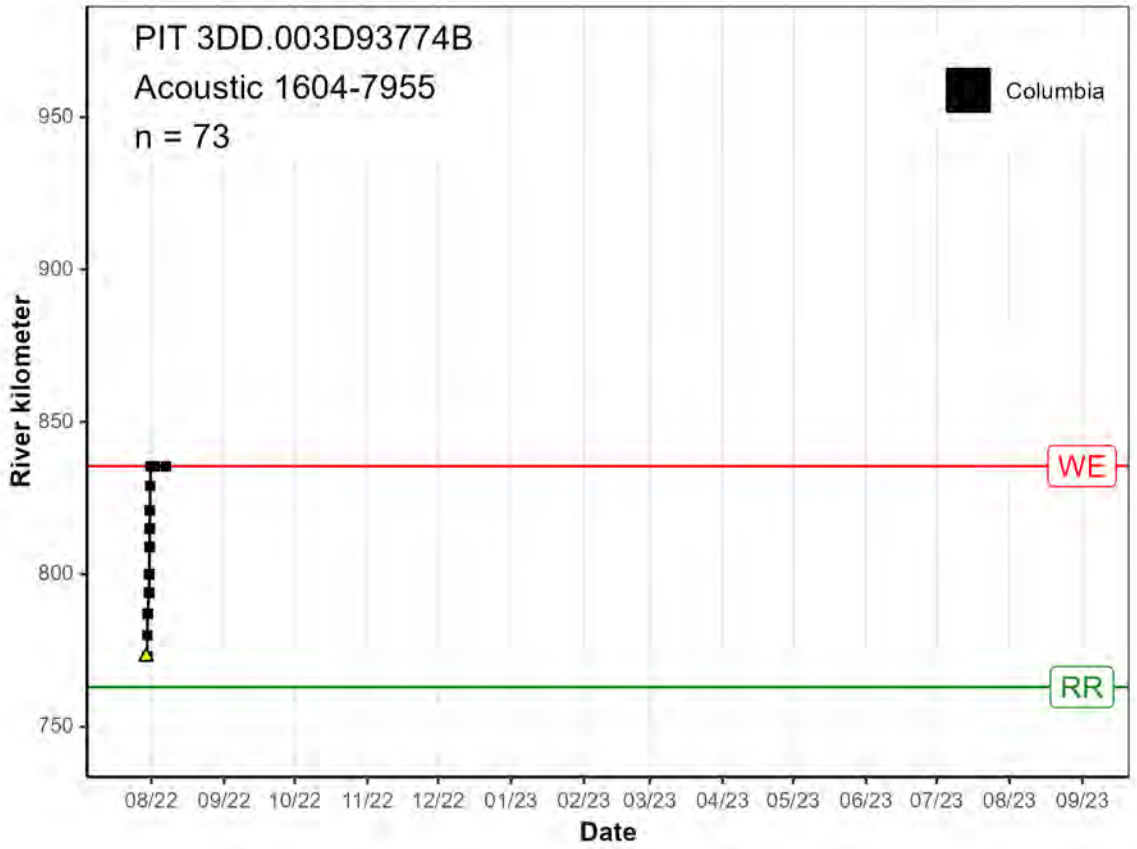
…continued on next page

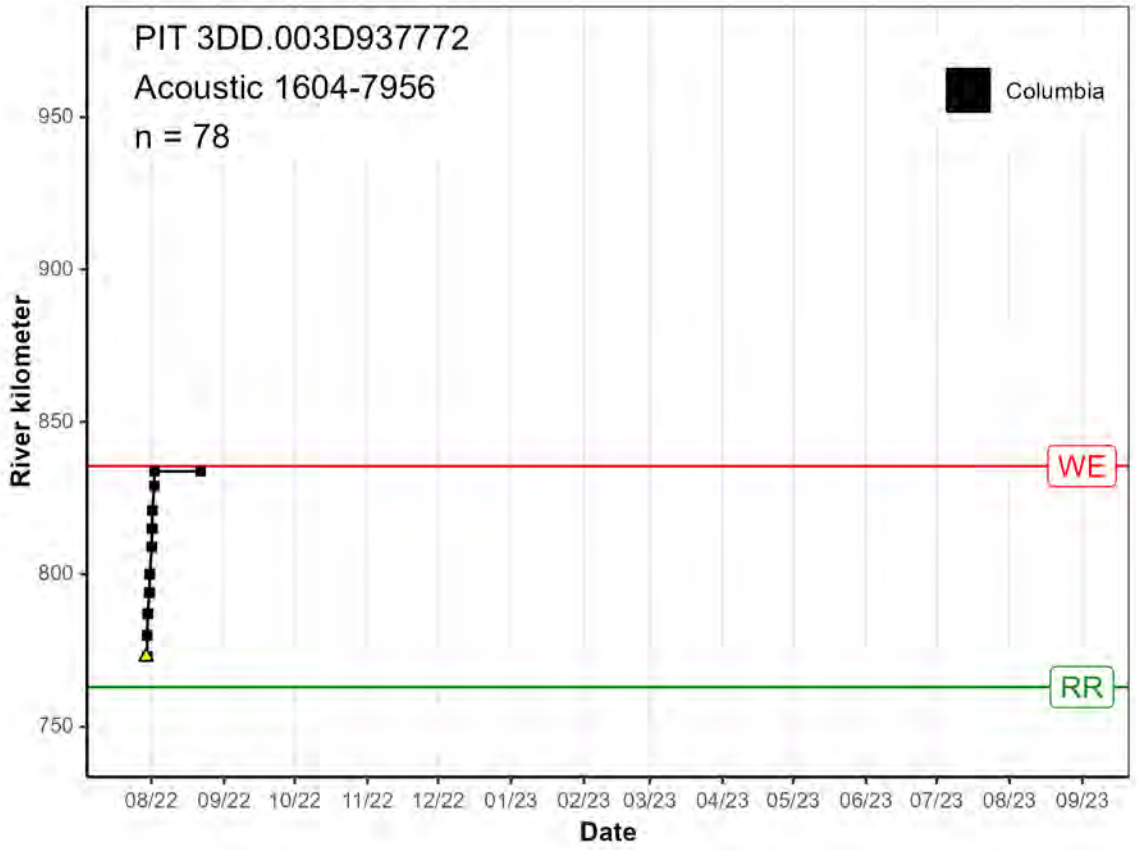
Appendix B continued.

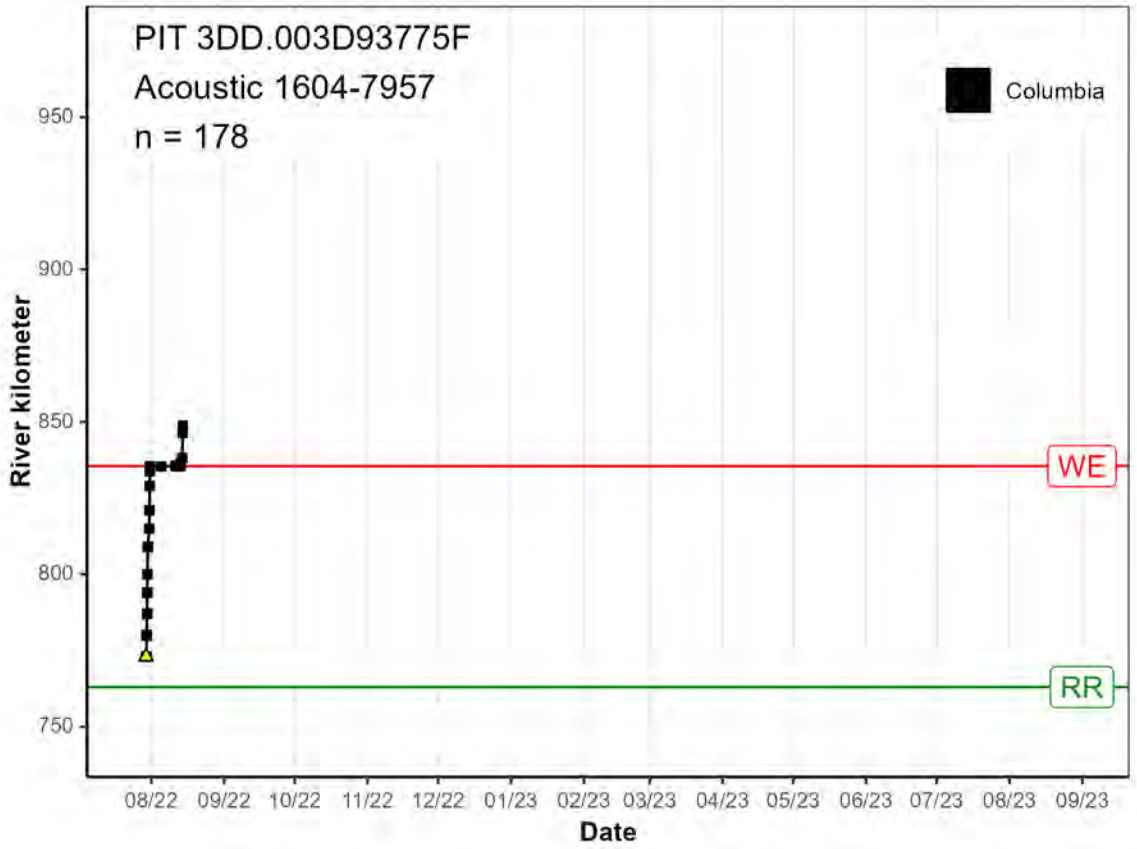


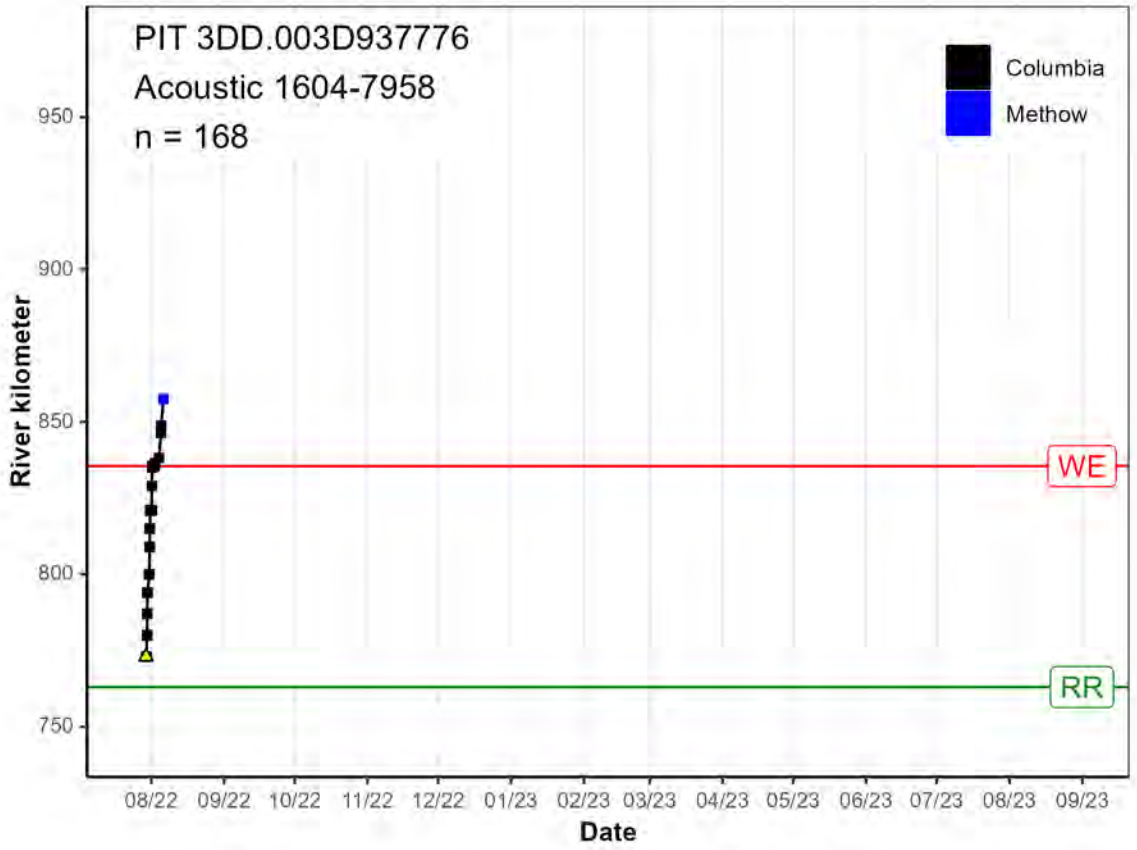
Appendix C. **Detection history plots for all acoustic tagged Pacific Lamprey that were detected in the Rocky Reach Reservoir, 2022-2023. The vertical axis shows river kilometers. "n" is the total number of detections. Tributary detections are colored other than black (see key).**

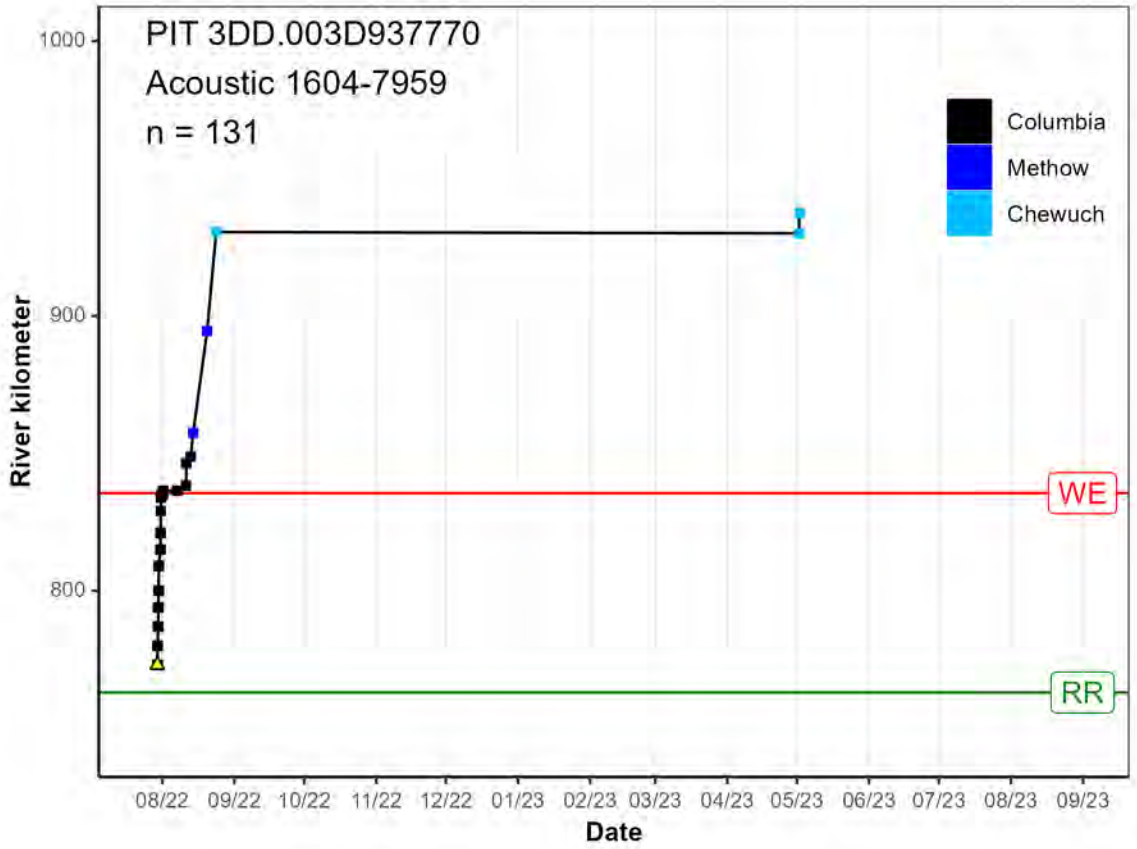

PIT 3DD.003D937777
Acoustic 1604-7954
n = 4617
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

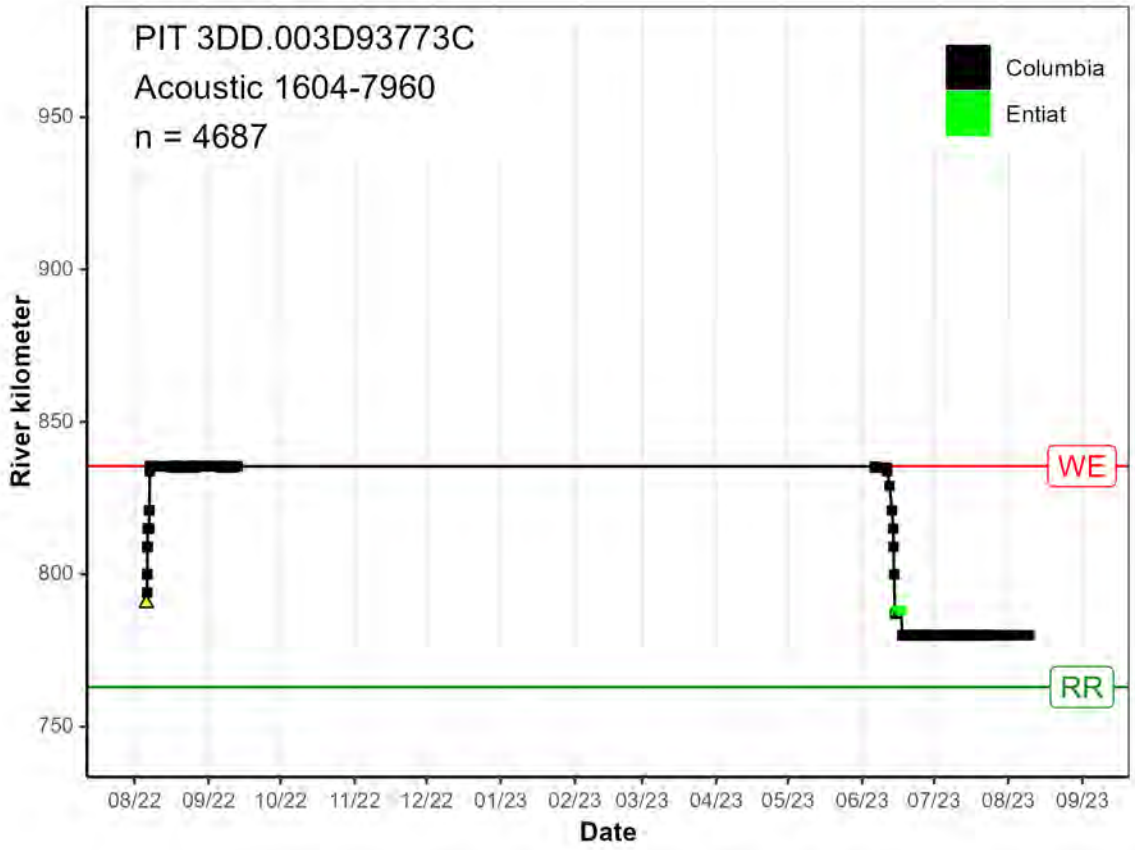

PIT 3DD.003D93774B
Acoustic 1604-7955
n = 73
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

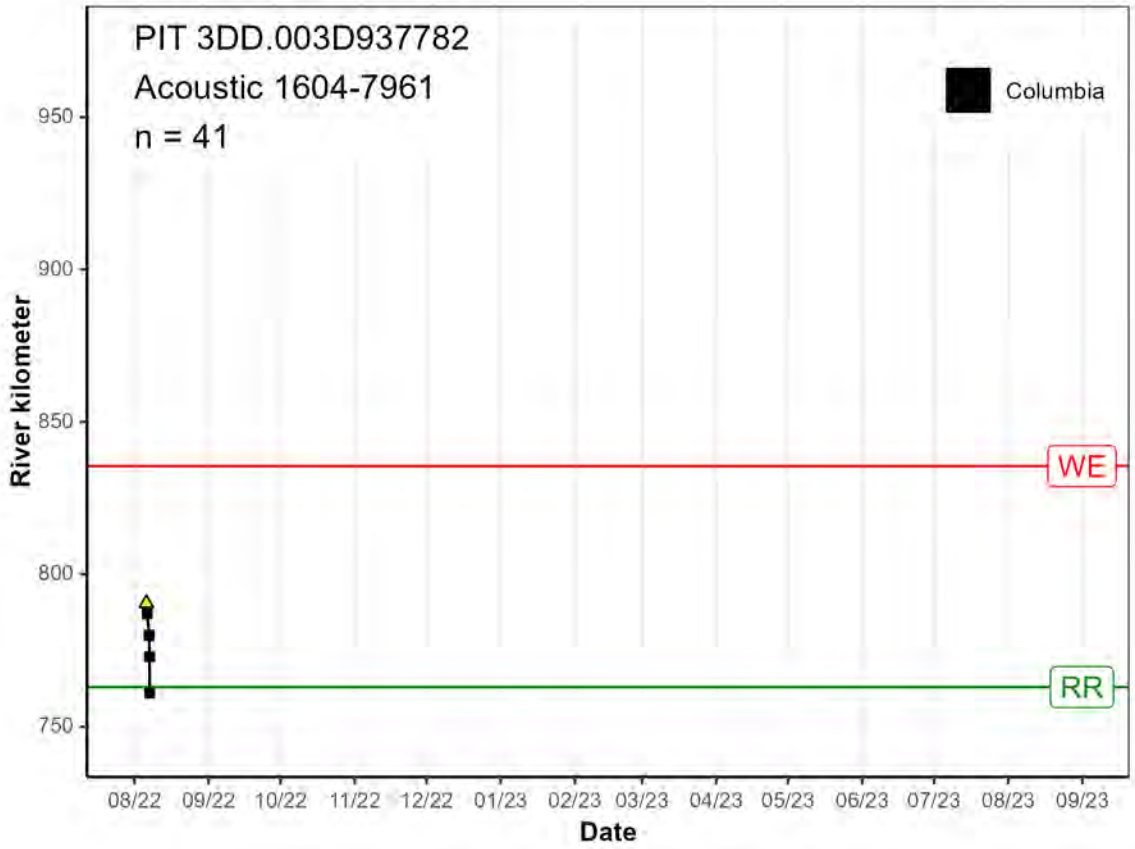

PIT 3DD.003D937772
Acoustic 1604-7956
n = 78
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

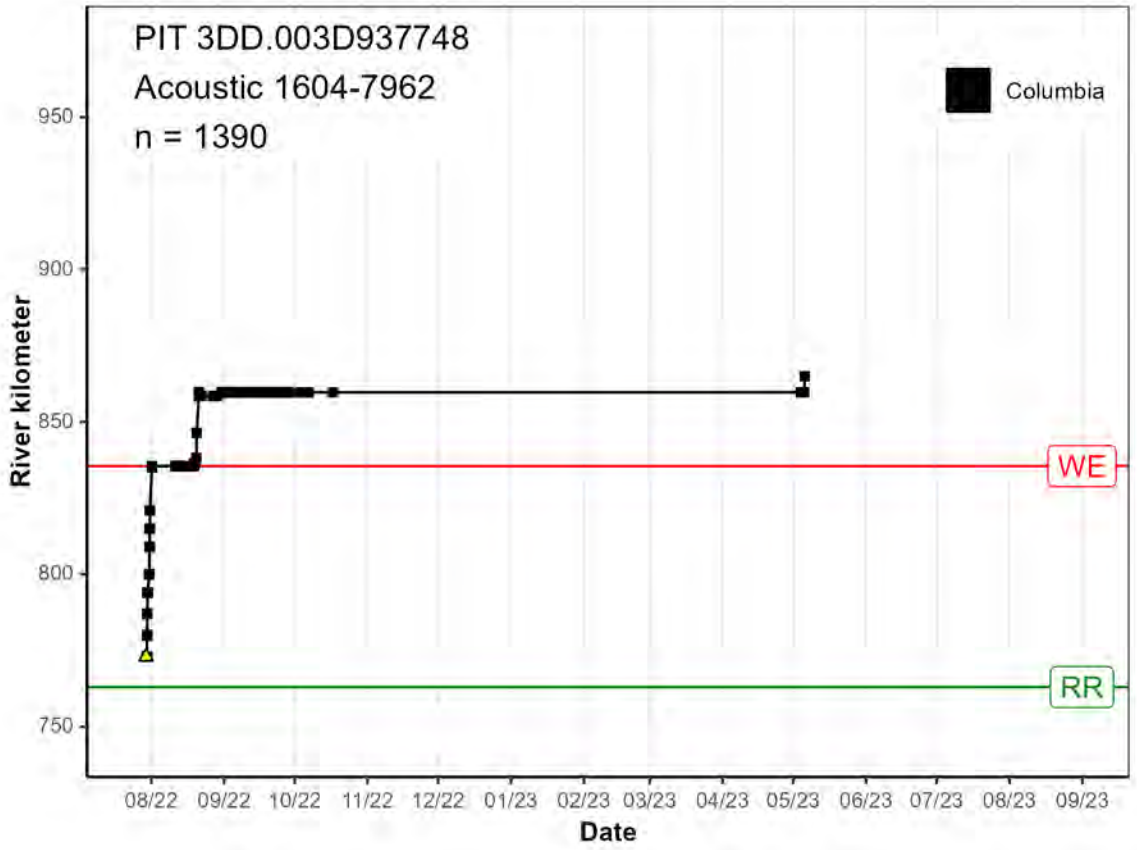

PIT 3DD.003D93775F
Acoustic 1604-7957
n = 178
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

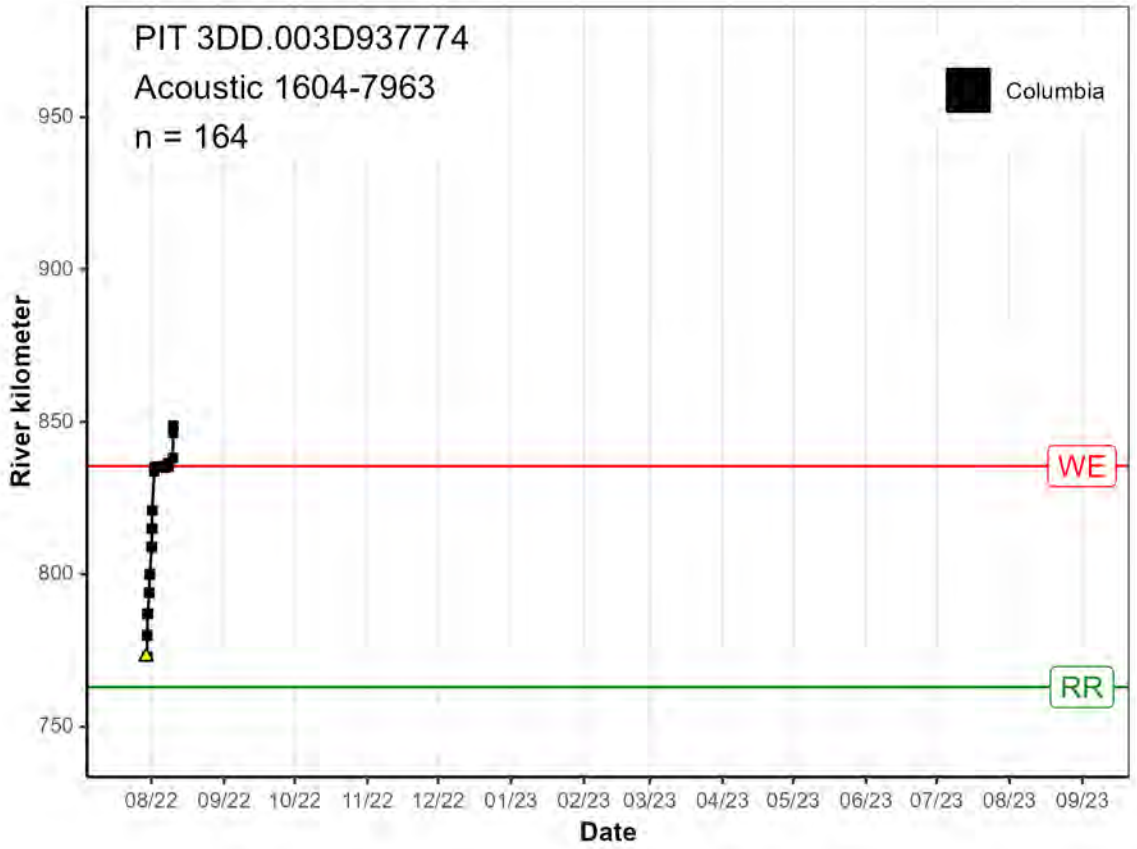

PIT 3DD.003D937776
Acoustic 1604-7958
n = 168
Columbia
Methow
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

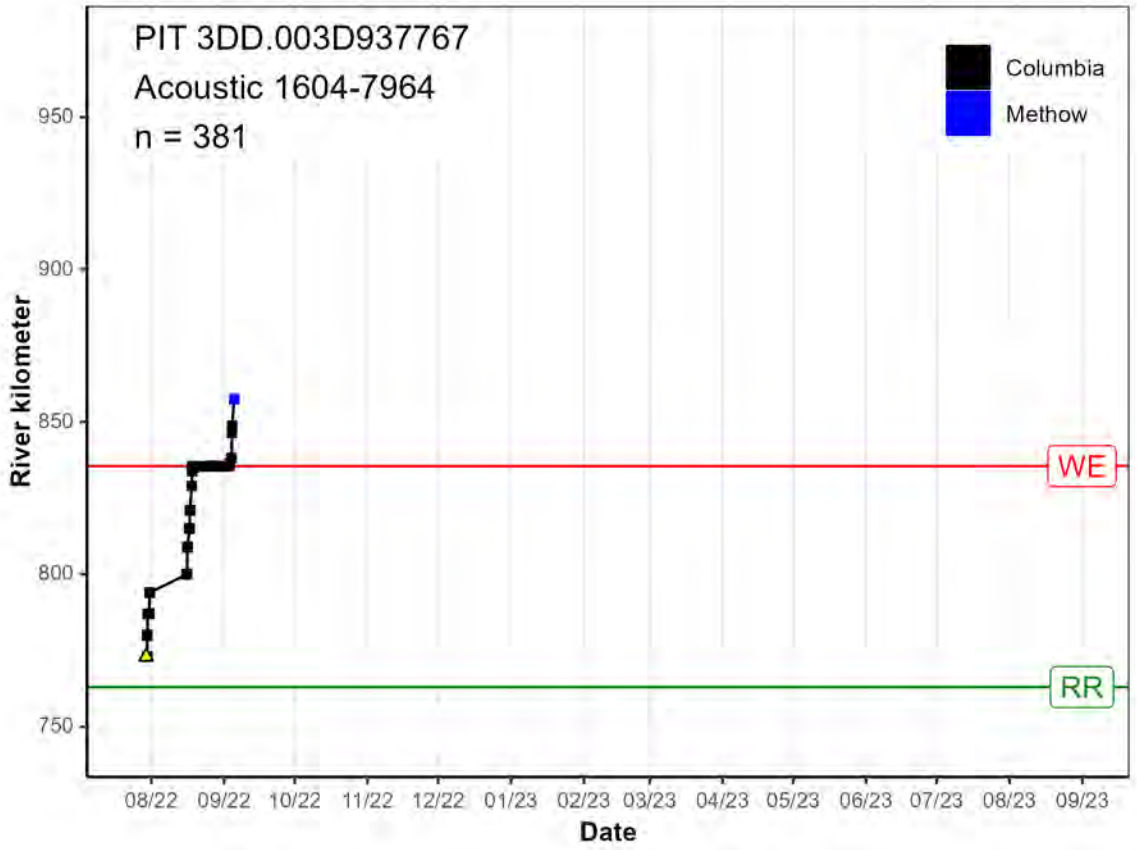

PIT 3DD.003D937770
Acoustic 1604-7959
n = 131
Columbia
Methow
Chewuch
River kilometer
1000
900
800
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

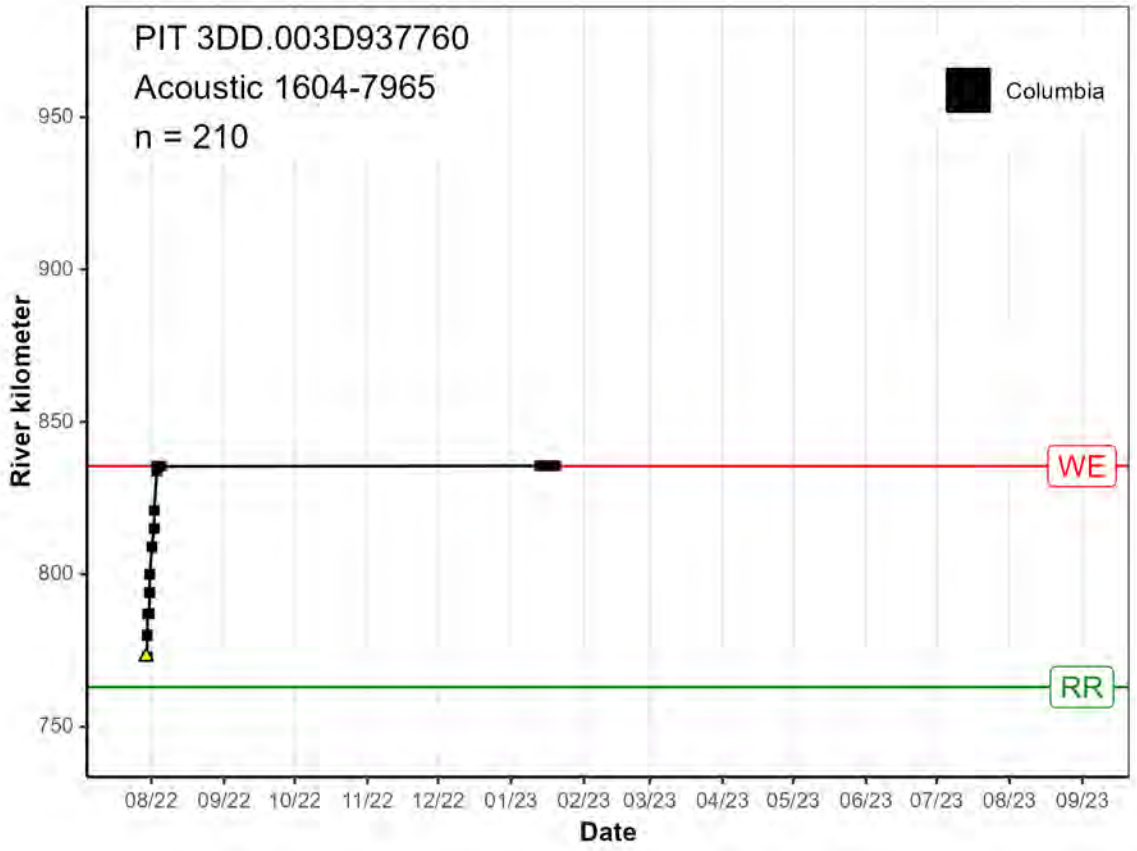

PIT 3DD.003D93773C
Acoustic 1604-7960
n = 4687
Columbia
Entiat
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

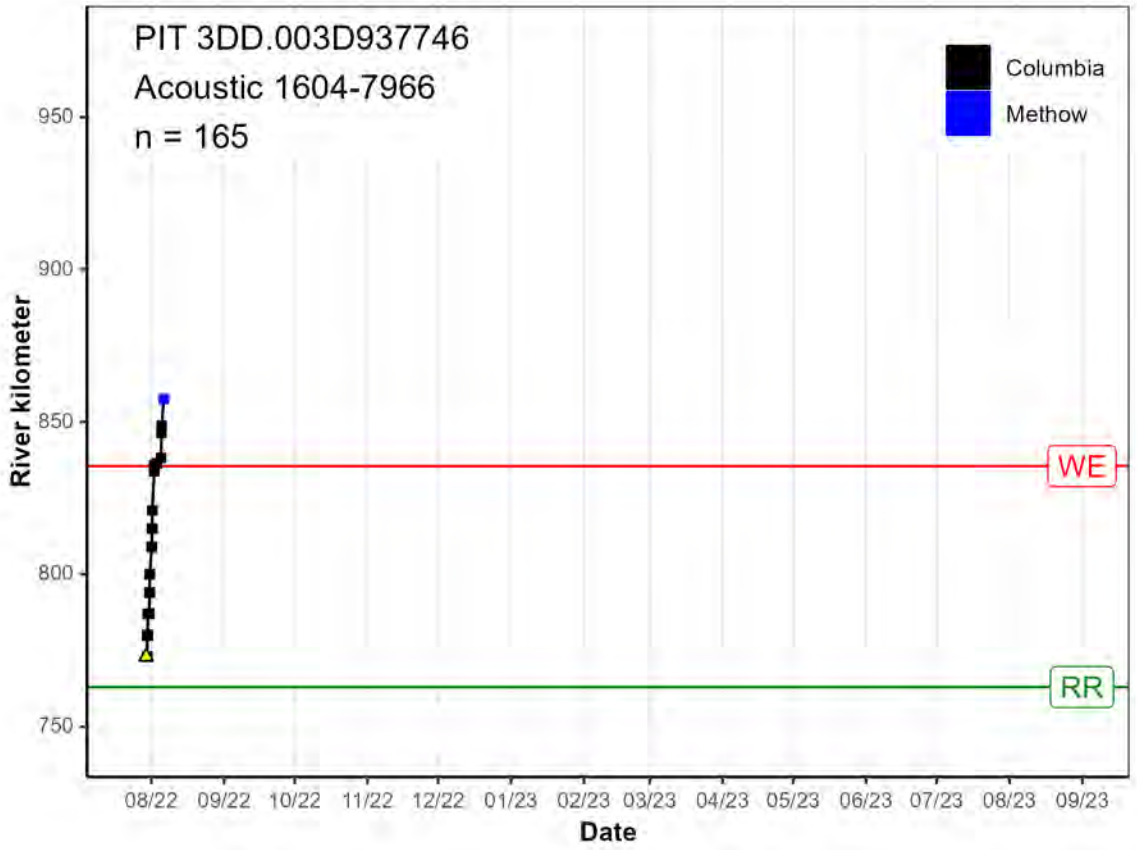

PIT 3DD.003D937782
Acoustic 1604-7961
n = 41
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

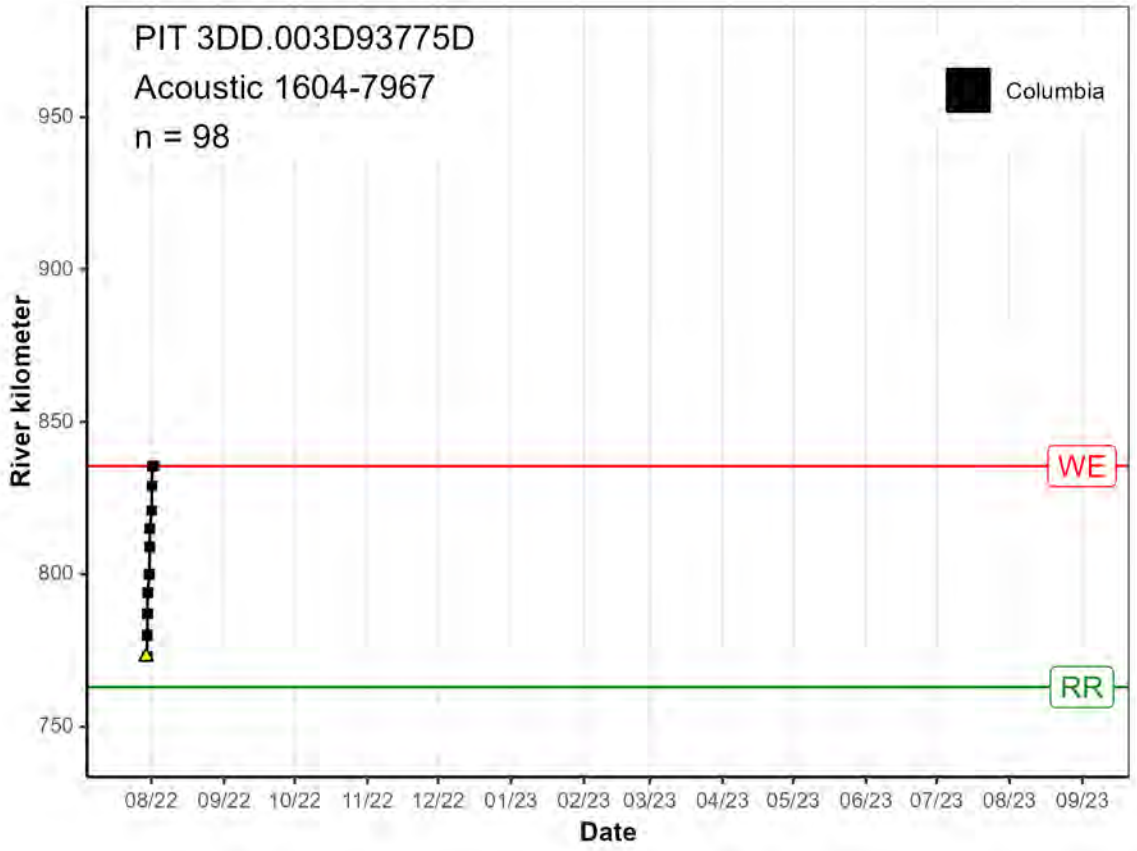

PIT 3DD.003D937748
Acoustic 1604-7962
n = 1390
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

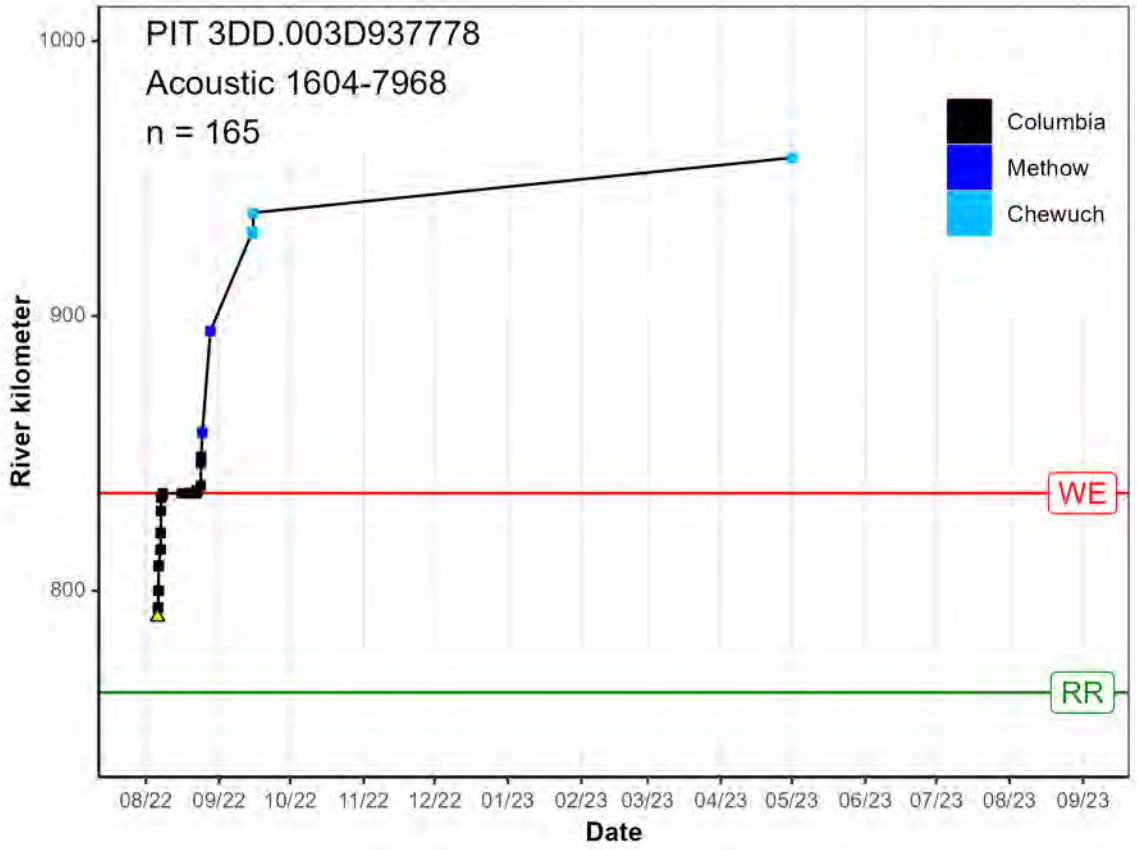

PIT 3DD.003D937774
Acoustic 1604-7963
n = 164
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

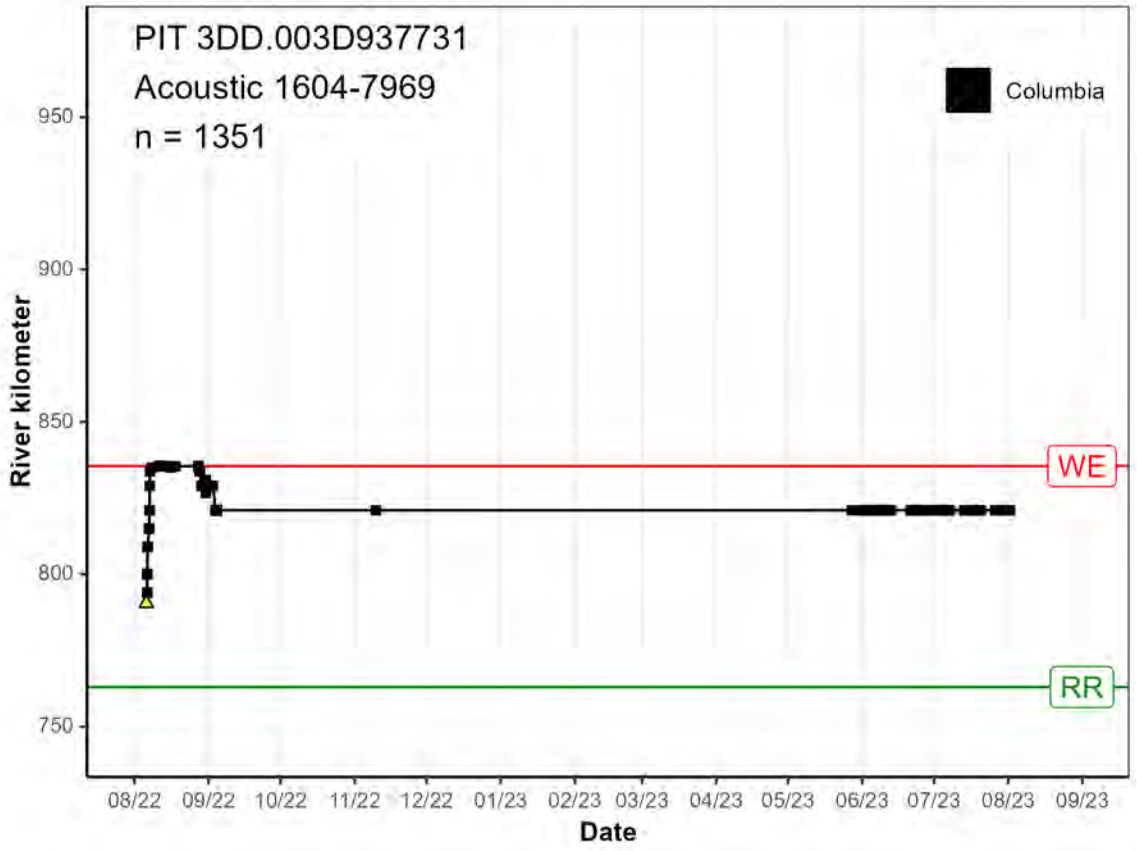

PIT 3DD.003D937767
Acoustic 1604-7964
n = 381
Columbia
Methow
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

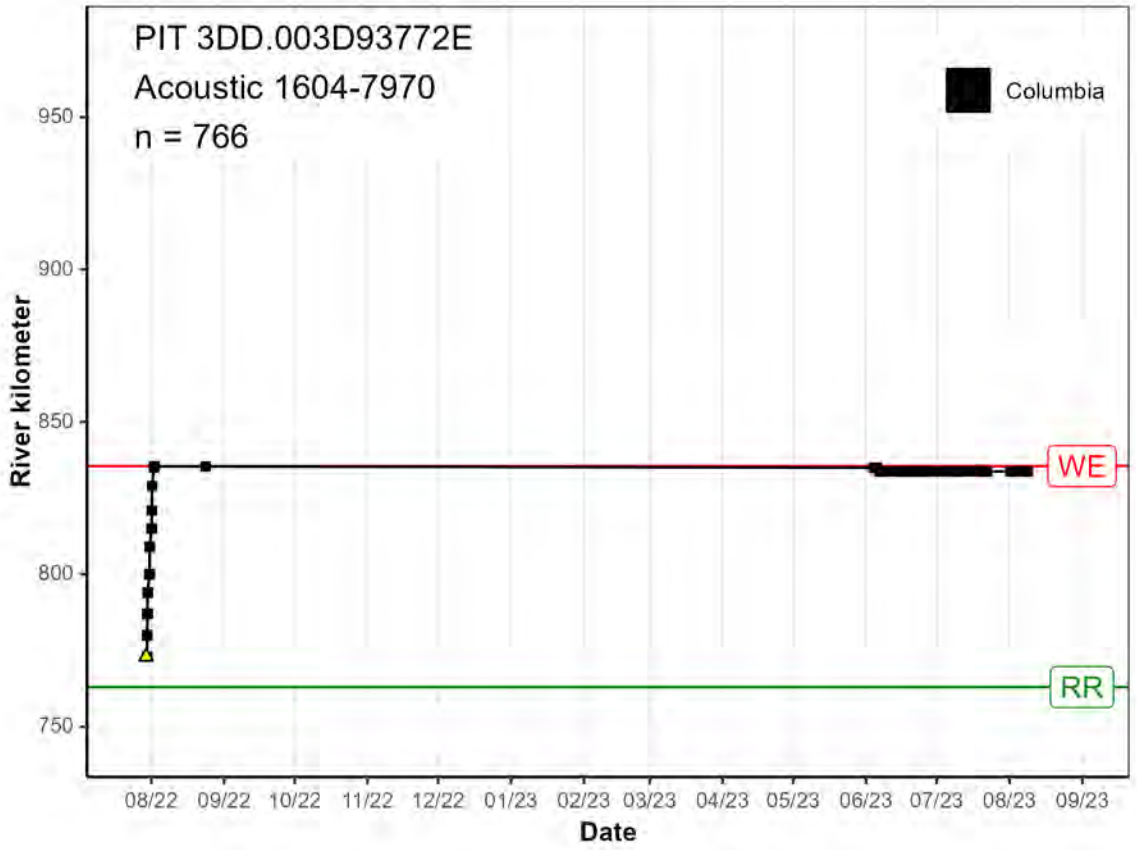

PIT 3DD.003D937760
Acoustic 1604-7965
n = 210
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

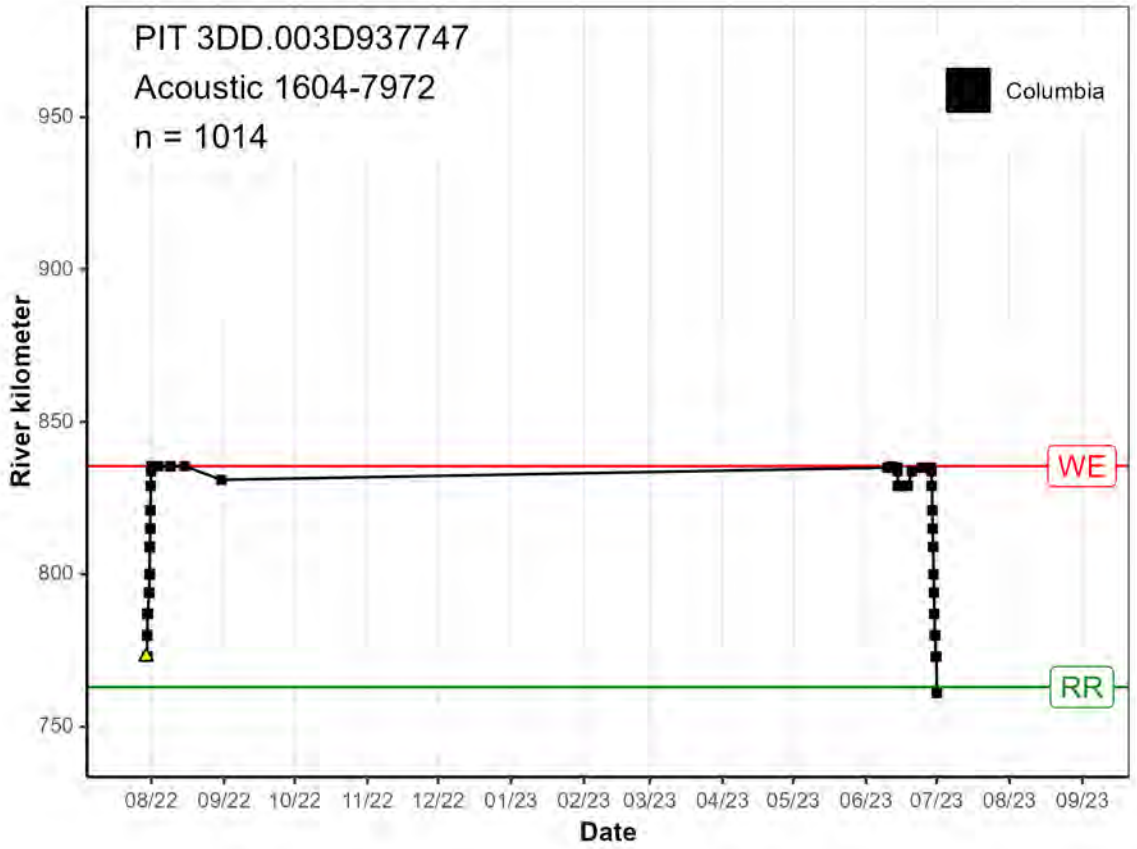

PIT 3DD.003D937746
Acoustic 1604-7966
n = 165
Columbia
Methow
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

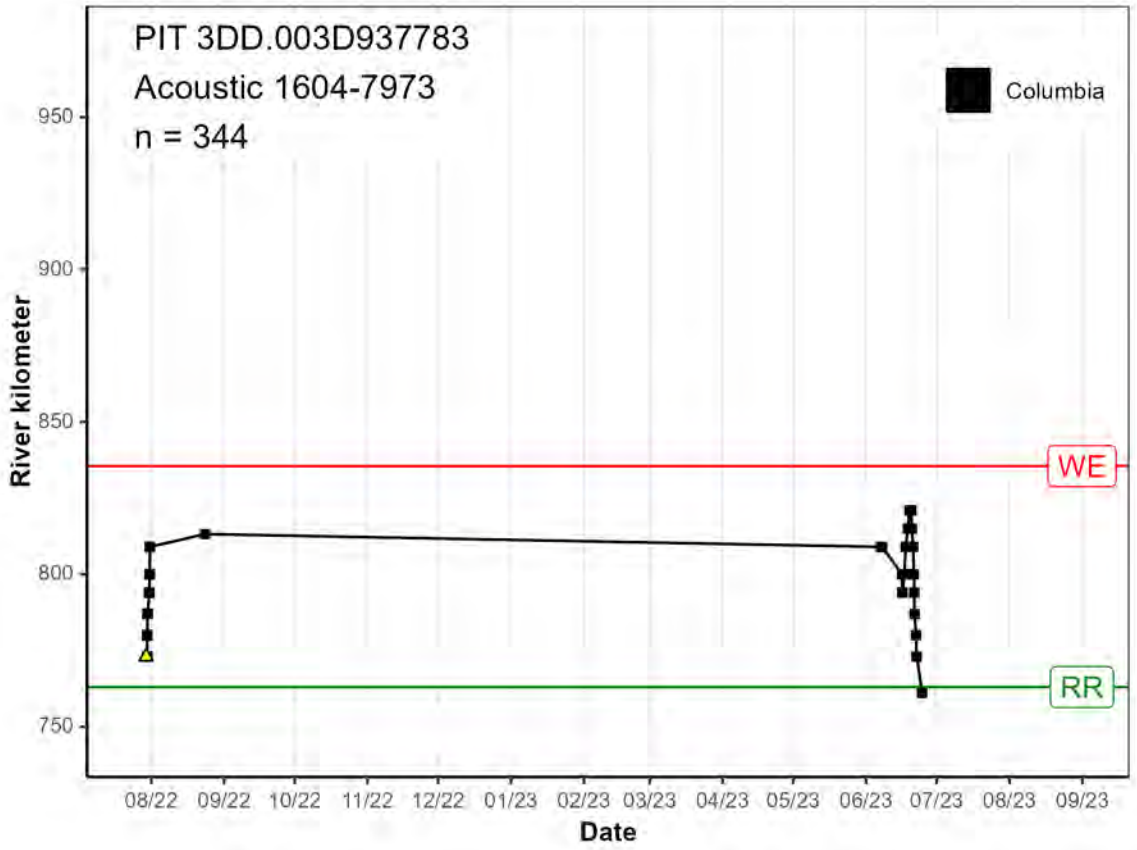

PIT 3DD.003D93775D
Acoustic 1604-7967
n = 98
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

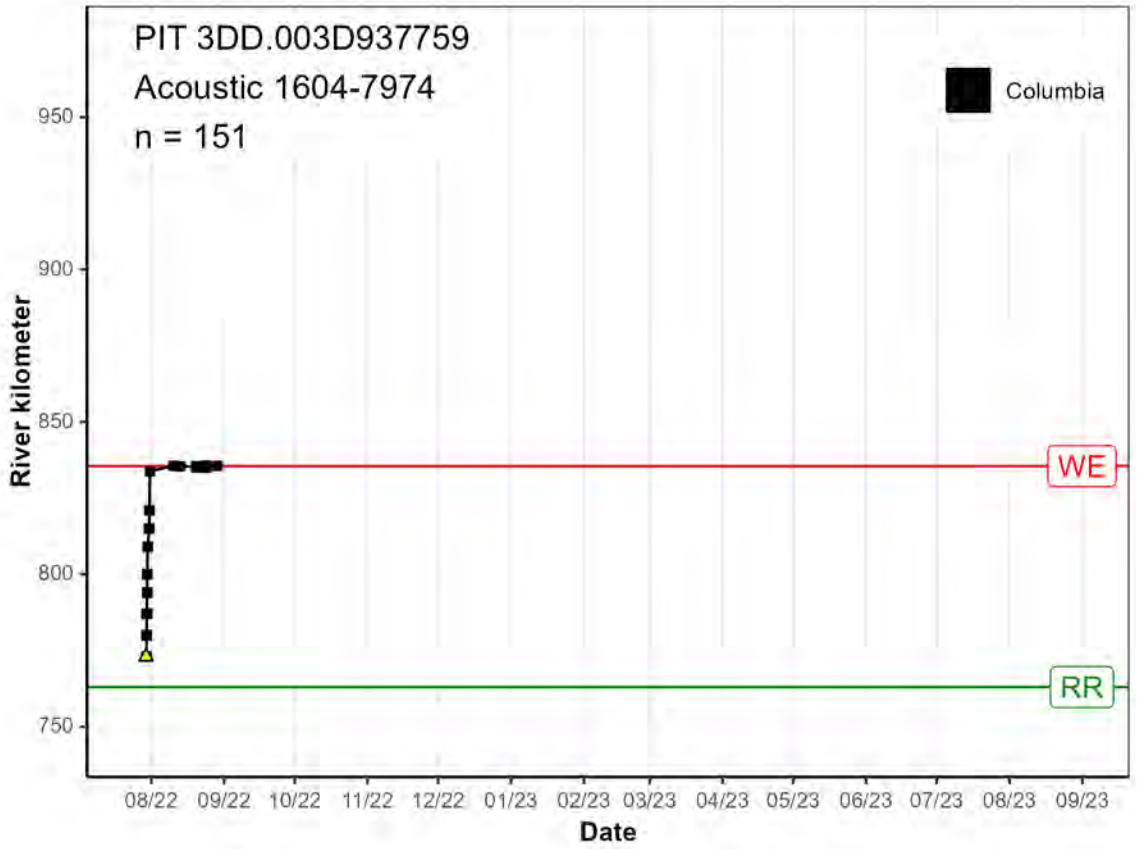

PIT 3DD.003D937778
Acoustic 1604-7968
n = 165
Columbia
Methow
Chewuch
River kilometer
1000
900
800
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

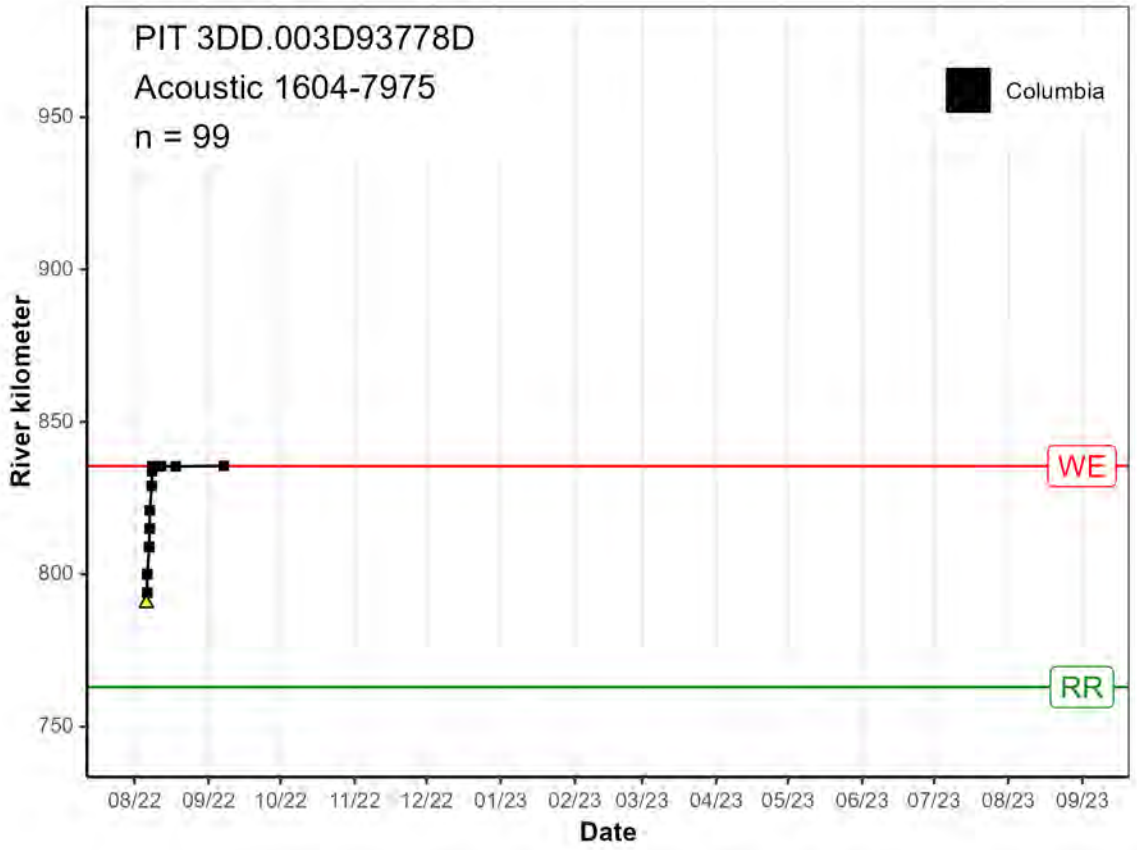

PIT 3DD.003D937731
Acoustic 1604-7969
n = 1351
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

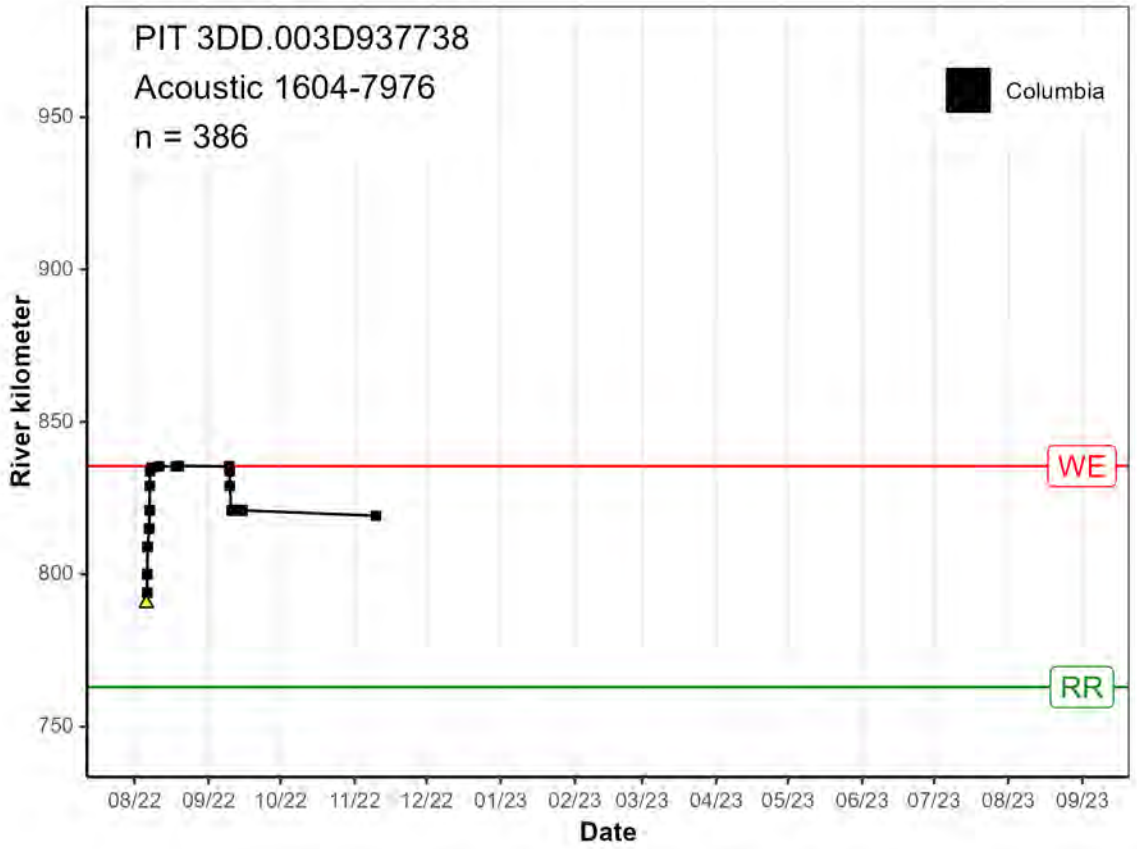

PIT 3DD.003D93772E
Acoustic 1604-7970
n = 766
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

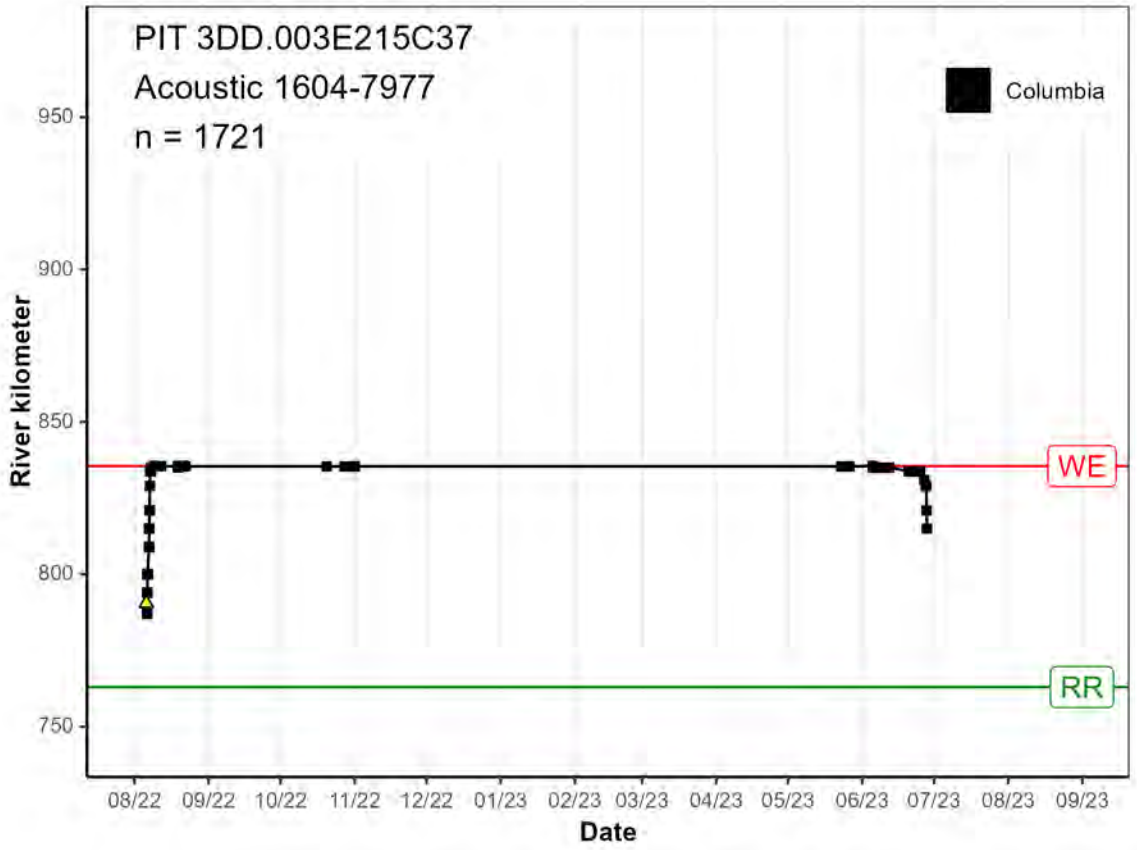

PIT 3DD.003D937747
Acoustic 1604-7972
n = 1014
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

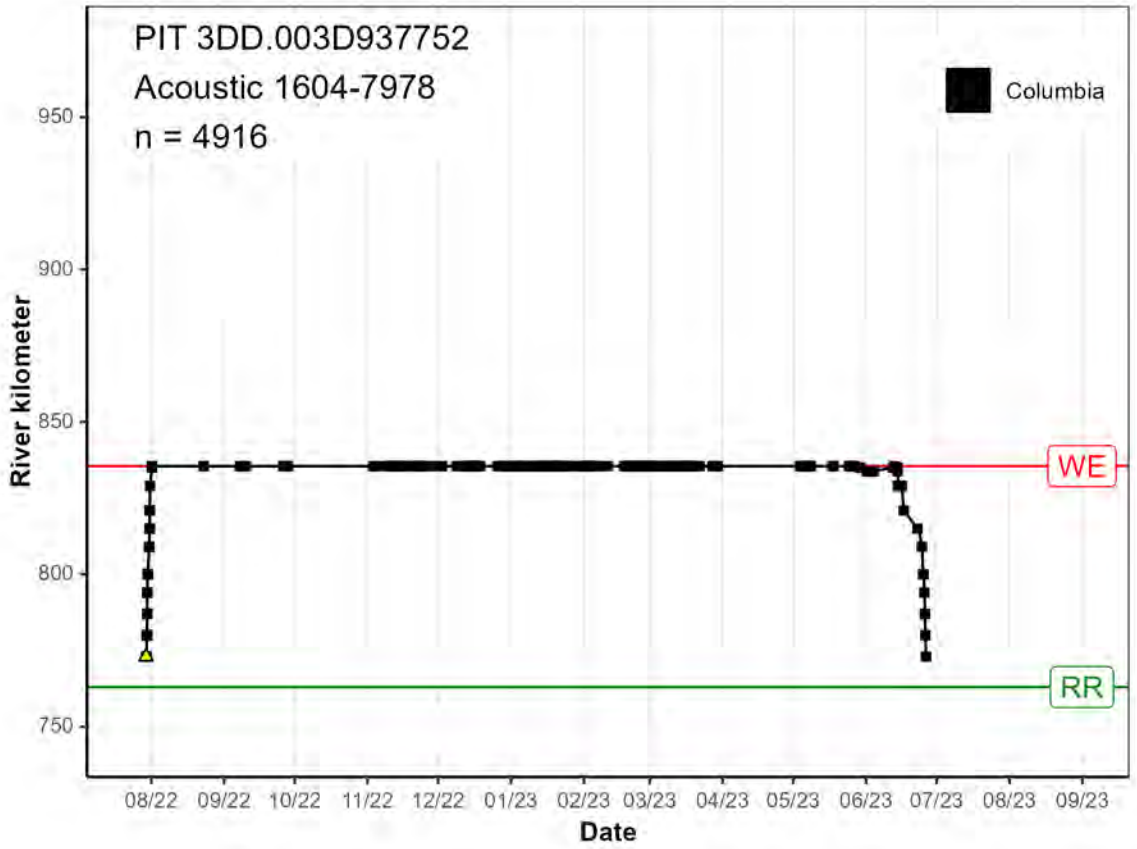

PIT 3DD.003D937783
Acoustic 1604-7973
n = 344
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

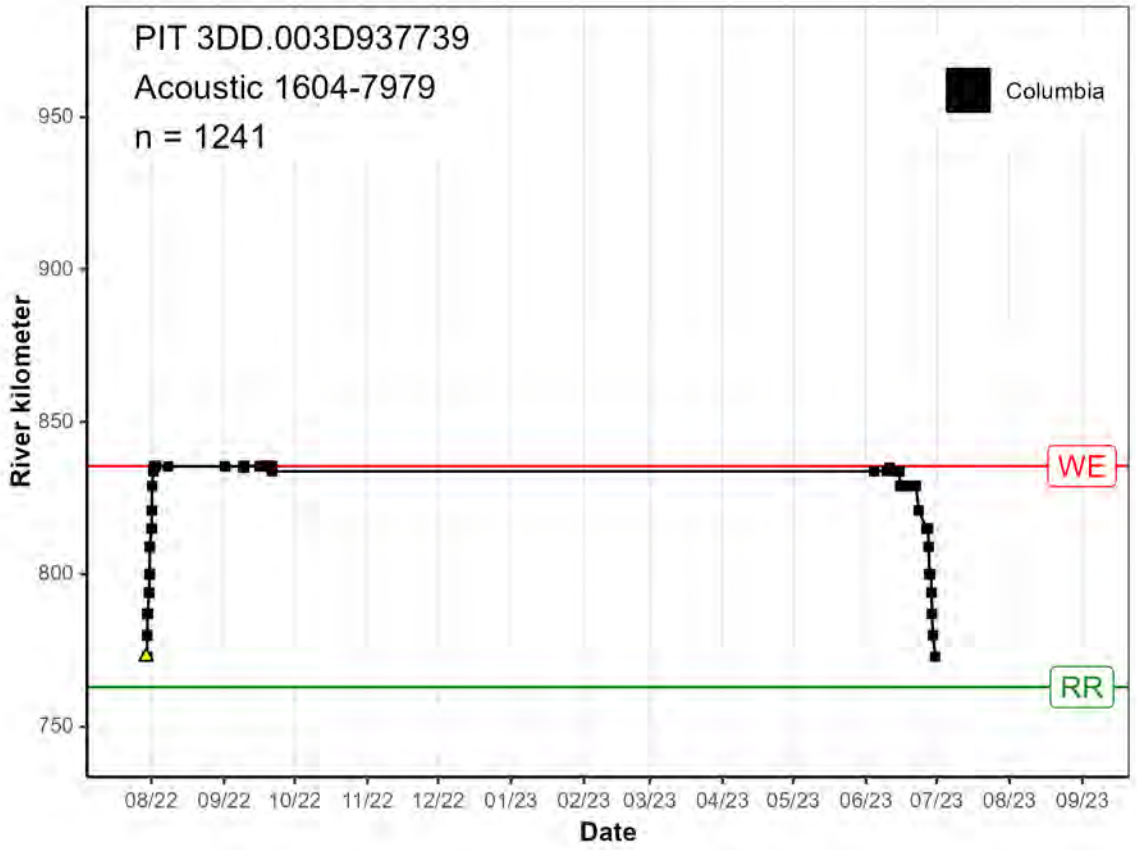

PIT 3DD.003D937759
Acoustic 1604-7974
n = 151
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

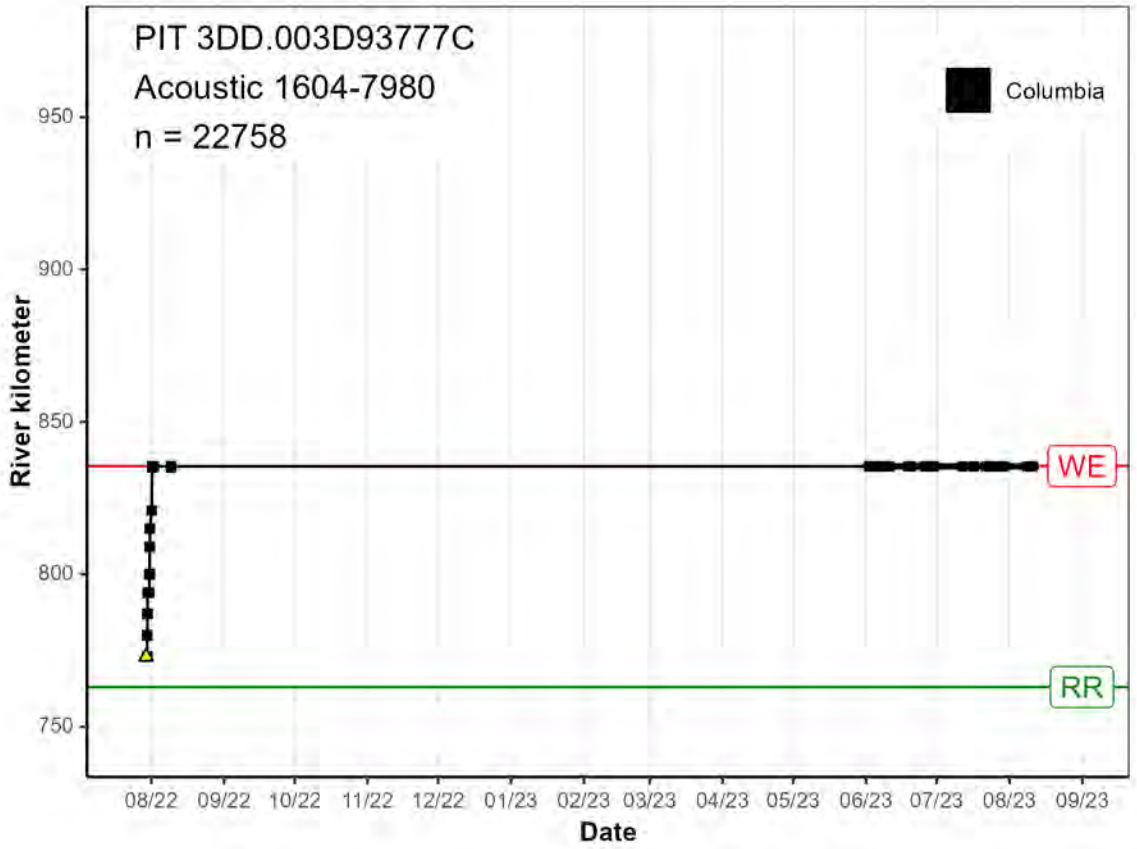

PIT 3DD.003D93778D
Acoustic 1604-7975
n = 99
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

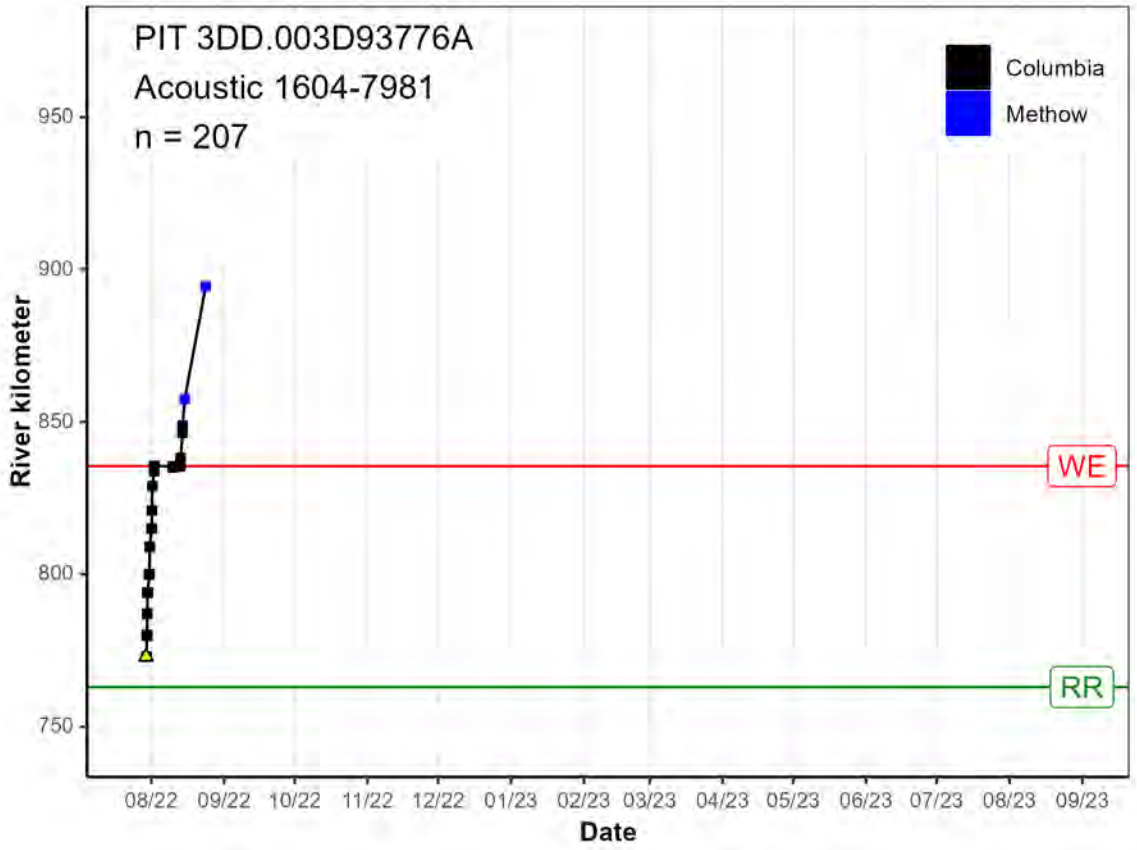

PIT 3DD.003D937738
Acoustic 1604-7976
n = 386
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

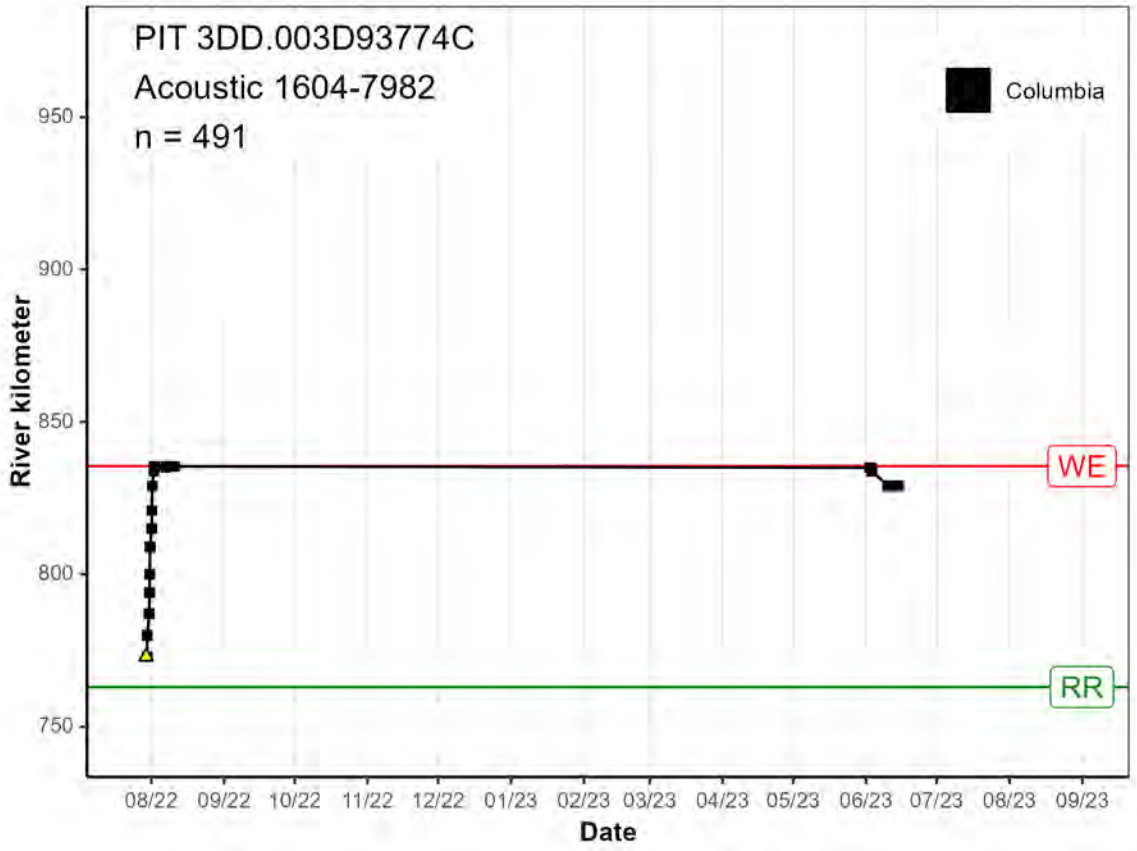

PIT 3DD.003E215C37
Acoustic 1604-7977
n = 1721
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

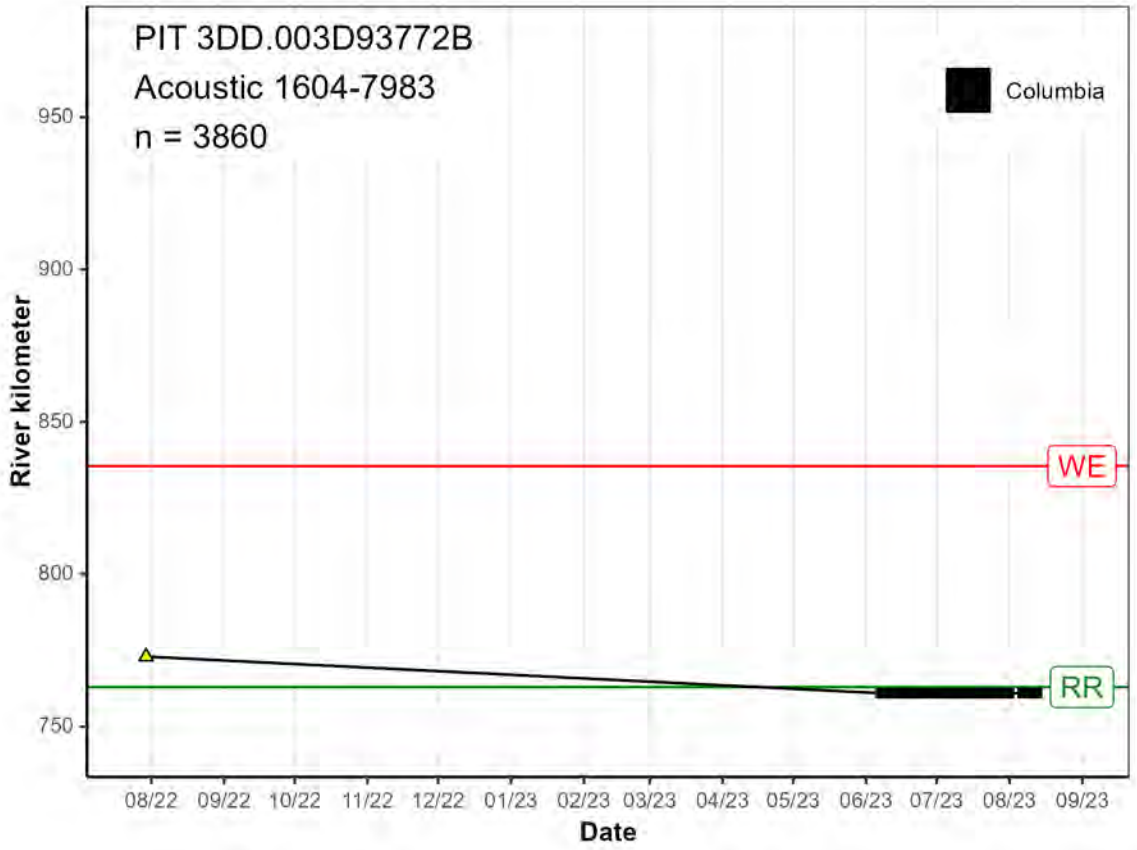

PIT 3DD.003D937752
Acoustic 1604-7978
n = 4916
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

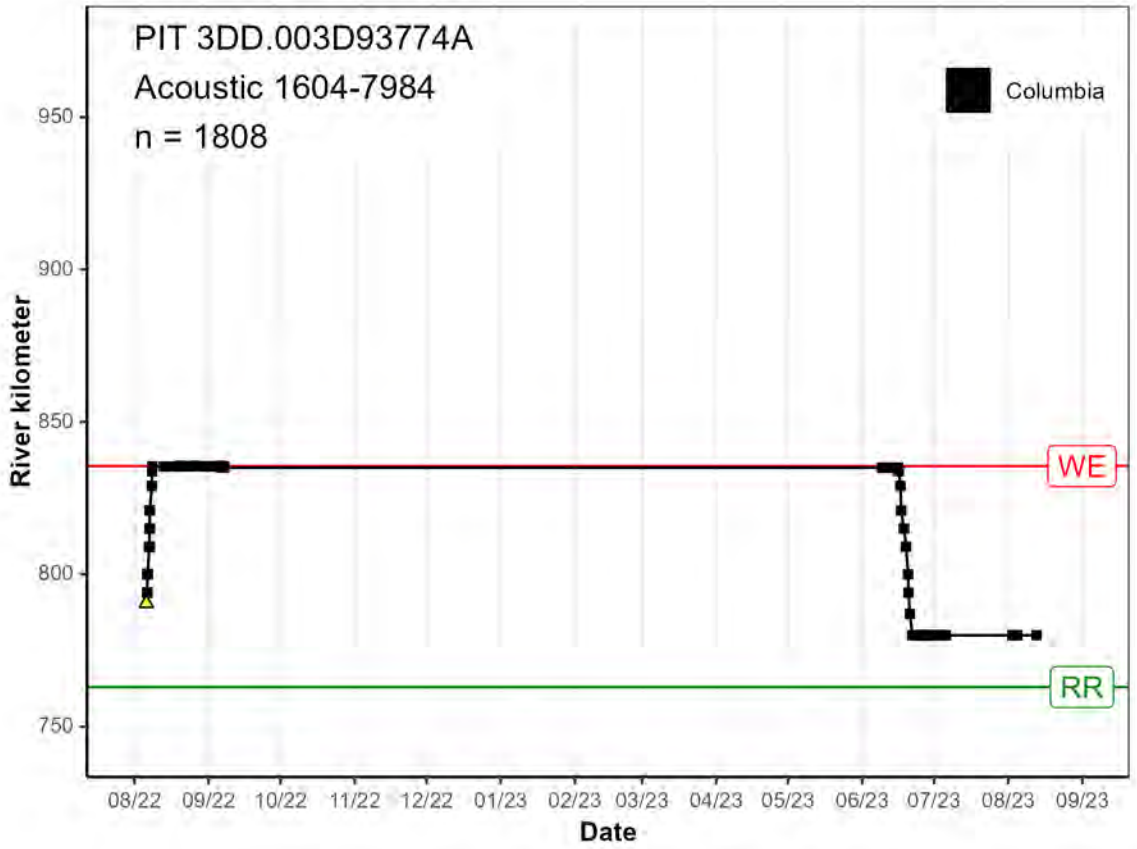

PIT 3DD.003D937739
Acoustic 1604-7979
n = 1241
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

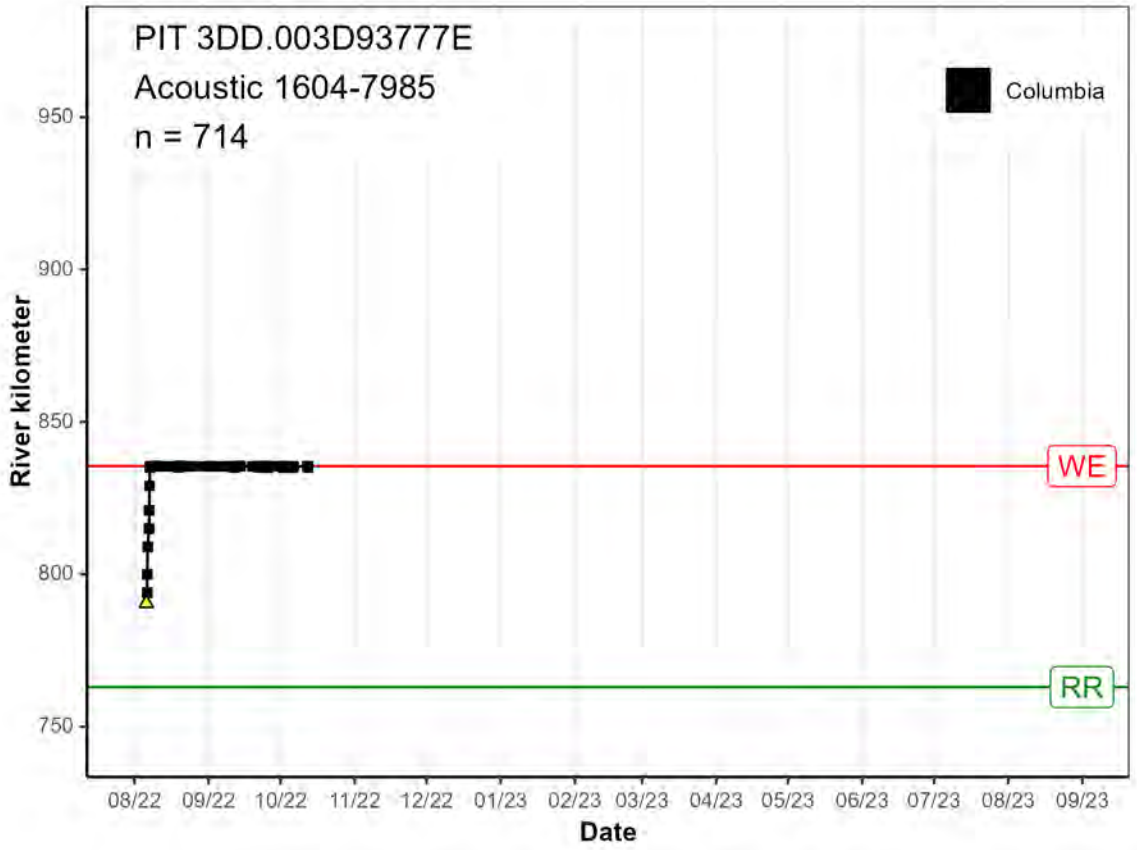

PIT 3DD.003D93777C
Acoustic 1604-7980
n = 22758
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

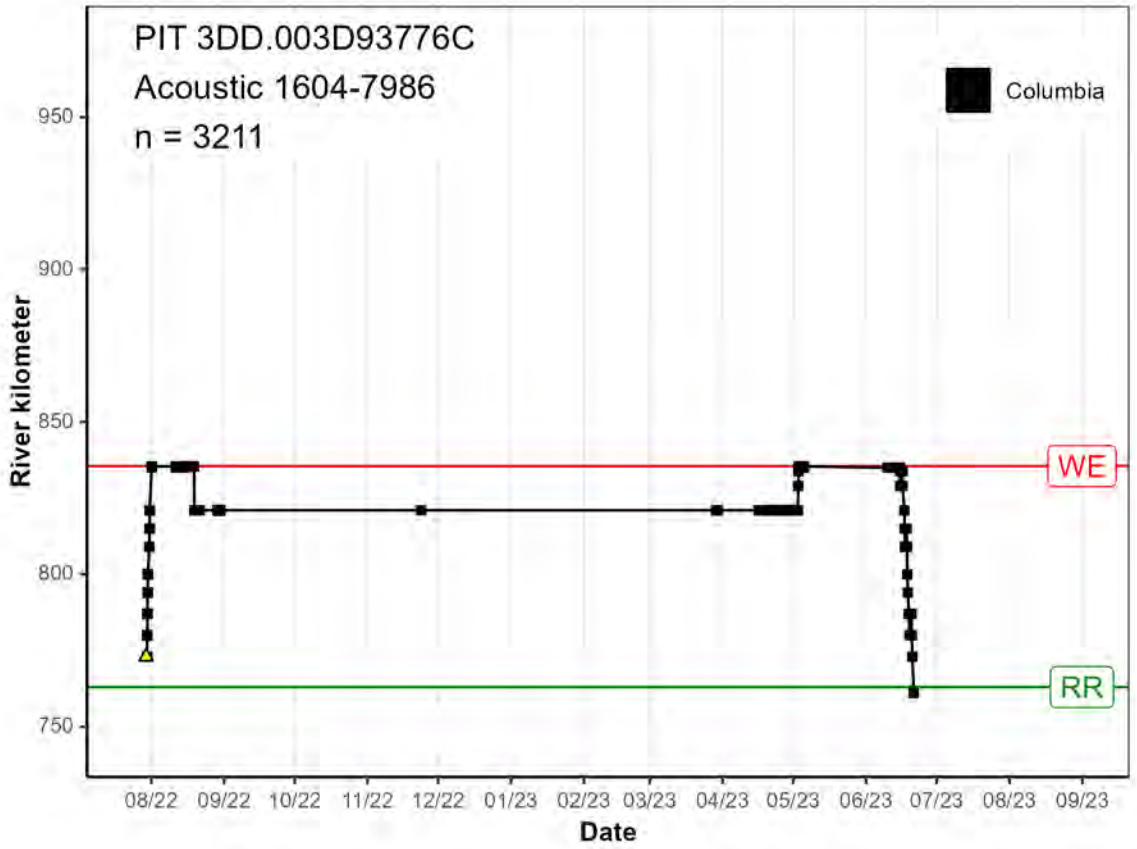

PIT 3DD.003D93776A
Acoustic 1604-7981
n = 207
Columbia
Methow
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

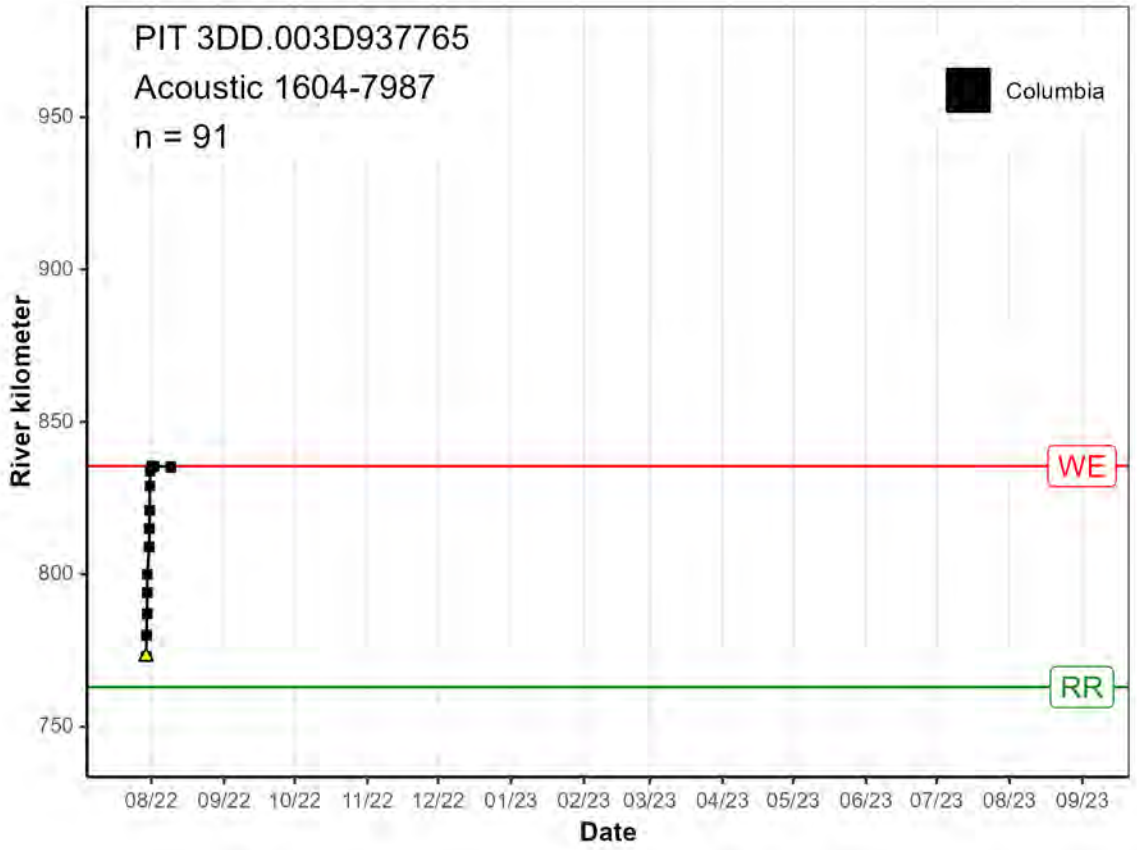

PIT 3DD.003D93774C
Acoustic 1604-7982
n = 491
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

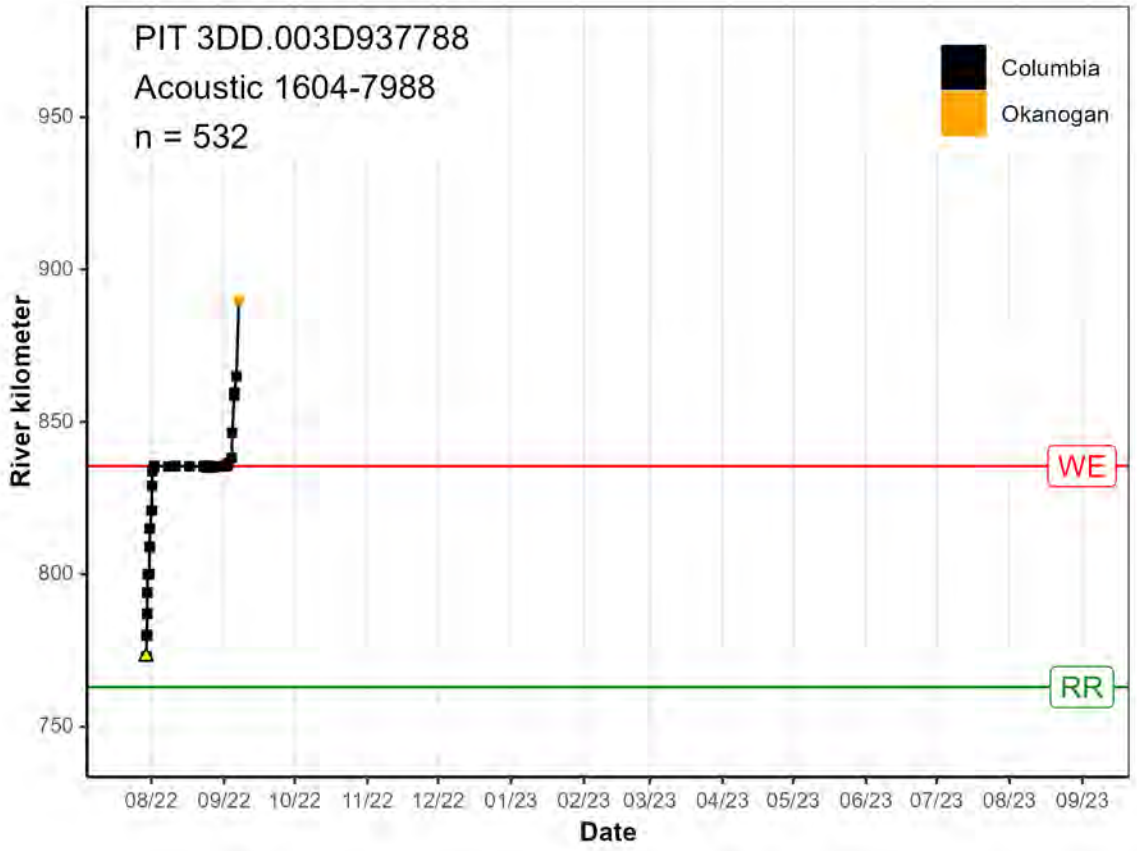

PIT 3DD.003D93772B
Acoustic 1604-7983
n = 3860
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

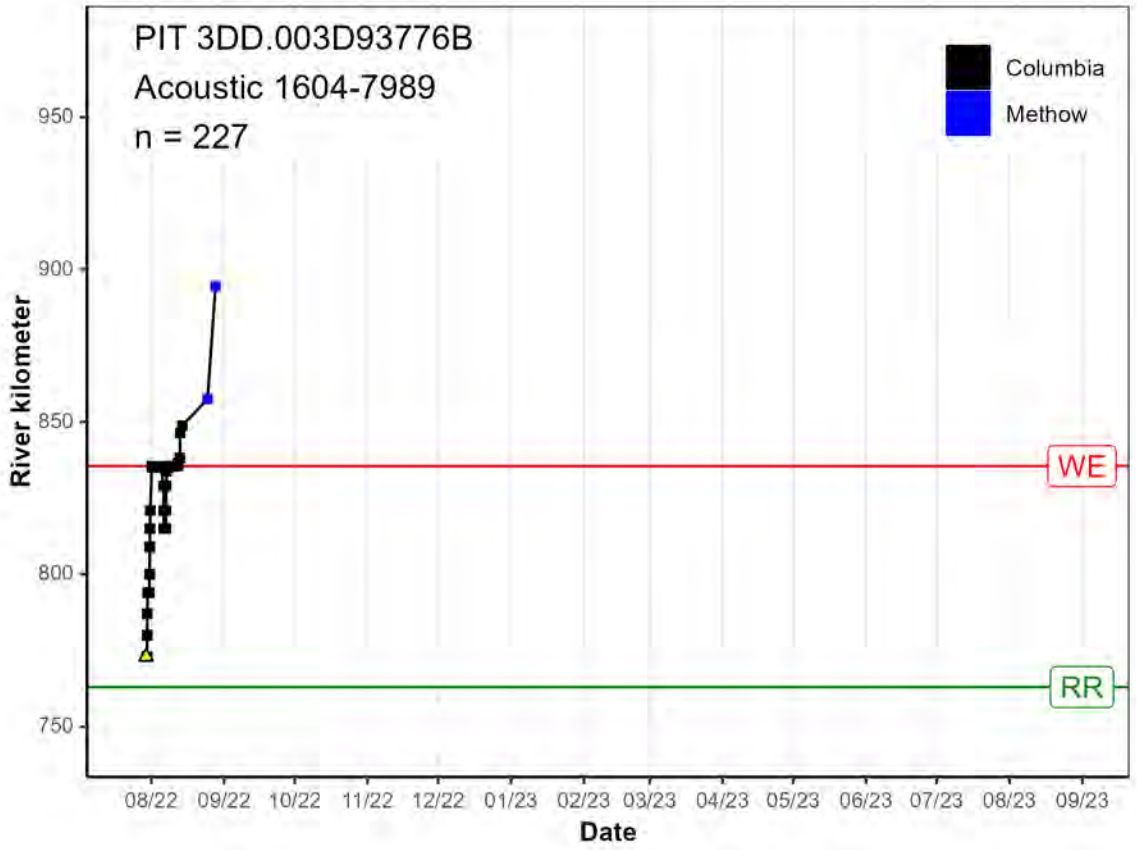

PIT 3DD.003D93774A
Acoustic 1604-7984
n = 1808
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

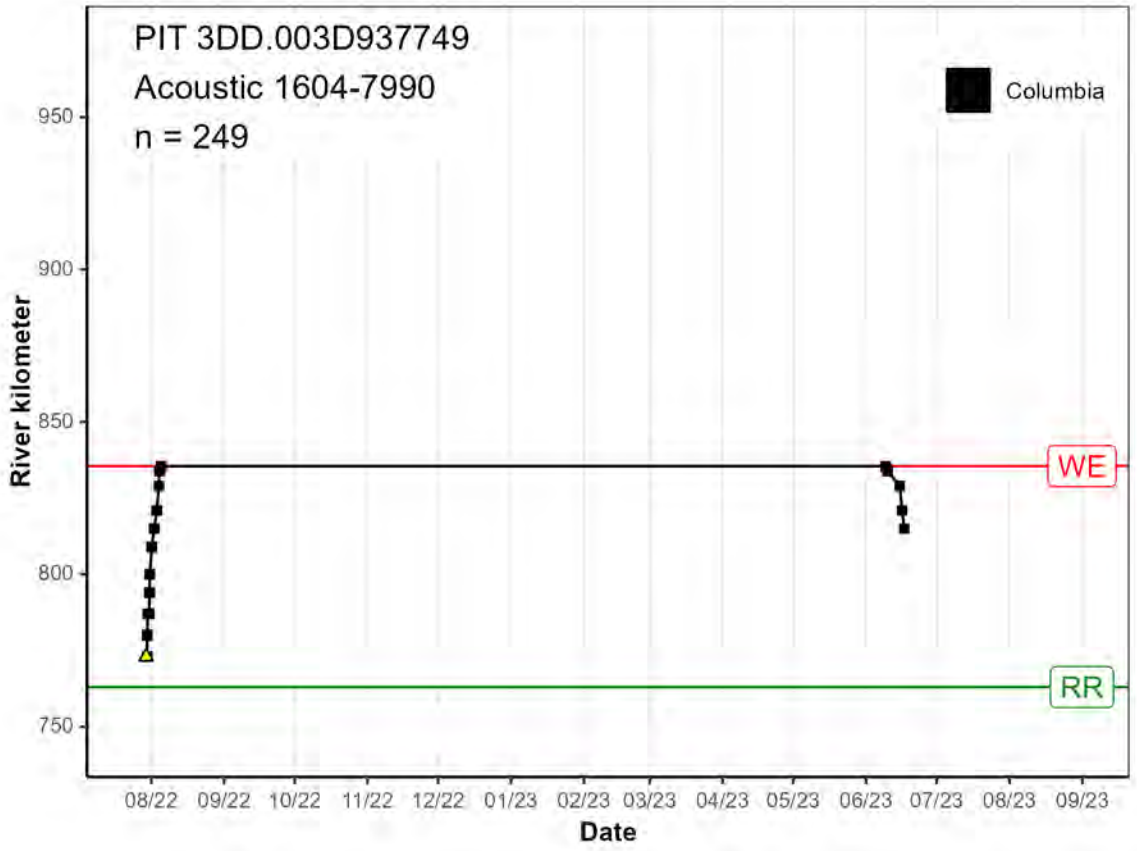

PIT 3DD.003D93777E
Acoustic 1604-7985
n = 714
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

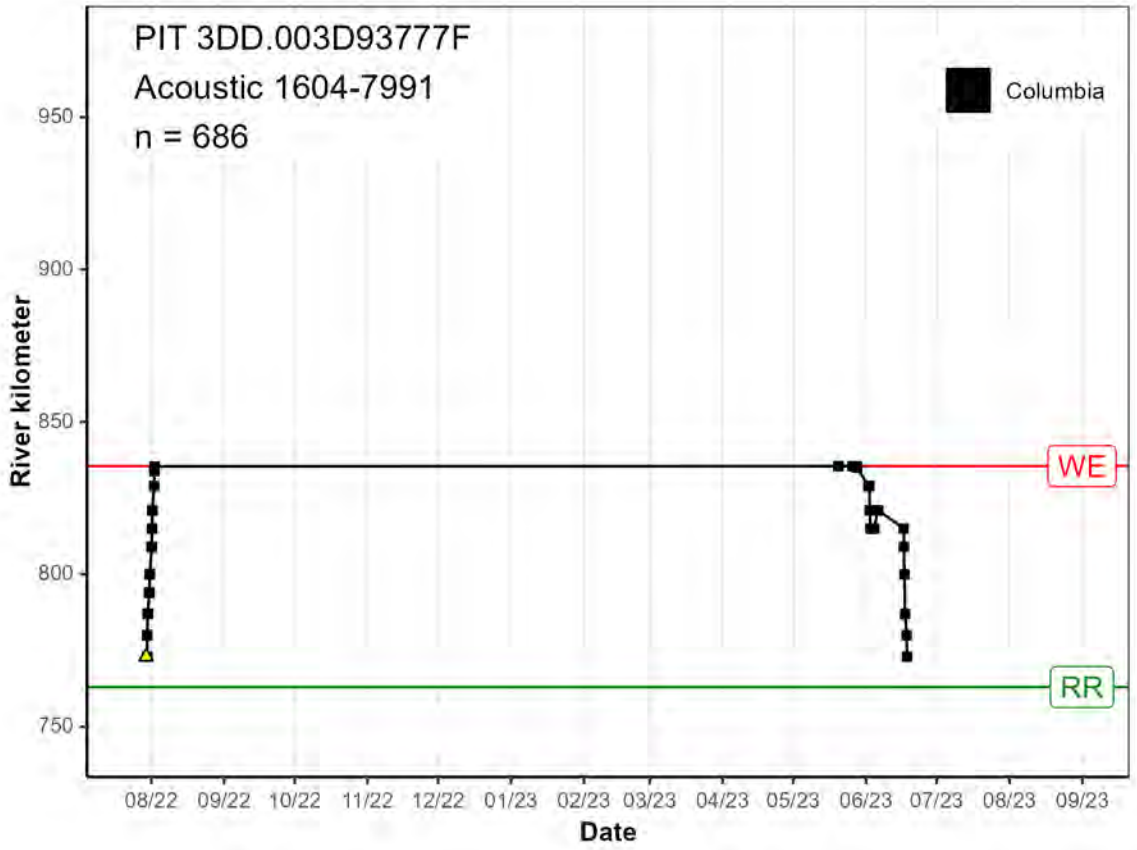

PIT 3DD.003D93776C
Acoustic 1604-7986
n = 3211
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

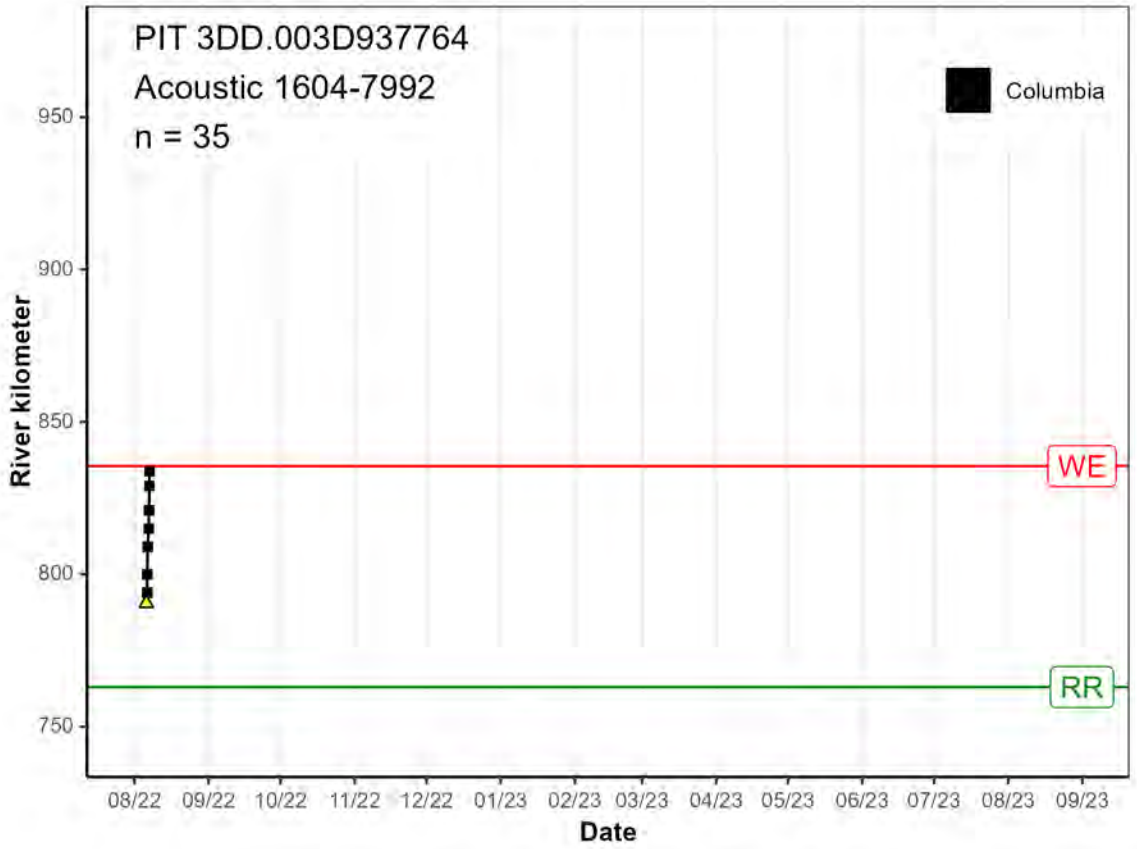

PIT 3DD.003D937765
Acoustic 1604-7987
n = 91
Columbia
WE
RR
River kilometer
950
900
850
800
750
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

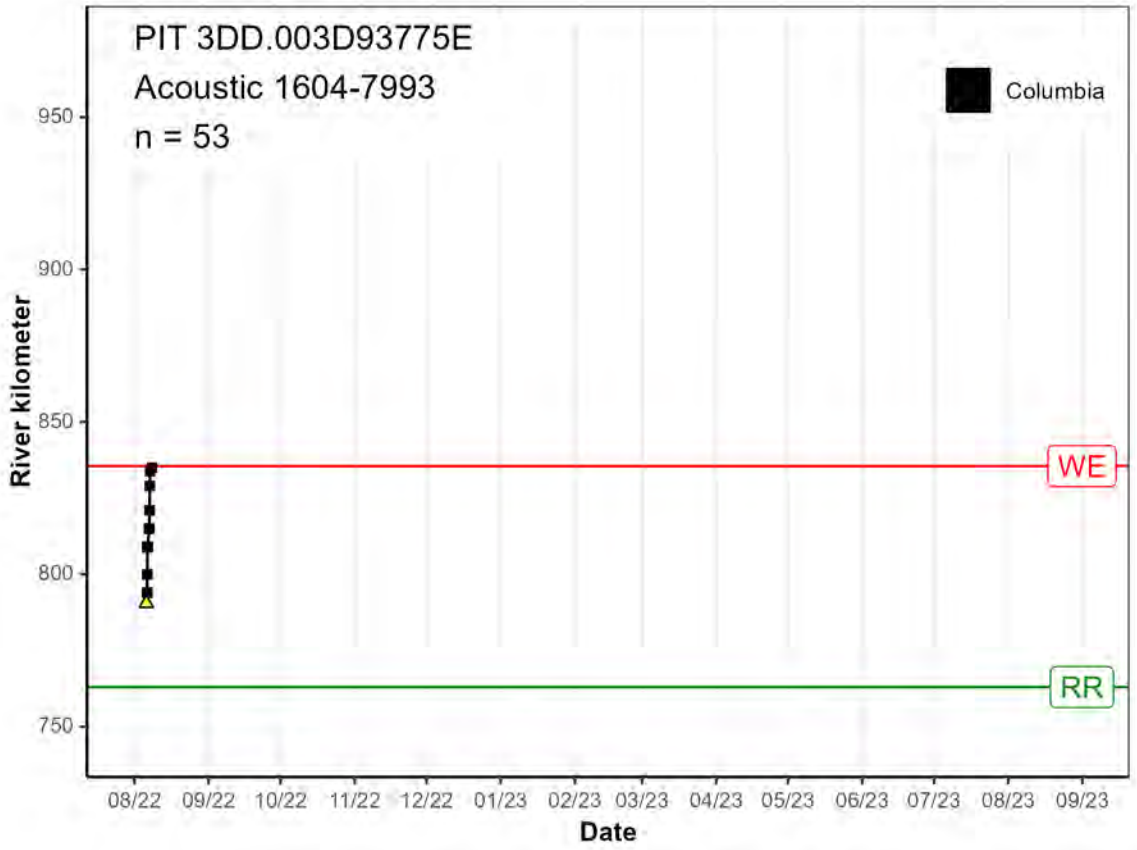

PIT 3DD.003D937788
Acoustic 1604-7988
n = 532
Columbia
Okanogan
WE
RR
River kilometer
950
900
850
800
750
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

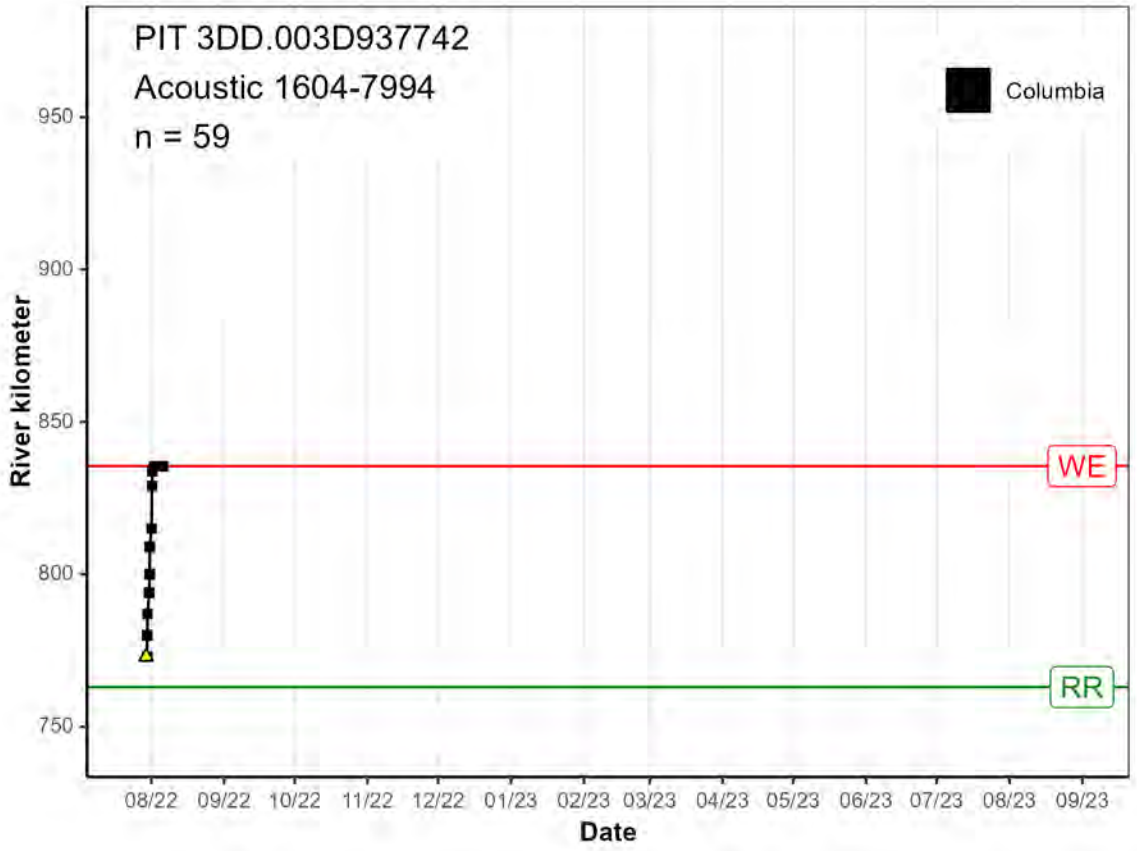

PIT 3DD.003D93776B
Acoustic 1604-7989
n = 227
Columbia
Methow
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

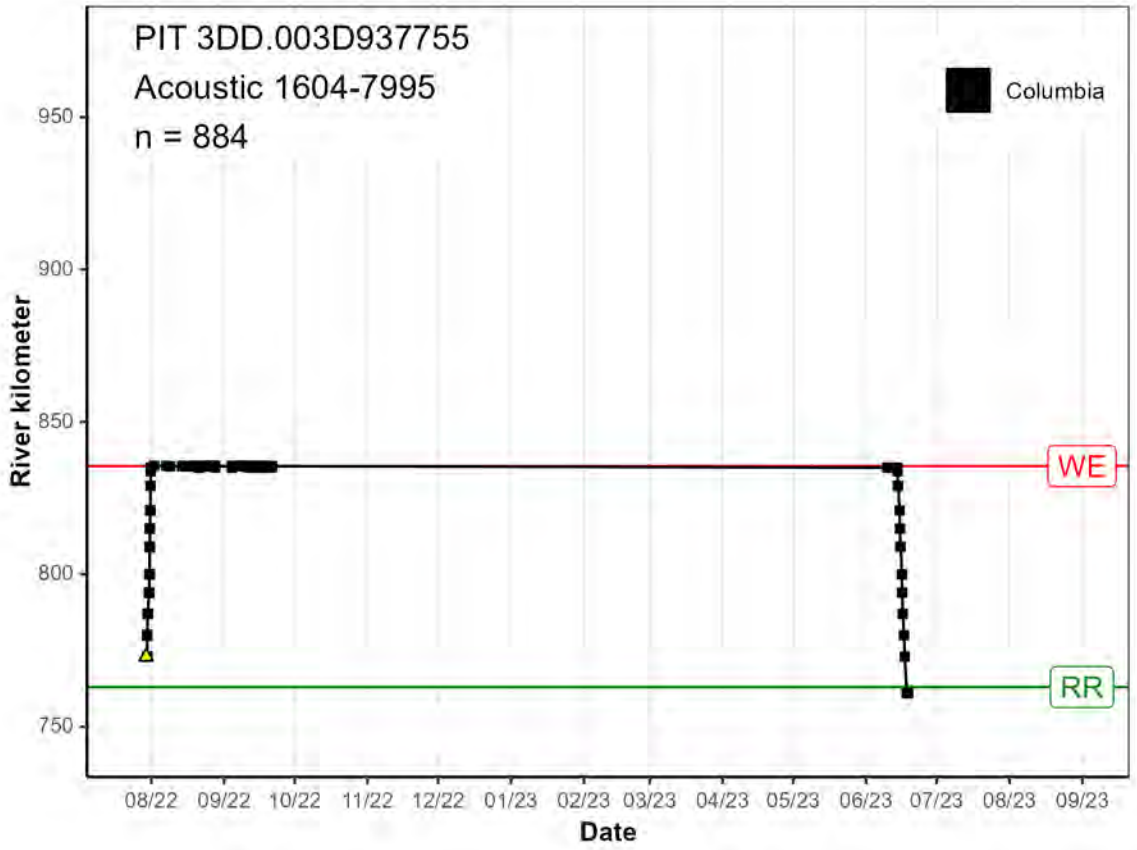

PIT 3DD.003D937749
Acoustic 1604-7990
n = 249
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

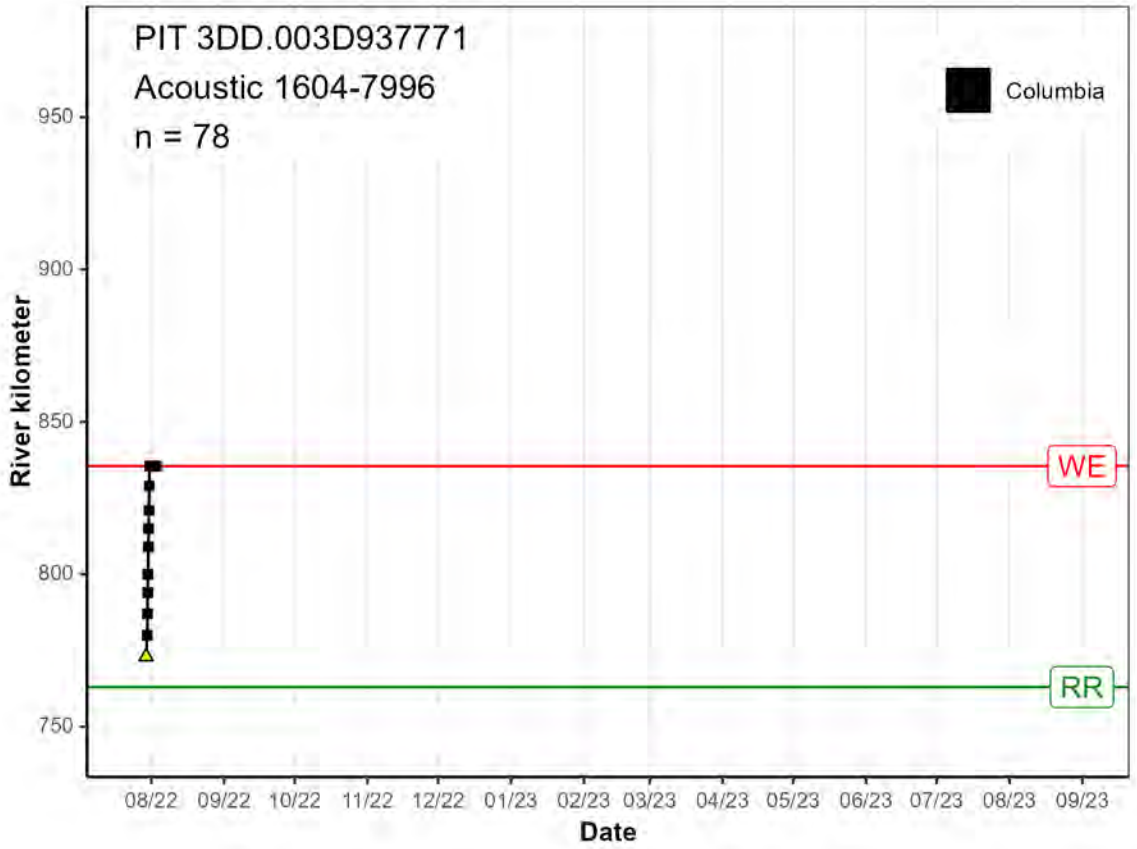

PIT 3DD.003D93777F
Acoustic 1604-7991
n = 686
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

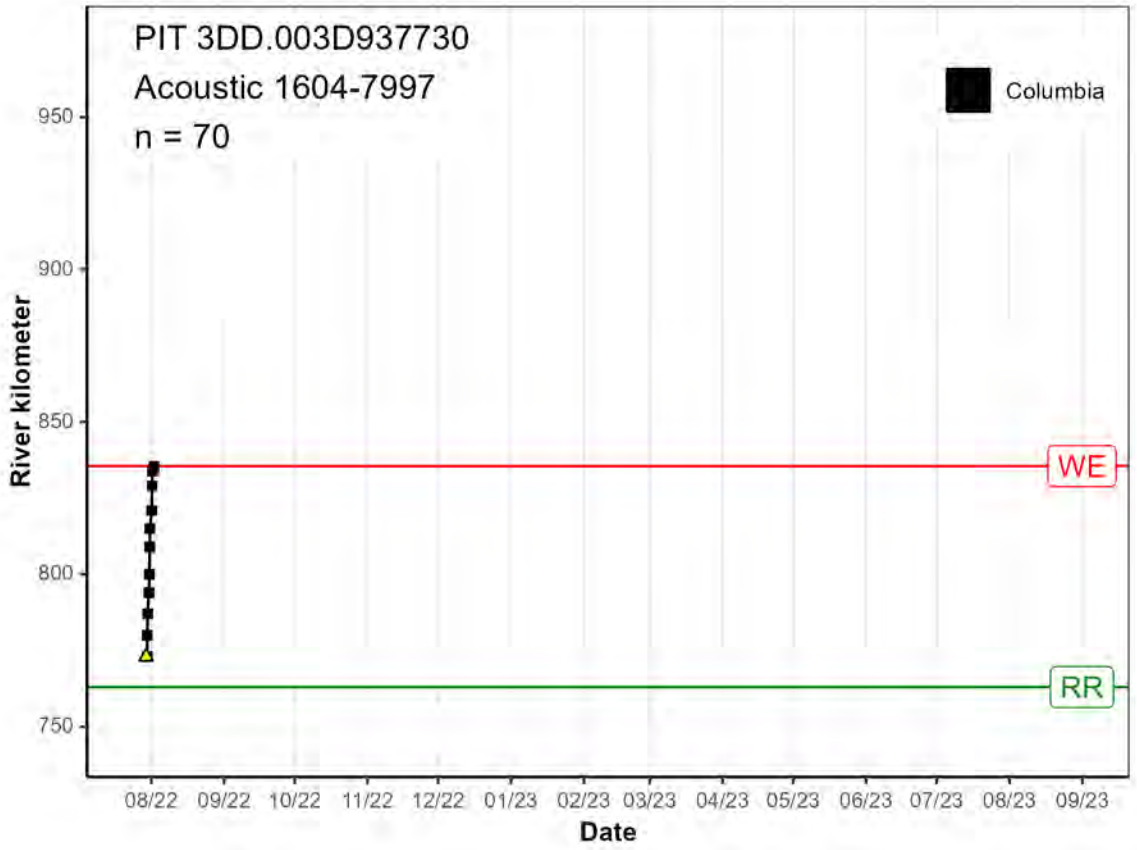

PIT 3DD.003D937764
Acoustic 1604-7992
n = 35
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

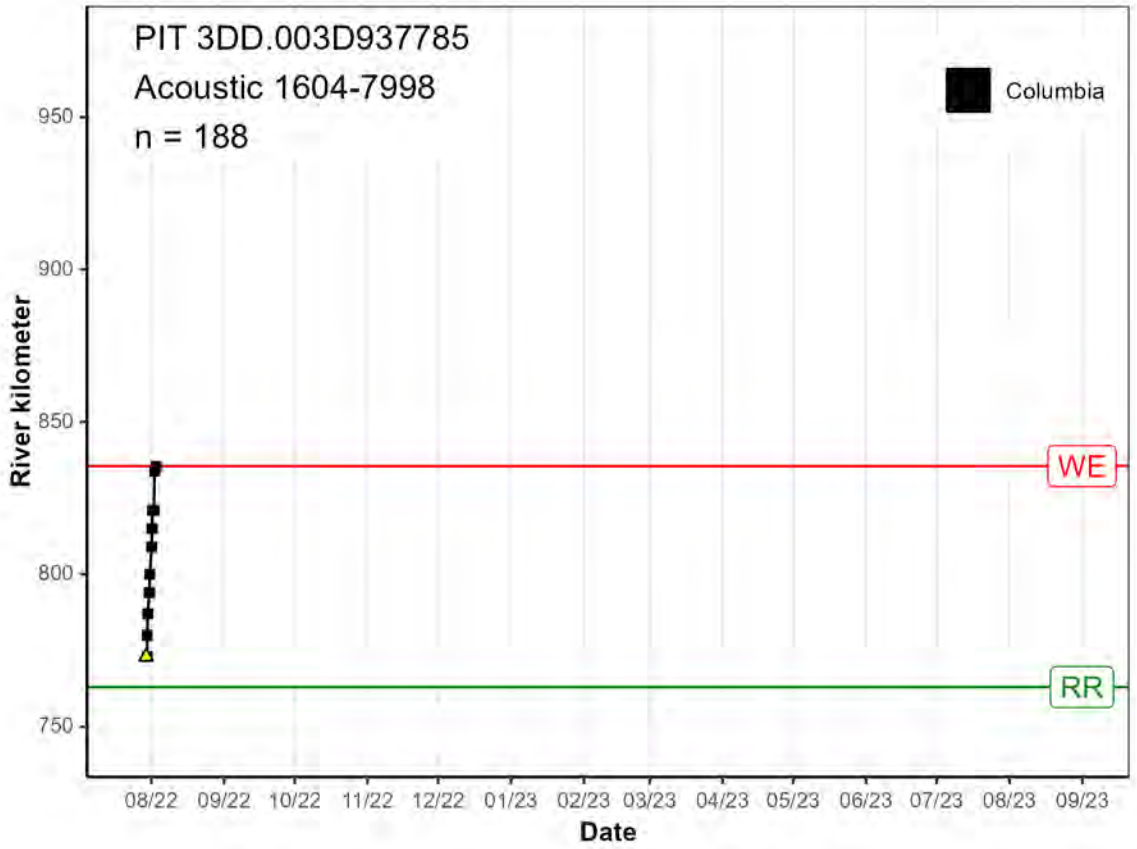

PIT 3DD.003D93775E
Acoustic 1604-7993
n = 53
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

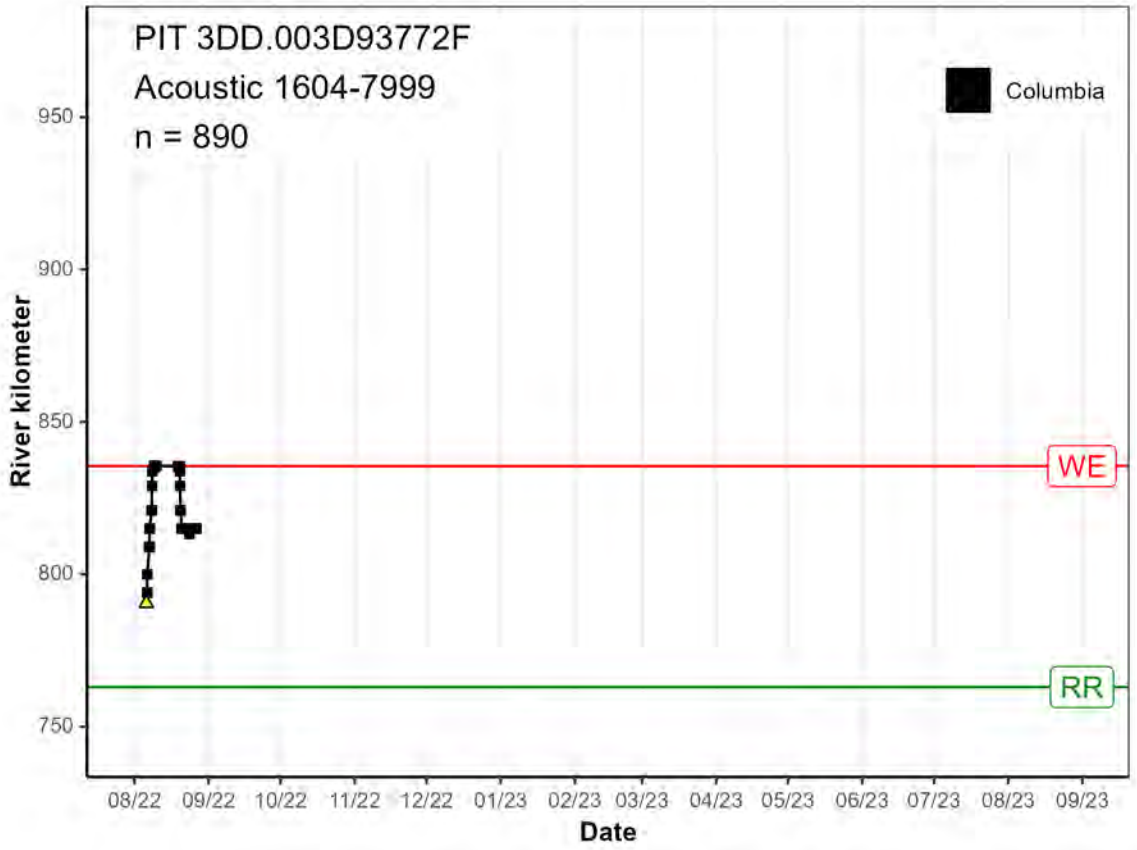

PIT 3DD.003D937742
Acoustic 1604-7994
n = 59
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

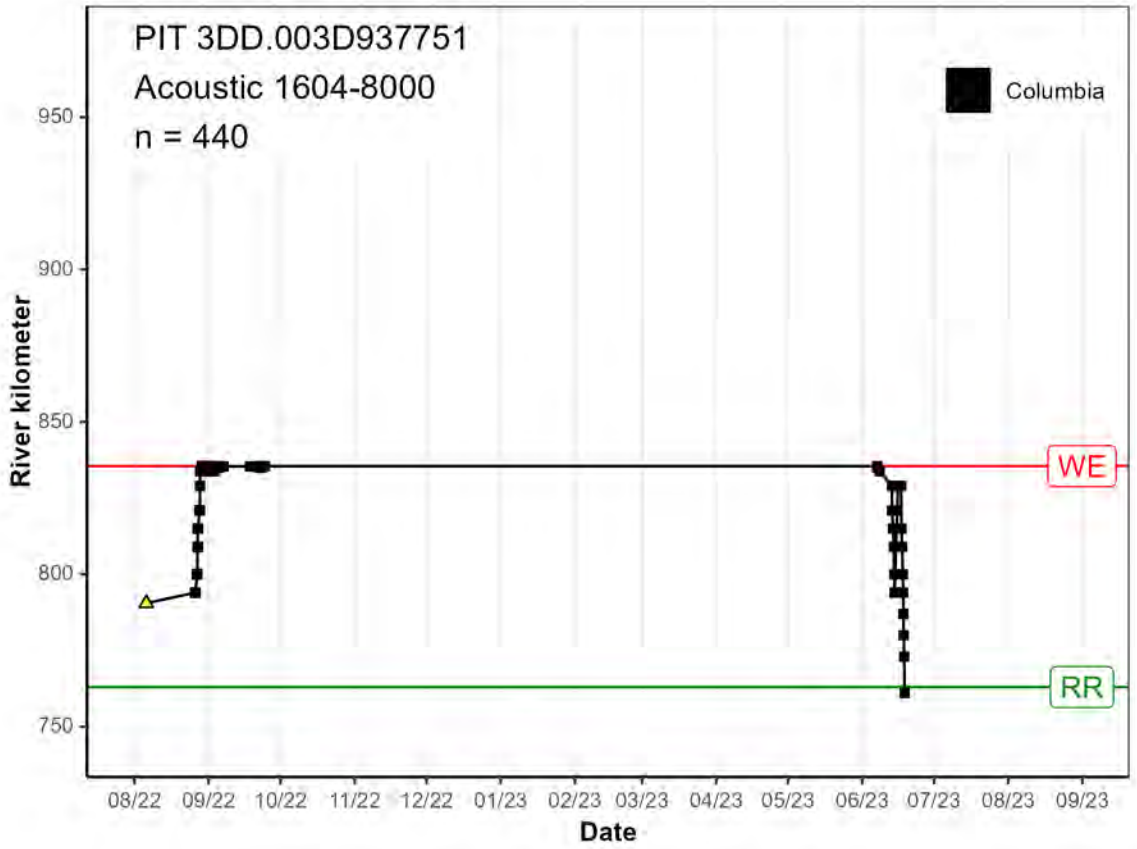

PIT 3DD.003D937755
Acoustic 1604-7995
n = 884
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

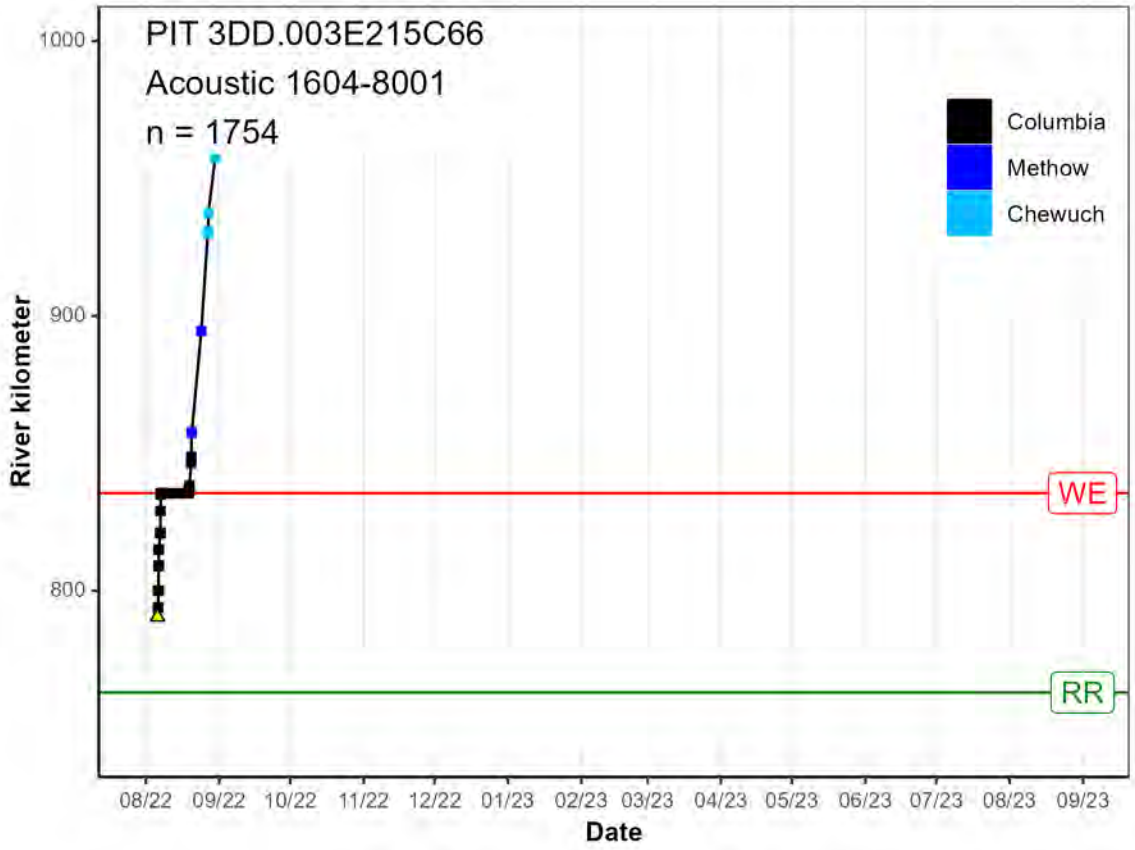

PIT 3DD.003D937771
Acoustic 1604-7996
n = 78
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

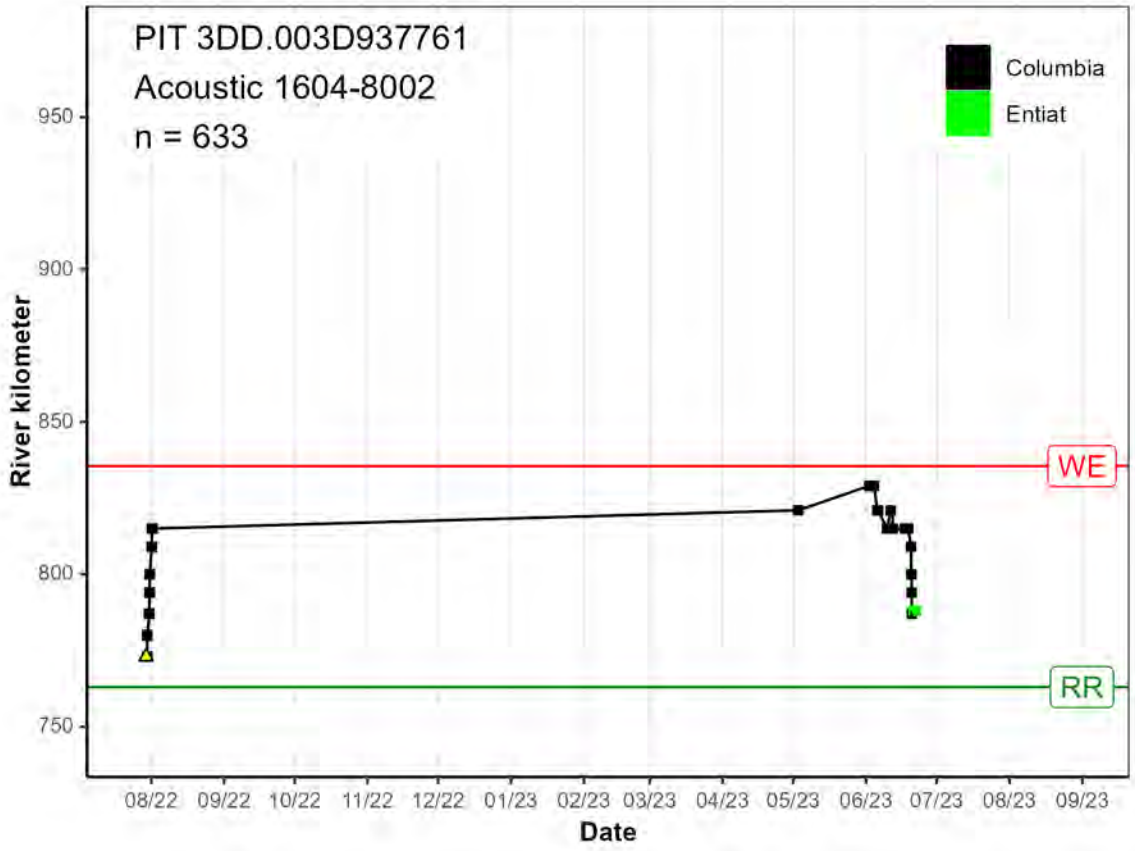

PIT 3DD.003D937730
Acoustic 1604-7997
n = 70
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

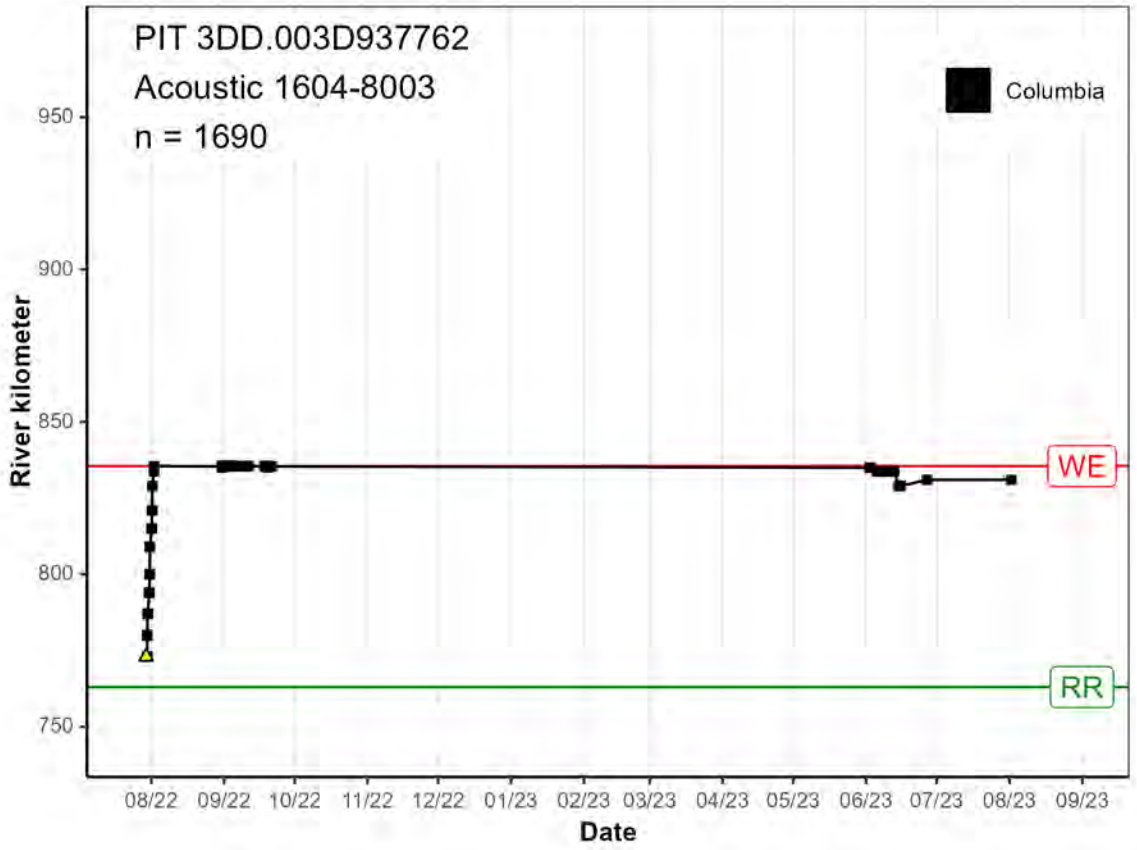

PIT 3DD.003D937785
Acoustic 1604-7998
n = 188
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

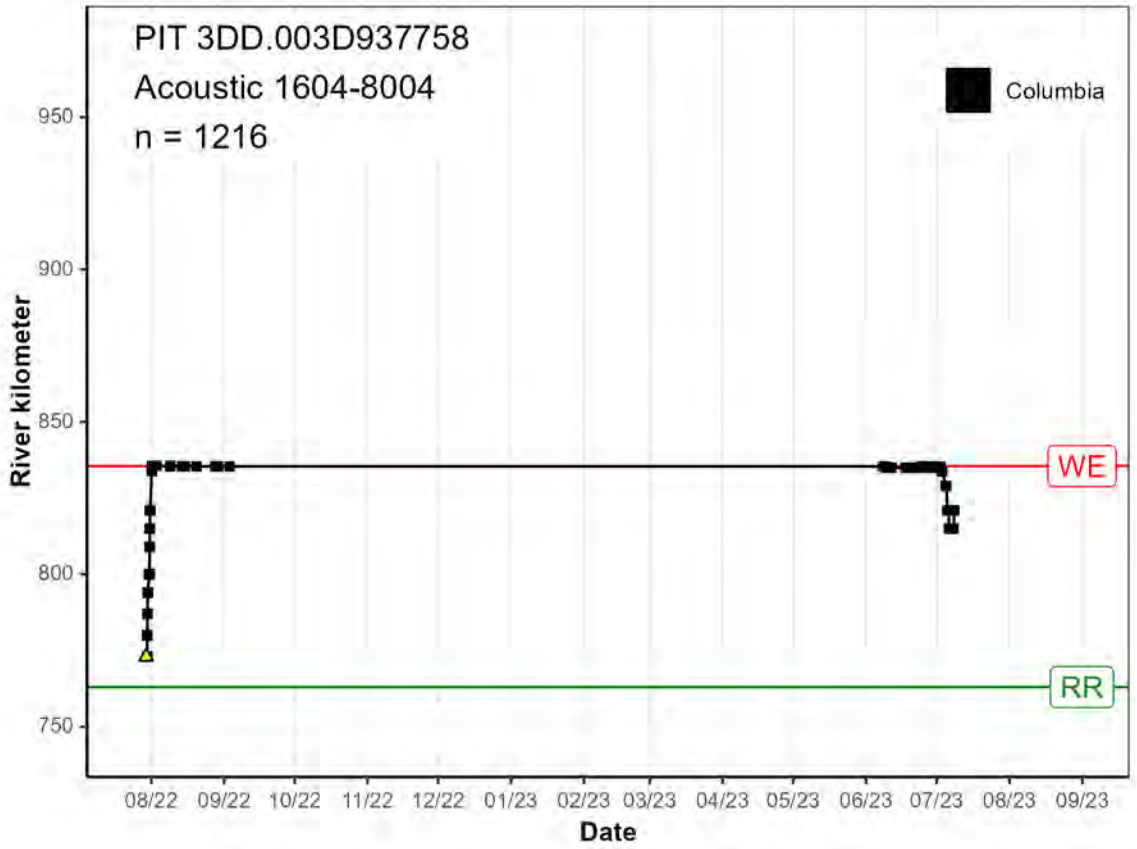

PIT 3DD.003D93772F
Acoustic 1604-7999
n = 890
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

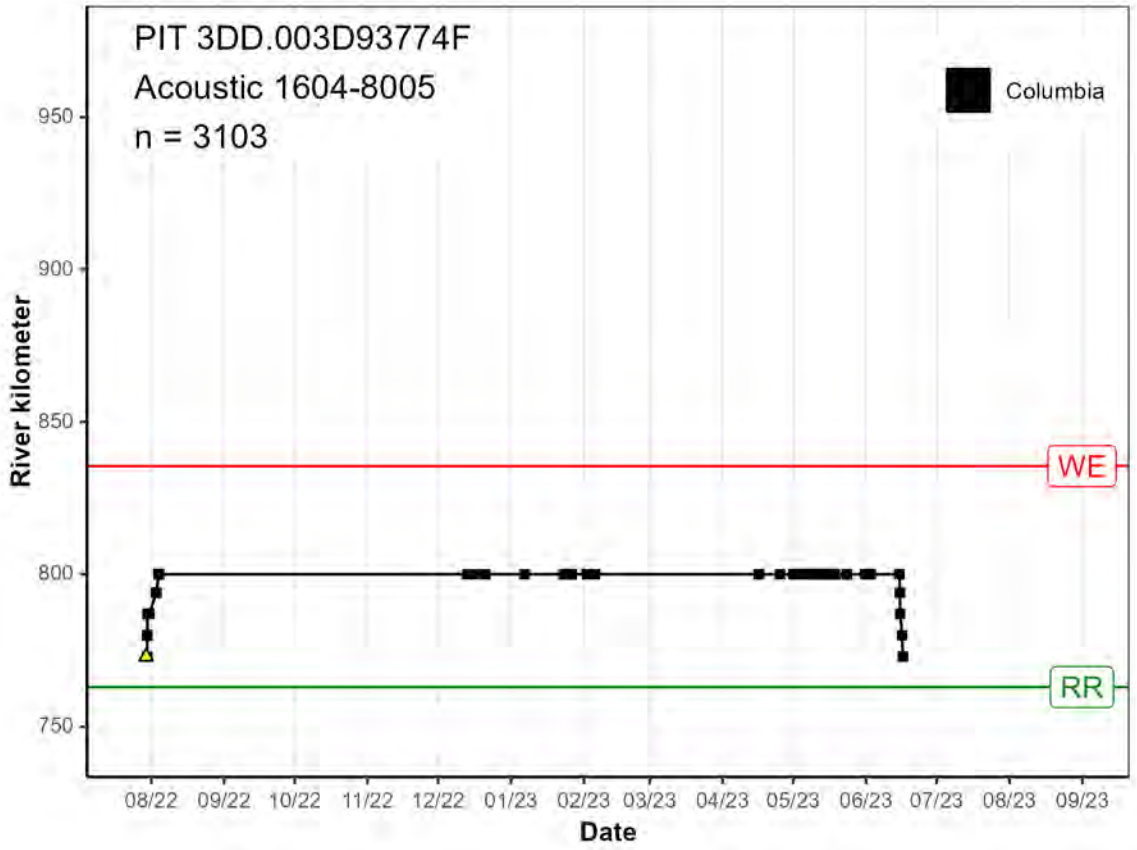

PIT 3DD.003D937751
Acoustic 1604-8000
n = 440
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

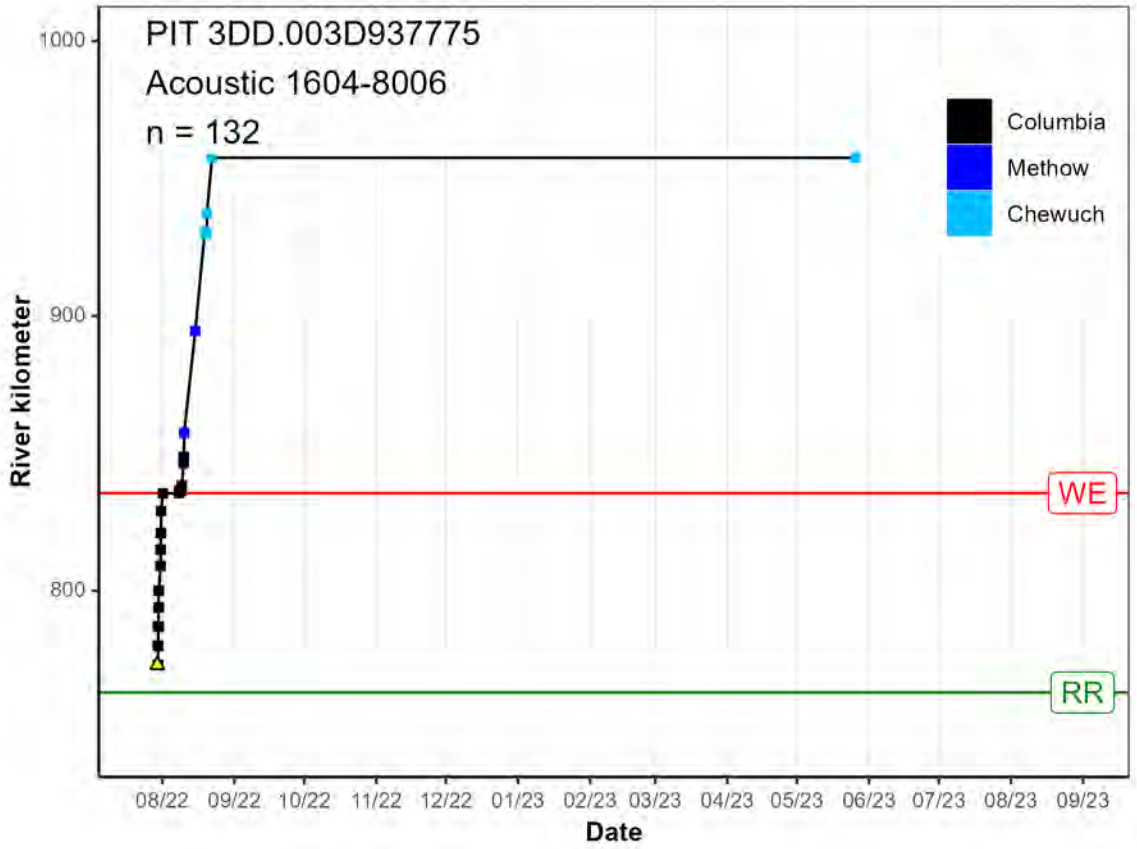

PIT 3DD.003E215C66
Acoustic 1604-8001
n = 1754
Columbia
Methow
Chewuch
River kilometer
1000
900
800
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

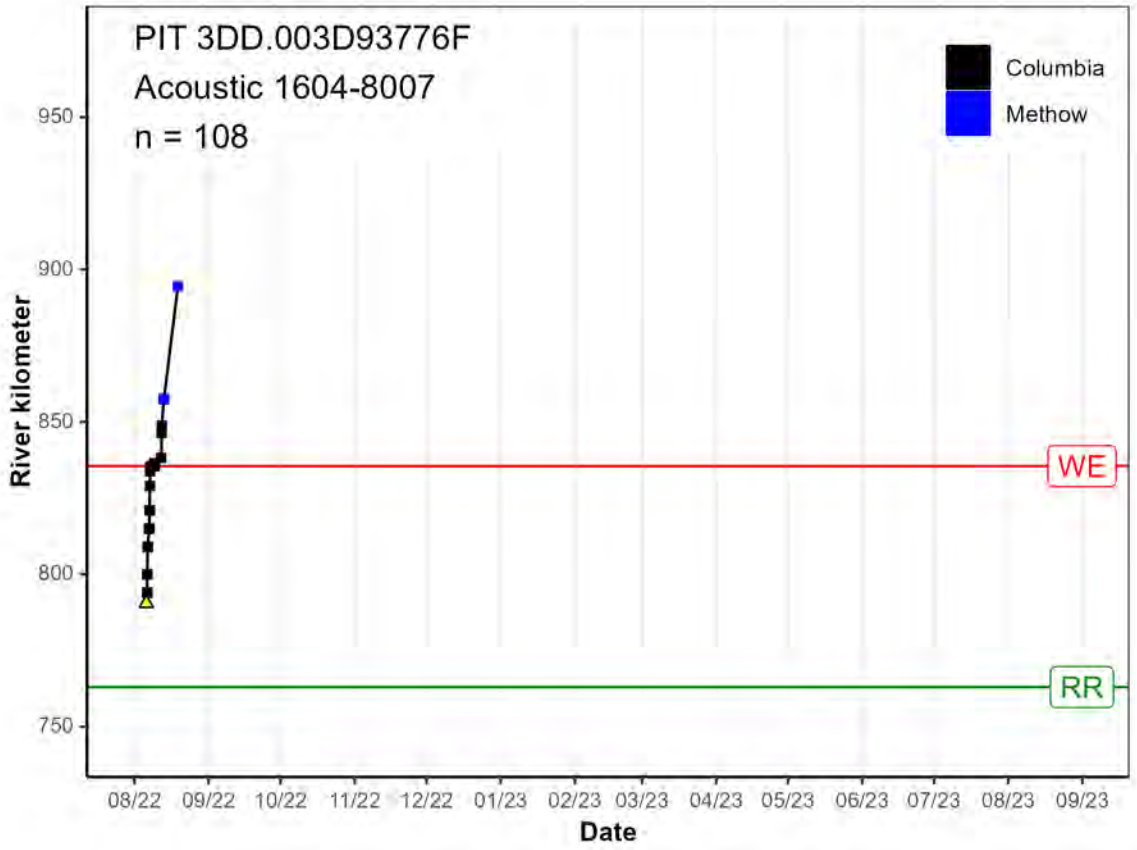

PIT 3DD.003D937761
Acoustic 1604-8002
n = 633
Columbia
Entiat
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

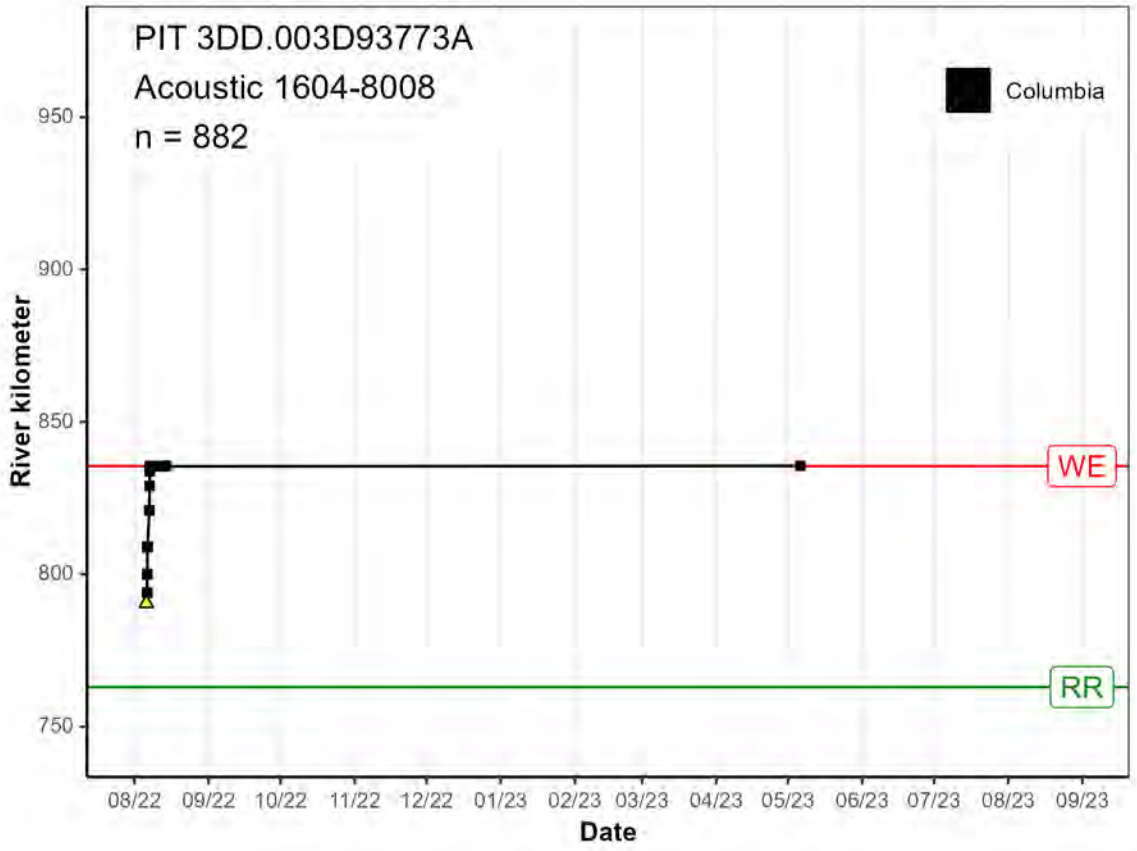

PIT 3DD.003D937762
Acoustic 1604-8003
n = 1690
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

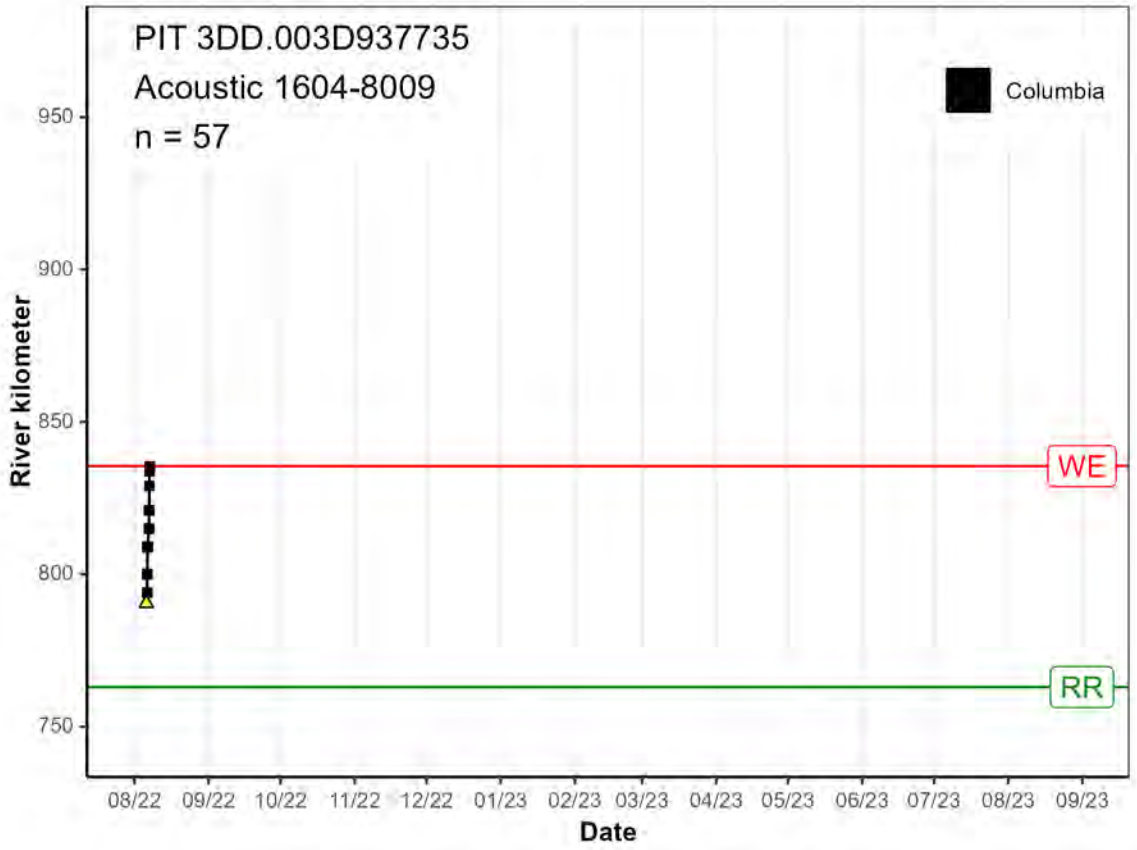

PIT 3DD.003D937758
Acoustic 1604-8004
n = 1216
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

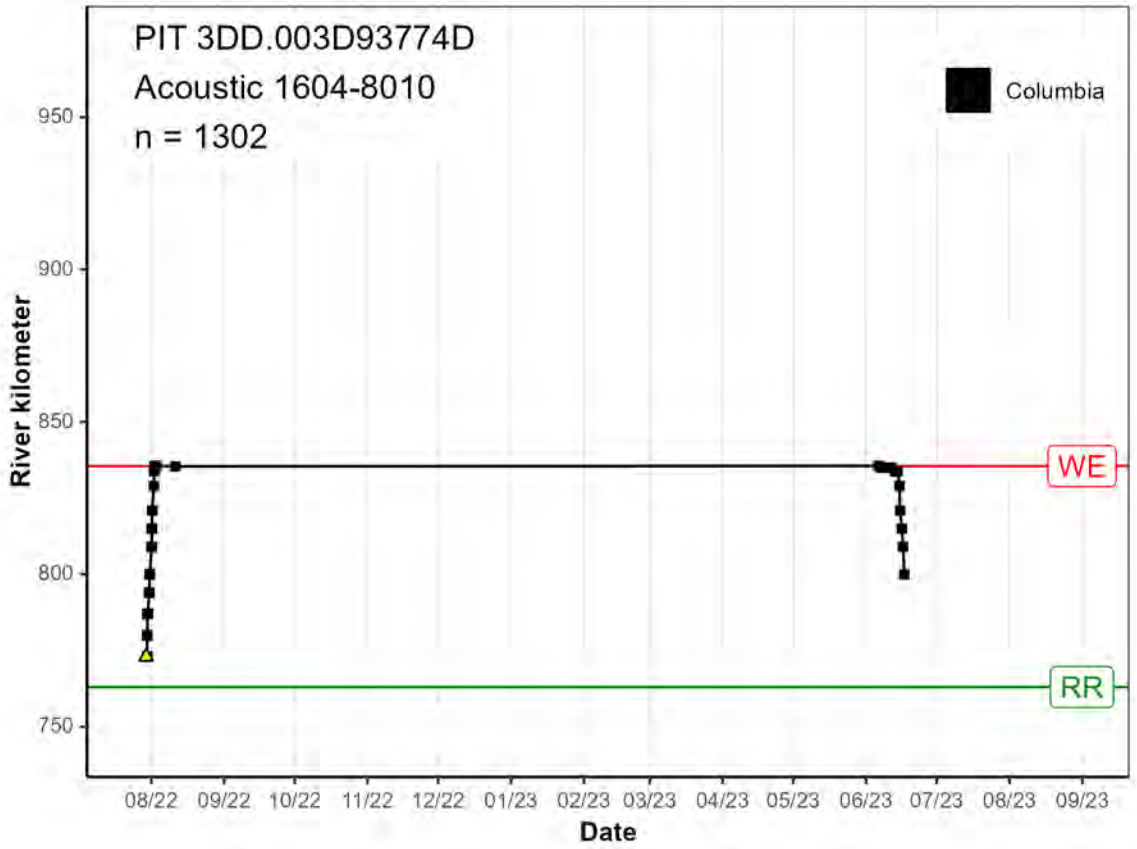

PIT 3DD.003D93774F
Acoustic 1604-8005
n = 3103
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

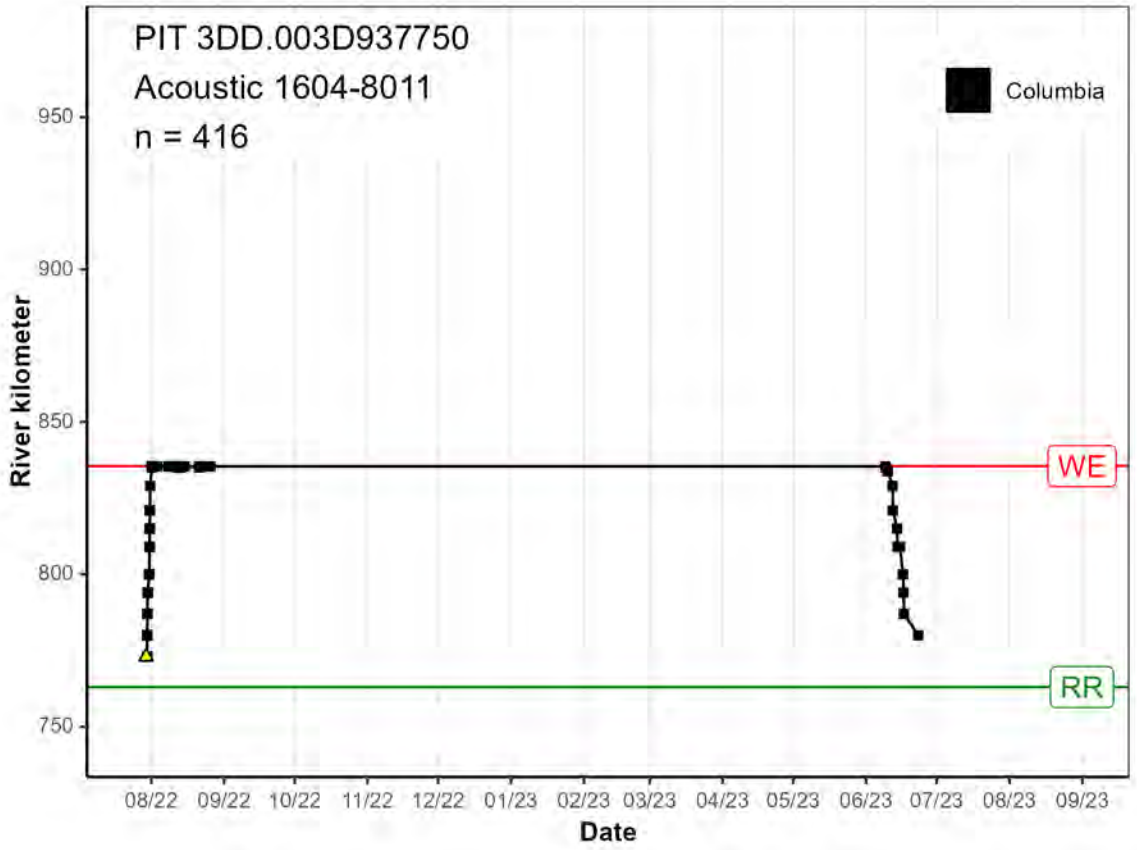

PIT 3DD.003D937775
Acoustic 1604-8006
n = 132
Columbia
Methow
Chewuch
River kilometer
1000
900
800
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

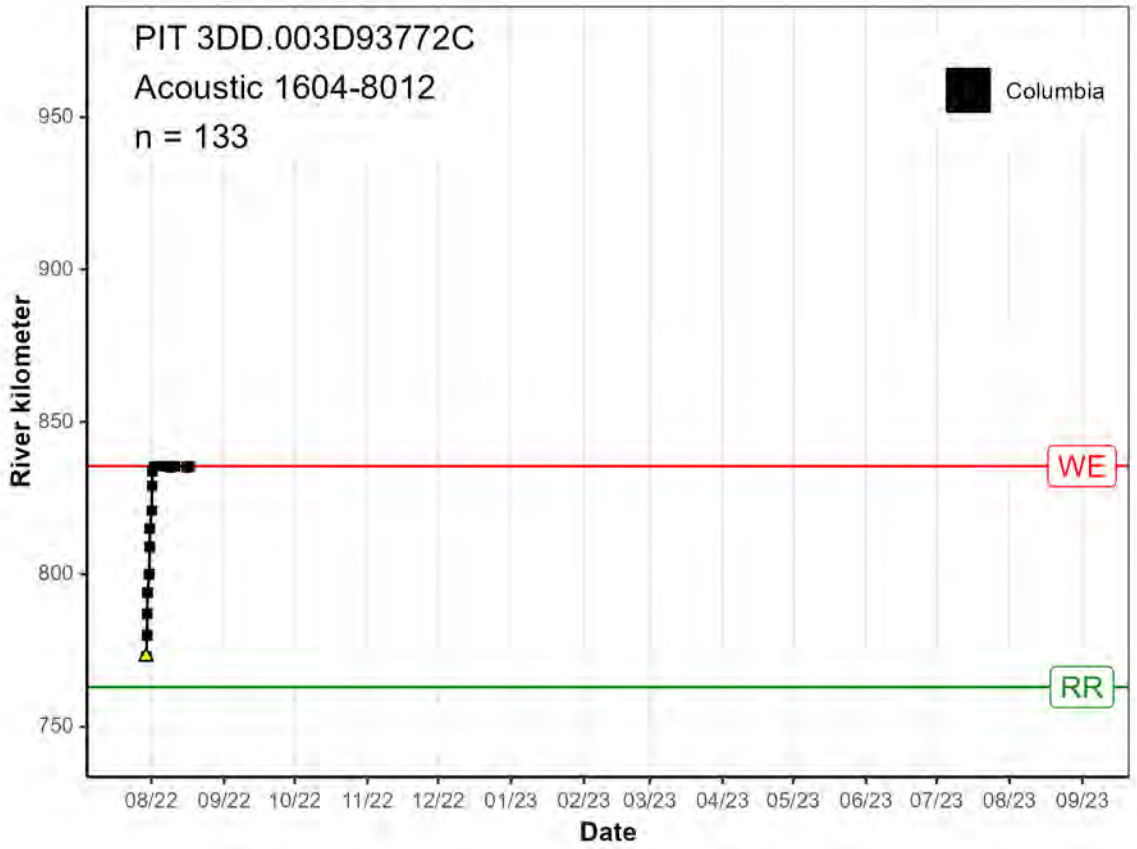

PIT 3DD.003D93776F
Acoustic 1604-8007
n = 108
Columbia
Methow
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

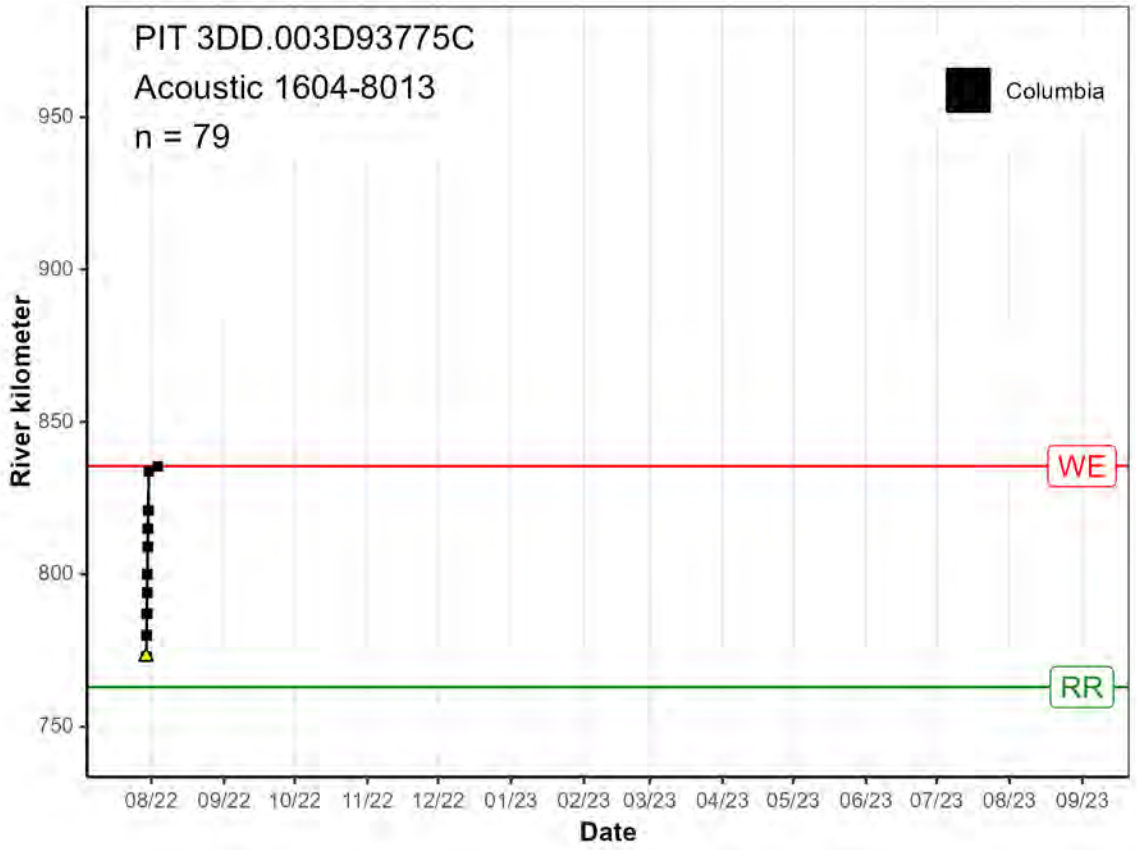

PIT 3DD.003D93773A
Acoustic 1604-8008
n = 882
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

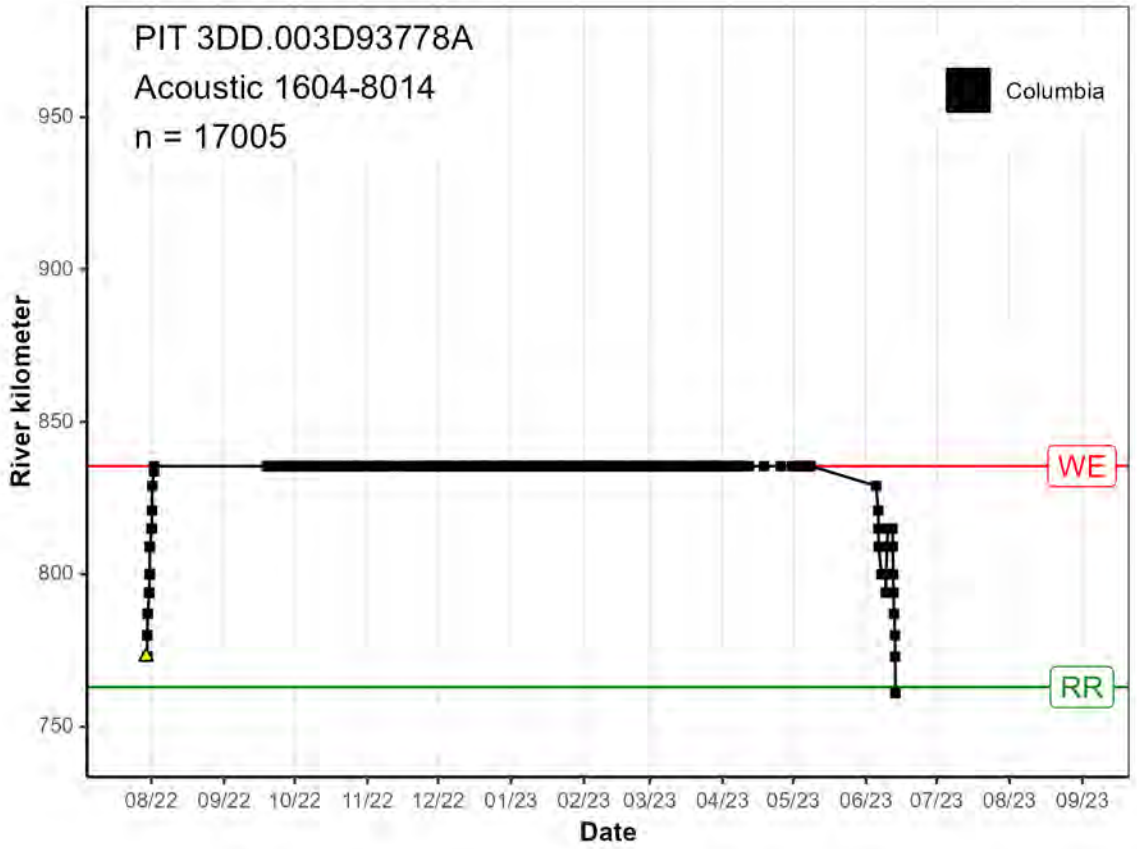

PIT 3DD.003D937735
Acoustic 1604-8009
n = 57
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

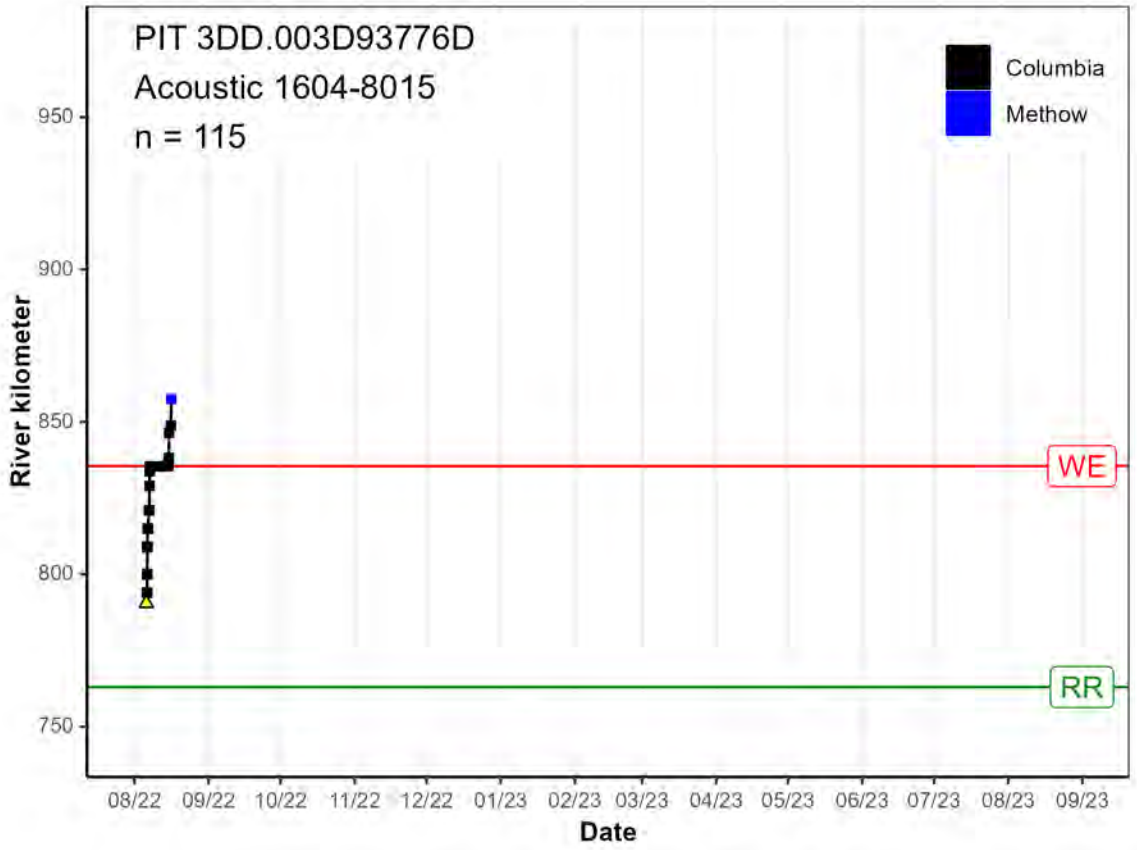

PIT 3DD.003D93774D
Acoustic 1604-8010
n = 1302
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

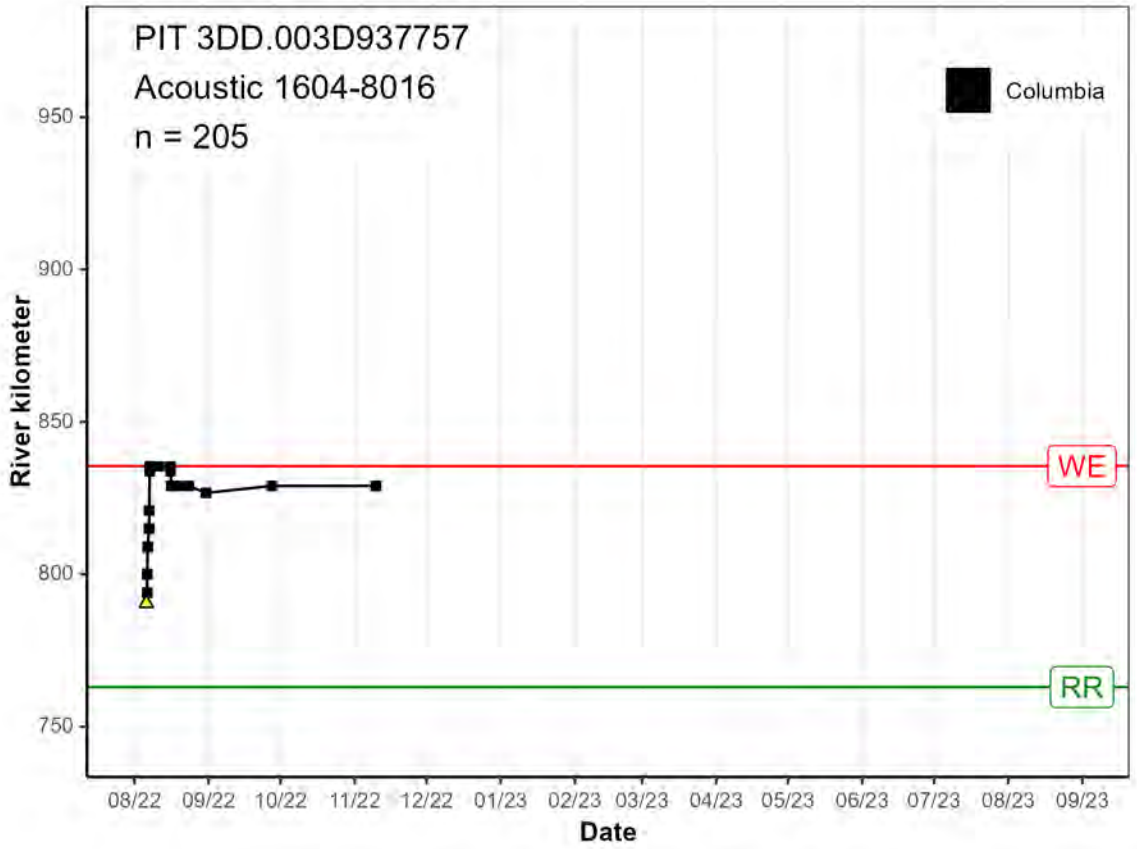

PIT 3DD.003D937750
Acoustic 1604-8011
n = 416
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

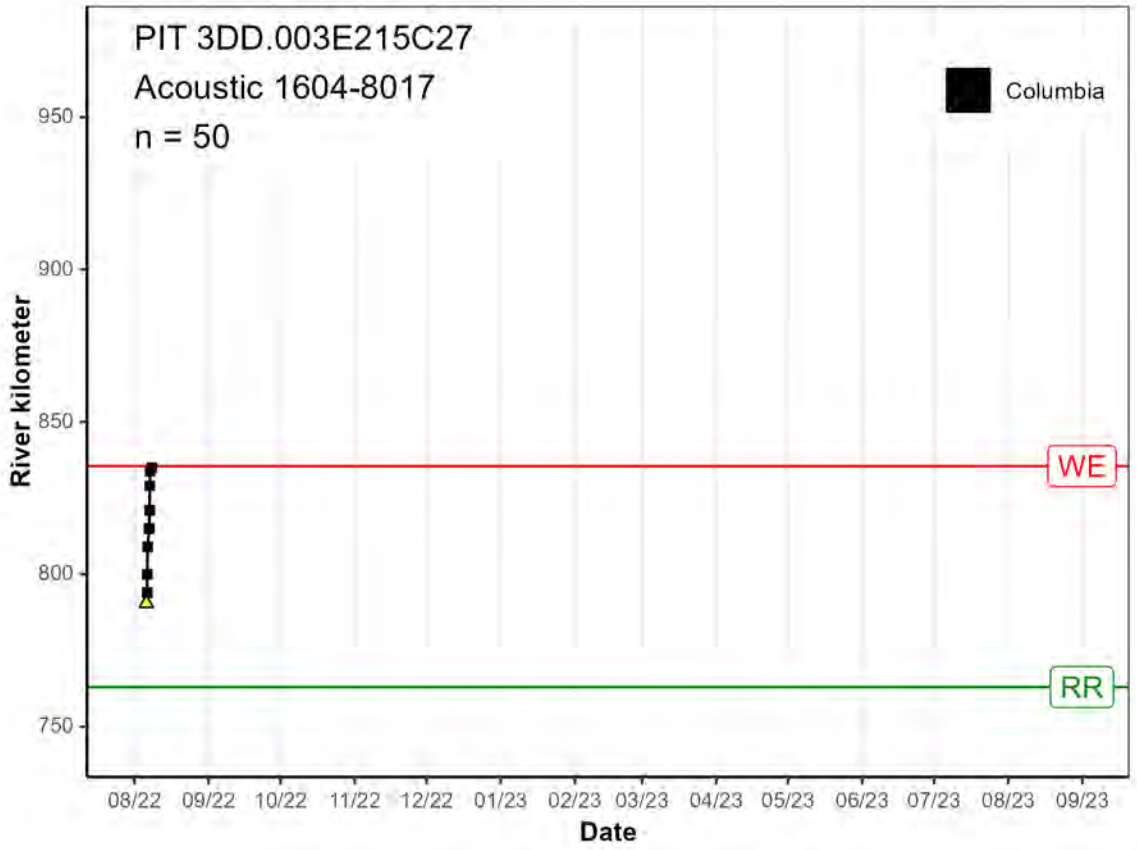

PIT 3DD.003D93772C
Acoustic 1604-8012
n = 133
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

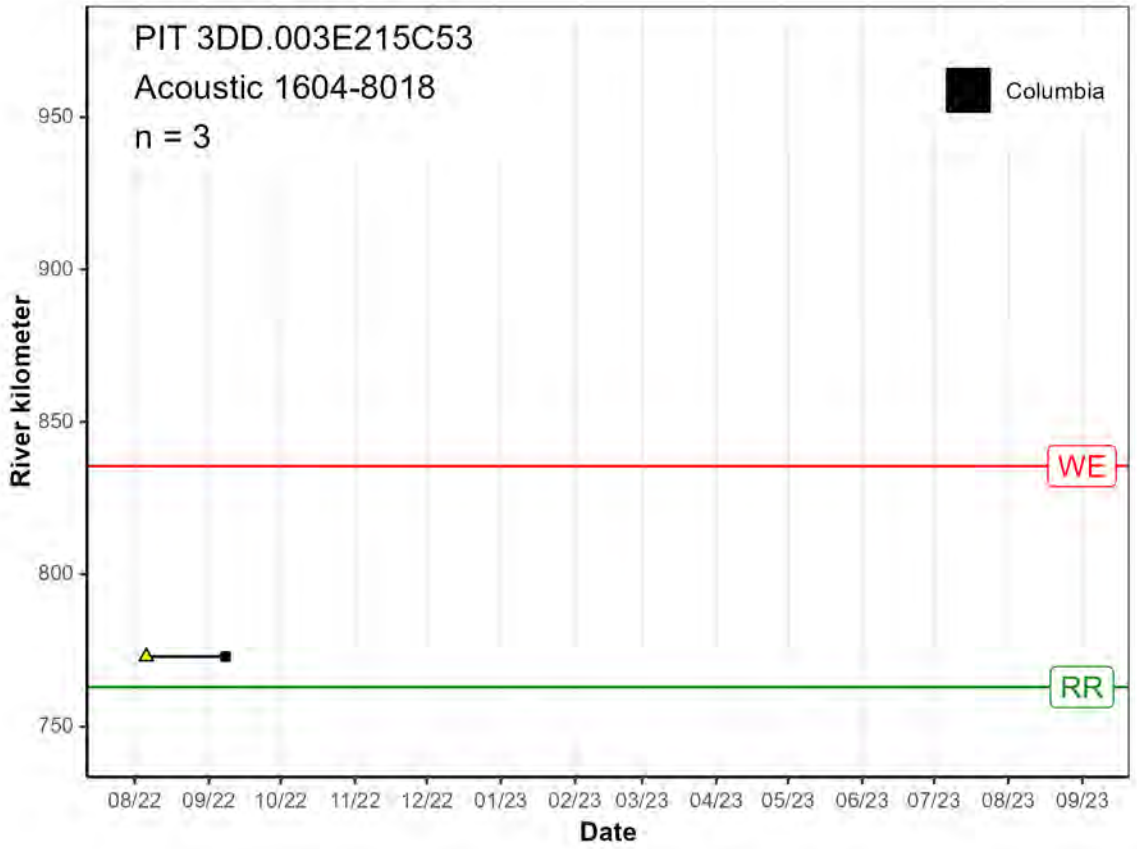

PIT 3DD.003D93775C
Acoustic 1604-8013
n = 79
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

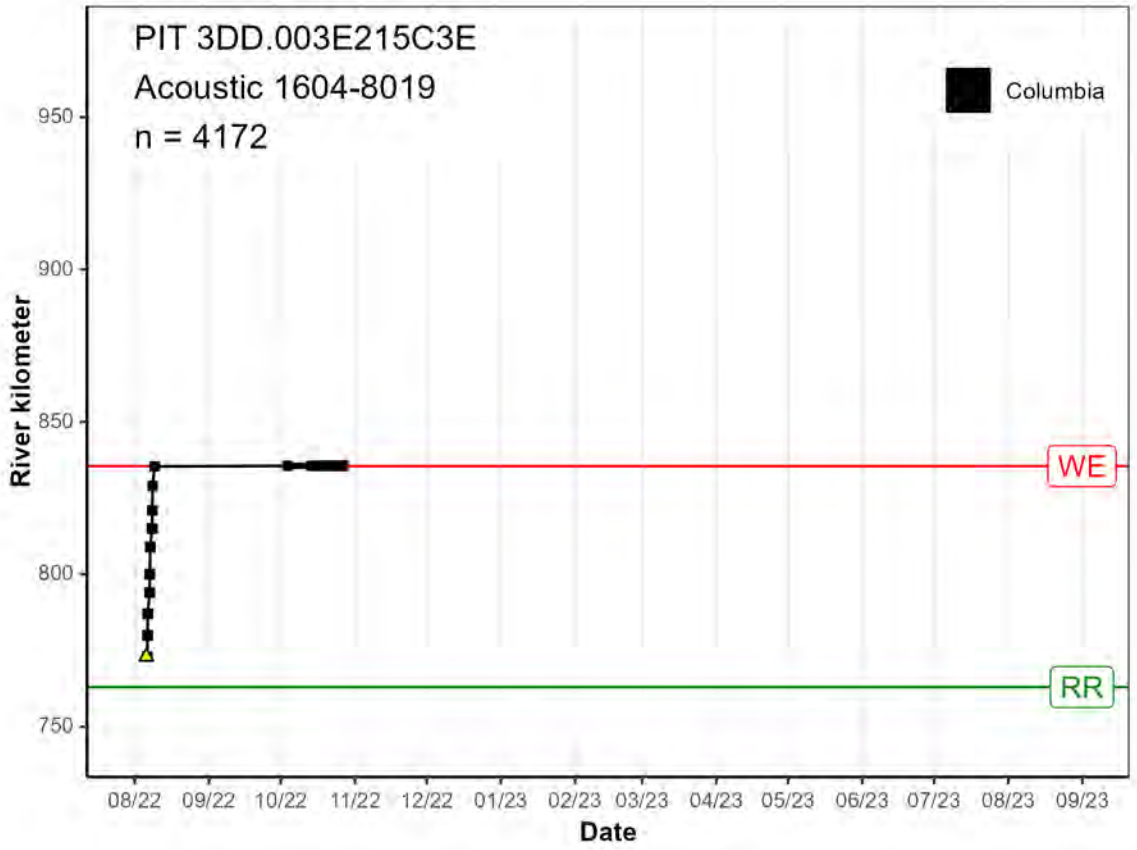

PIT 3DD.003D93778A
Acoustic 1604-8014
n = 17005
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

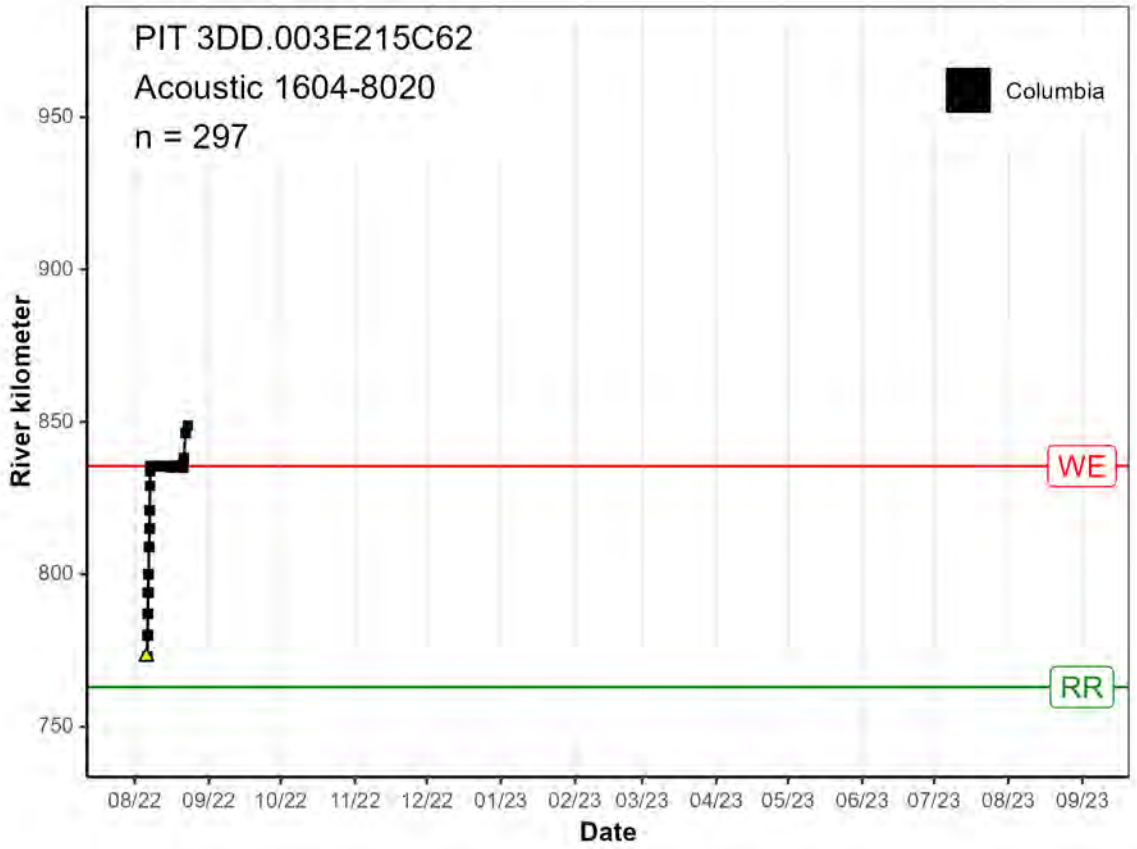

PIT 3DD.003D93776D
Acoustic 1604-8015
n = 115
Columbia
Methow
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

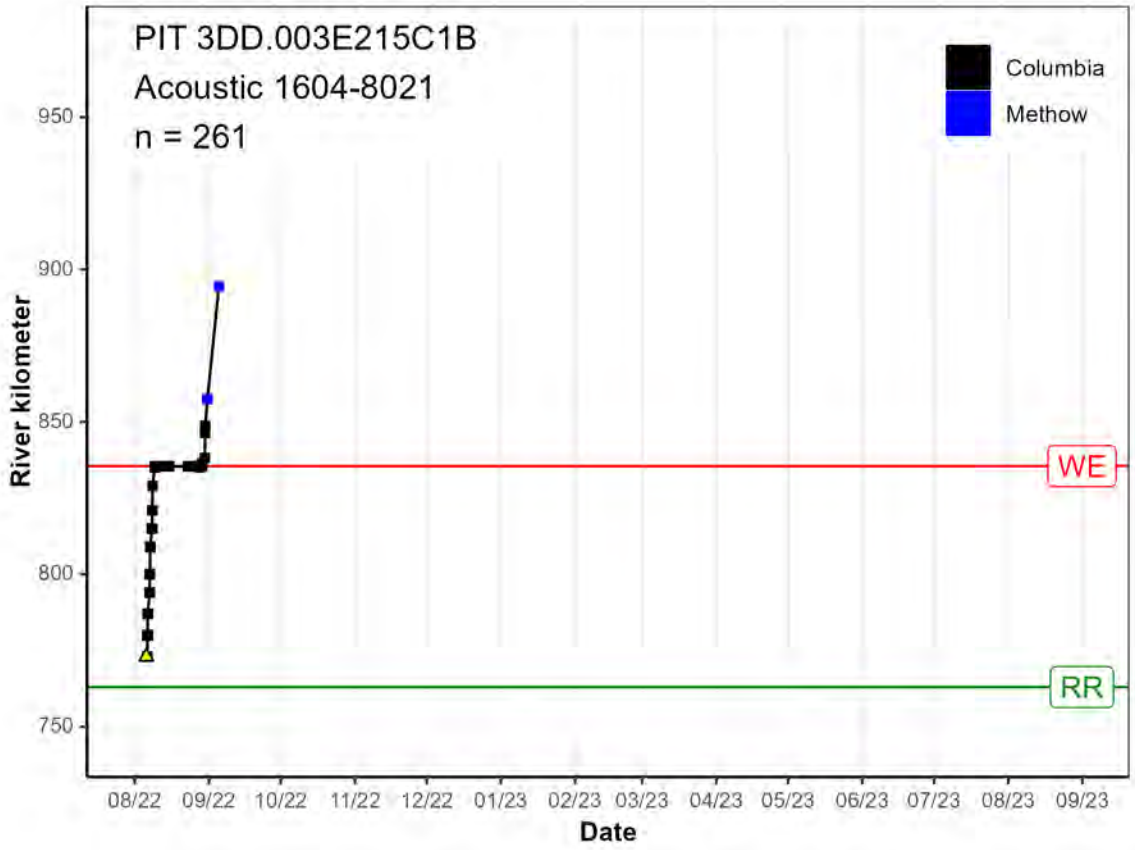

PIT 3DD.003D937757
Acoustic 1604-8016
n = 205
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date


PIT 3DD.003E215C27
Acoustic 1604-8017
n = 50
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

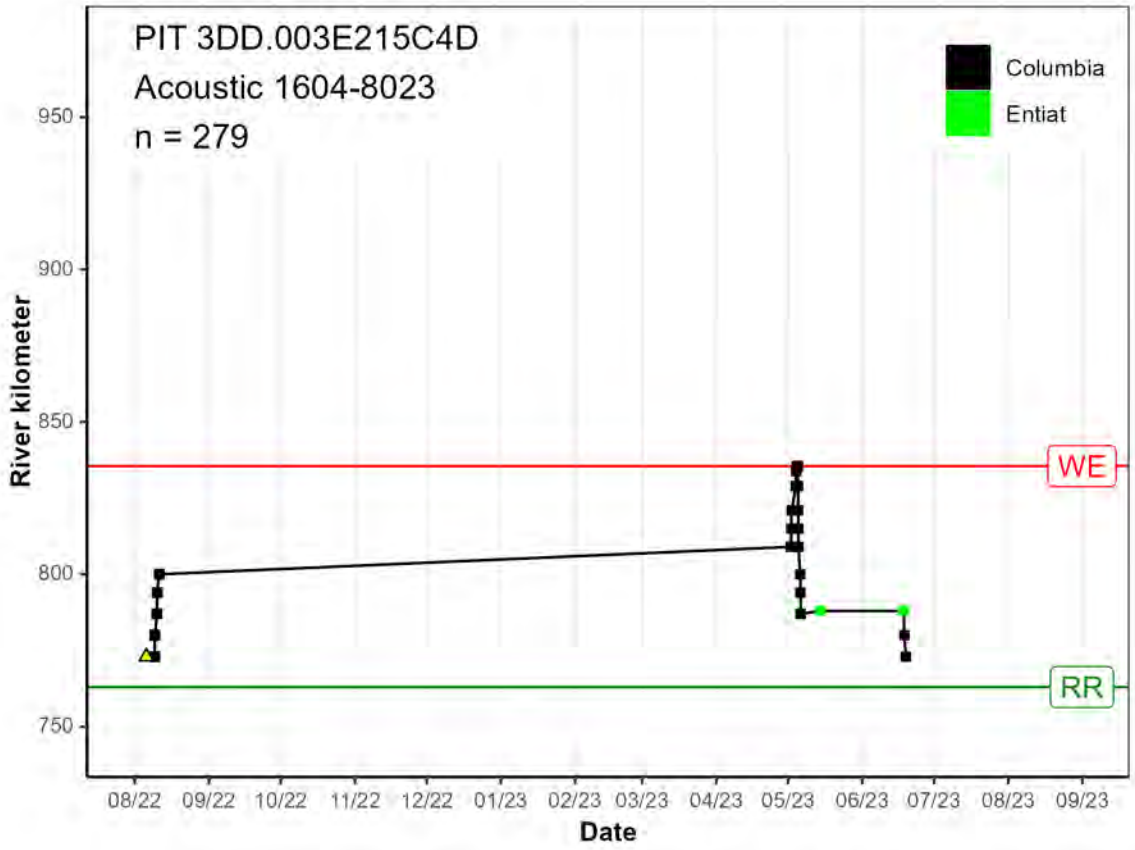

PIT 3DD.003E215C53
Acoustic 1604-8018
n = 3
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

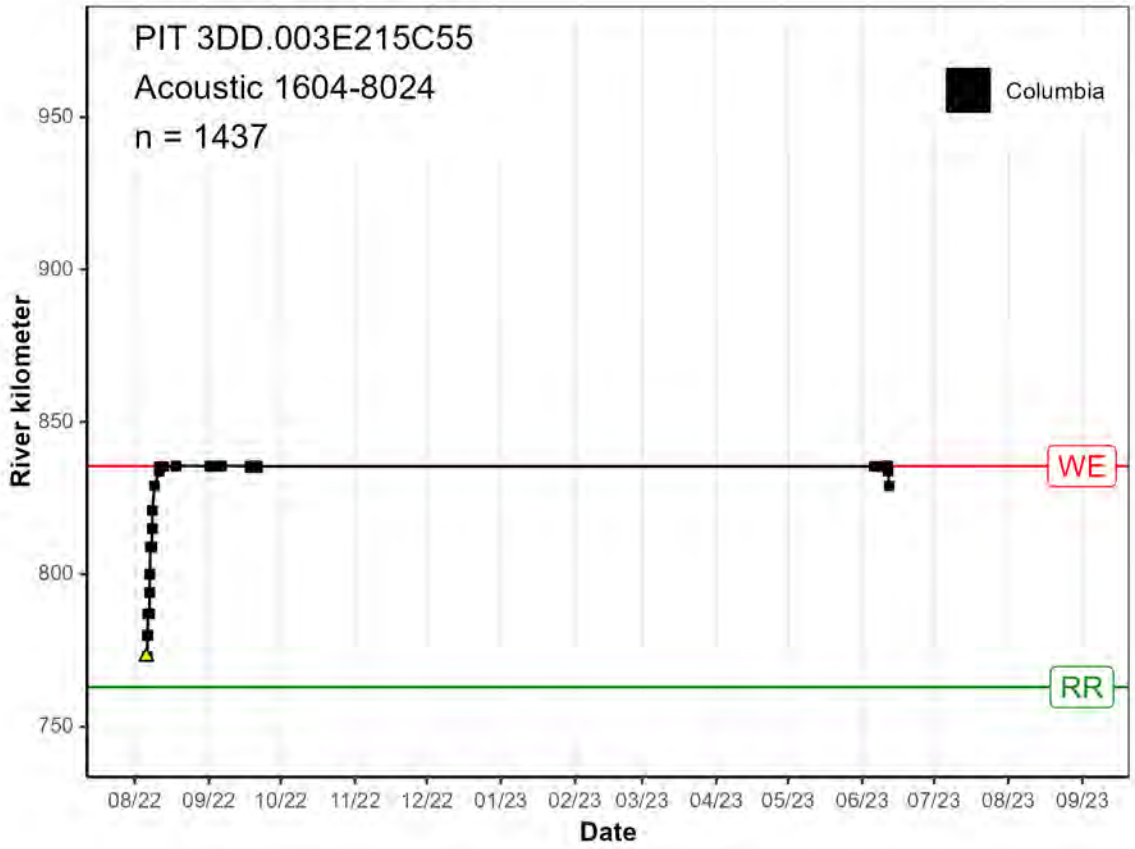

PIT 3DD.003E215C3E
Acoustic 1604-8019
n = 4172
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

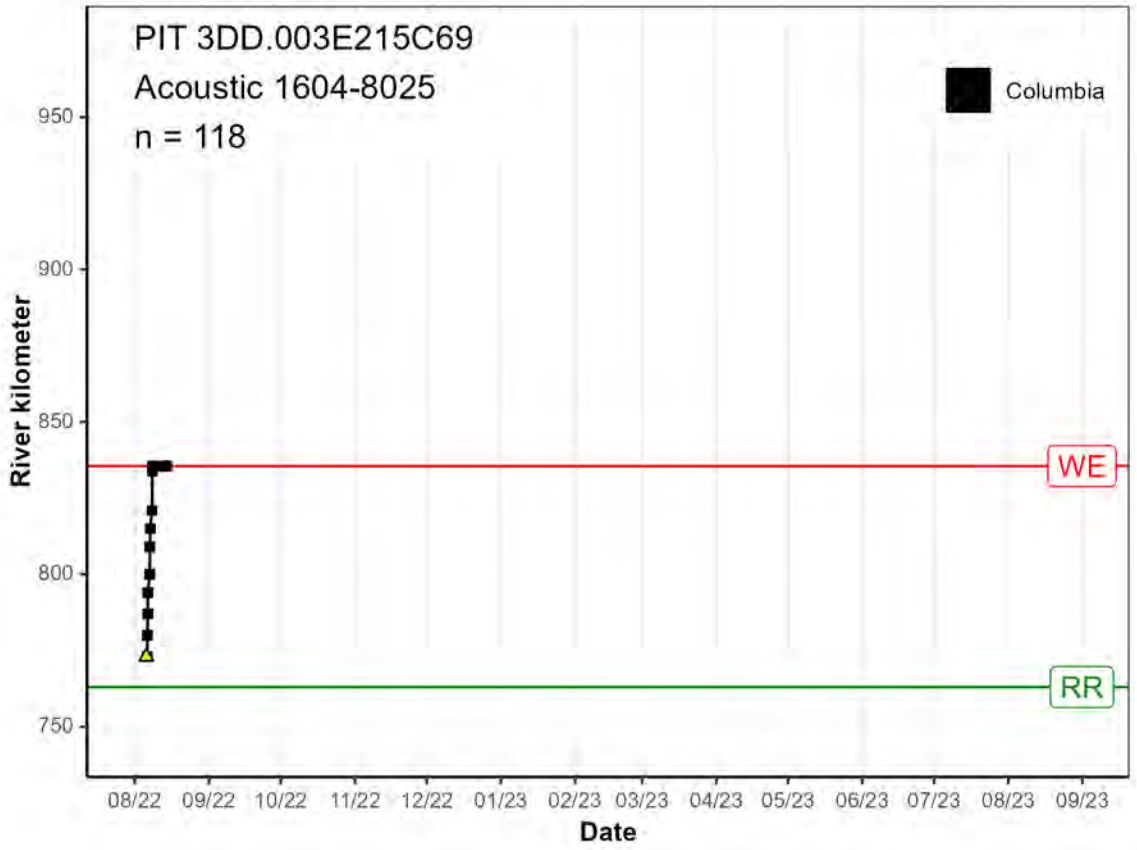

PIT 3DD.003E215C62
Acoustic 1604-8020
n = 297
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

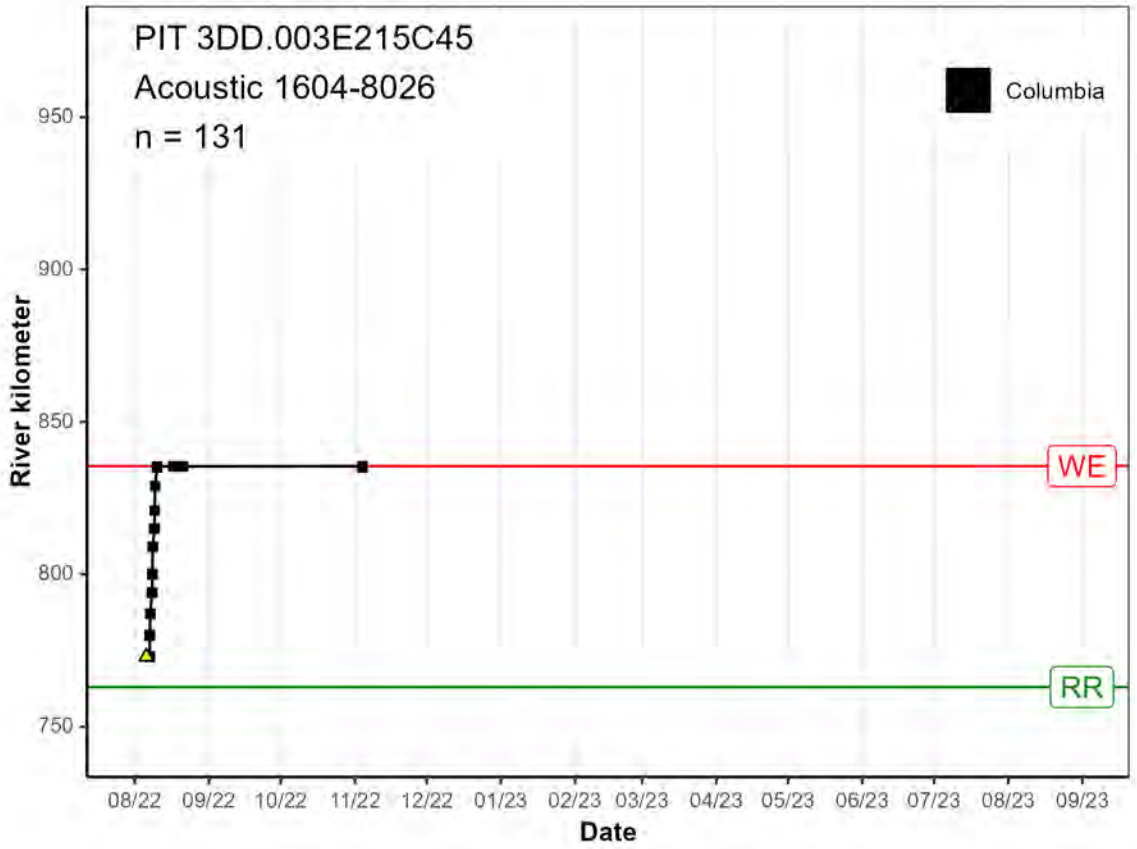

PIT 3DD.003E215C1B
Acoustic 1604-8021
n = 261
Columbia
Methow
WE
RR
River kilometer
950
900
850
800
750
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

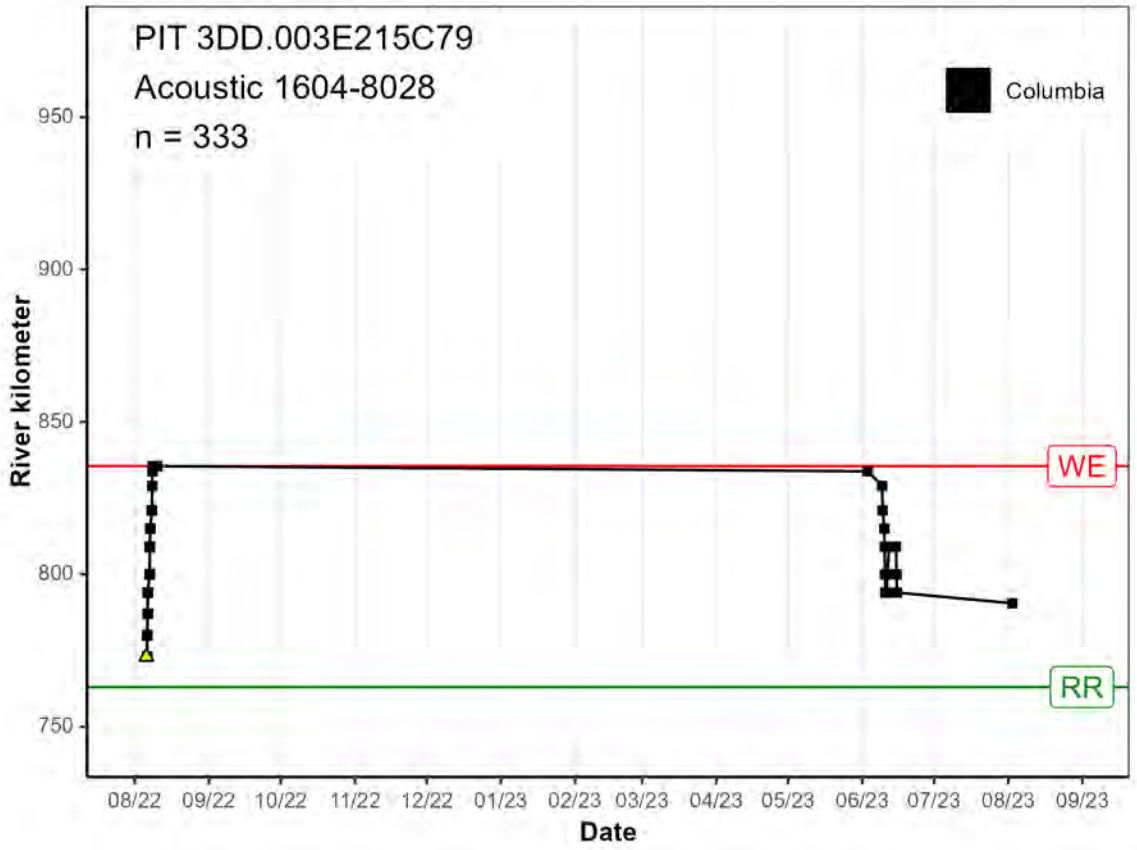
PIT 3DD.003E215C20
Acoustic 1604-8022
n = 2260
Columbia
Entiat
WE
RR
River kilometer
950
900
850
800
750
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

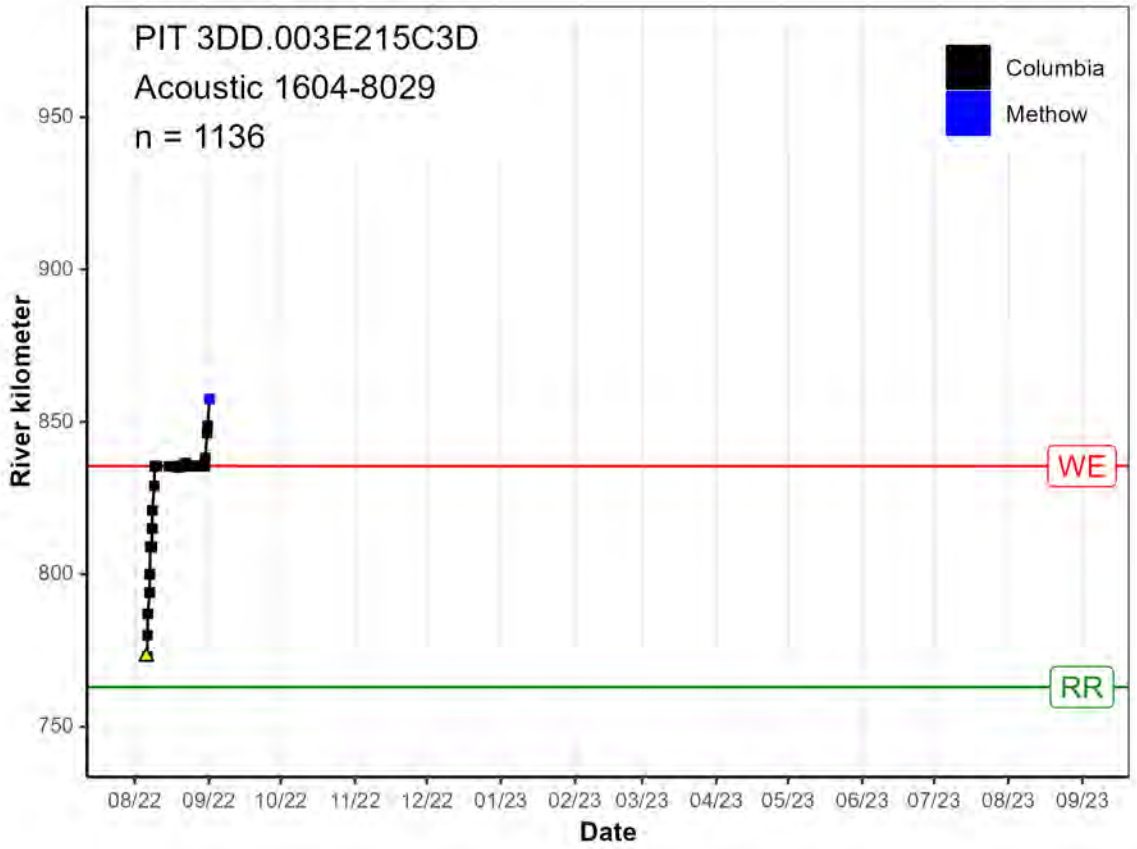

PIT 3DD.003E215C4D
Acoustic 1604-8023
n = 279
Columbia
Entiat
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

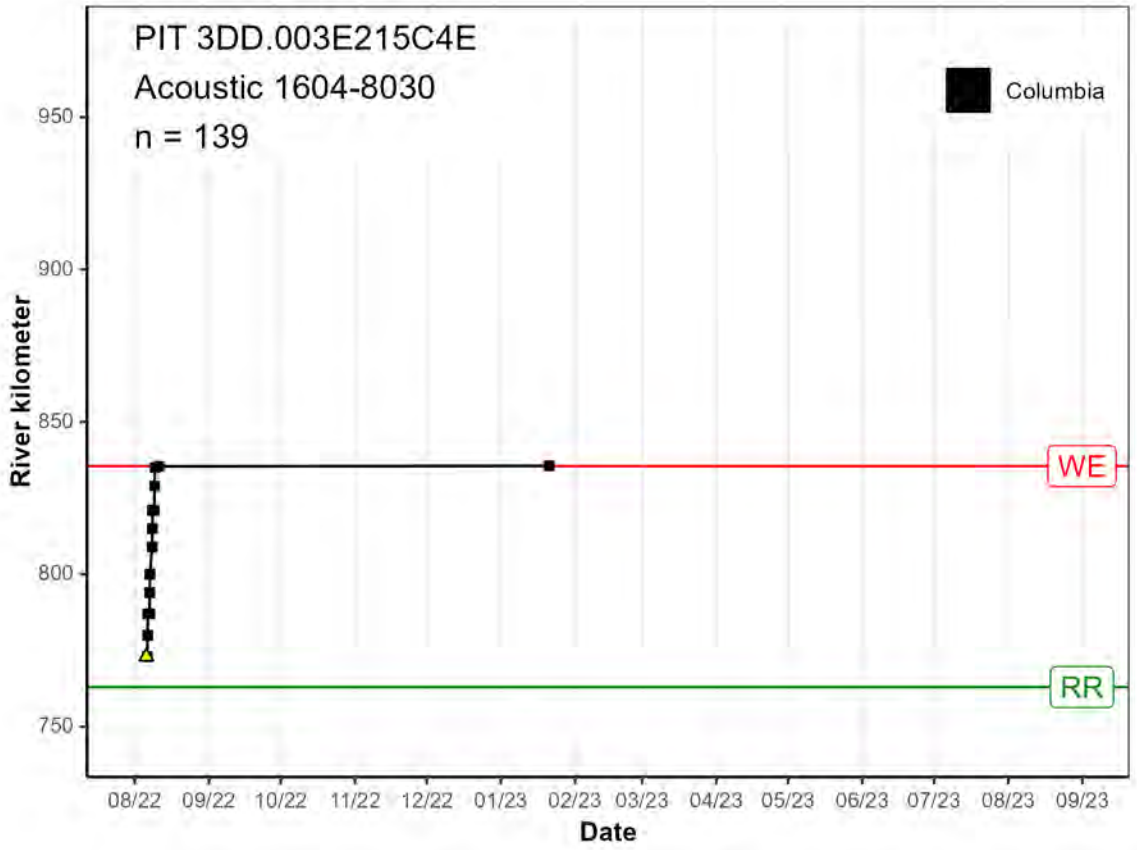

PIT 3DD.003E215C55
Acoustic 1604-8024
n = 1437
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

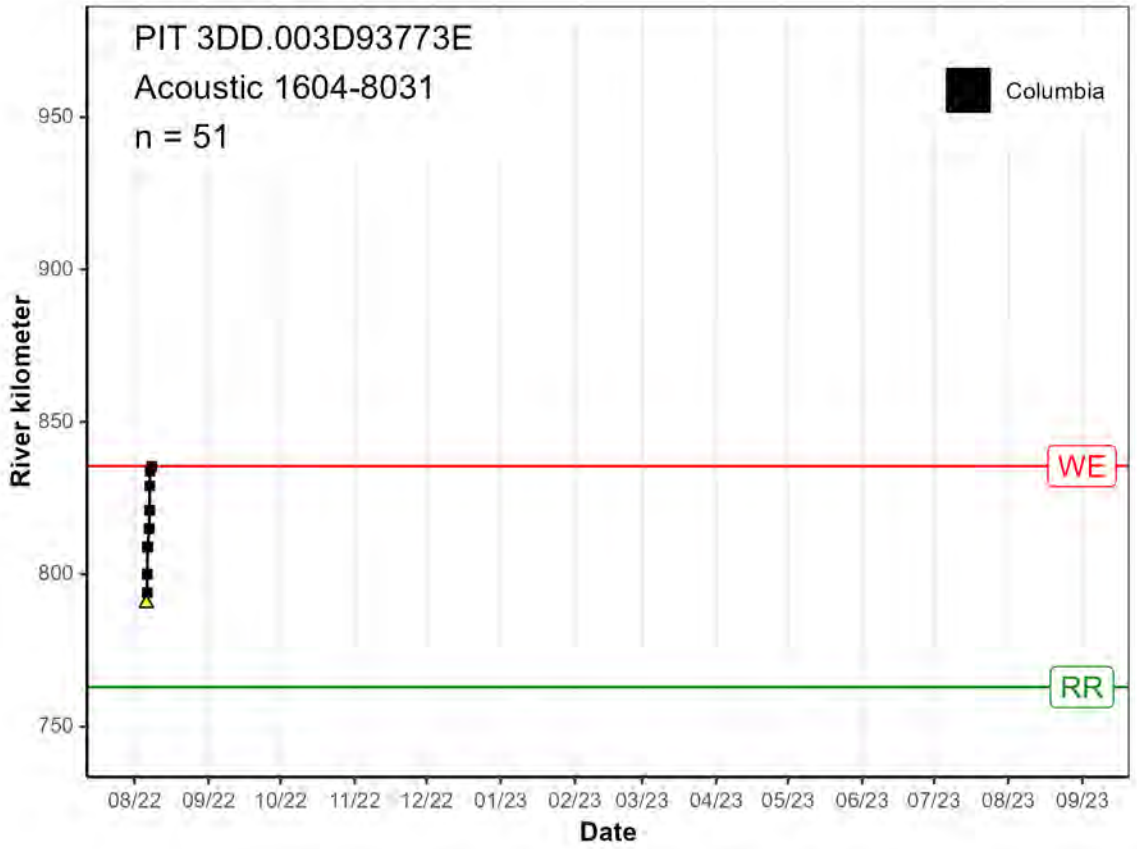

PIT 3DD.003E215C69
Acoustic 1604-8025
n = 118
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

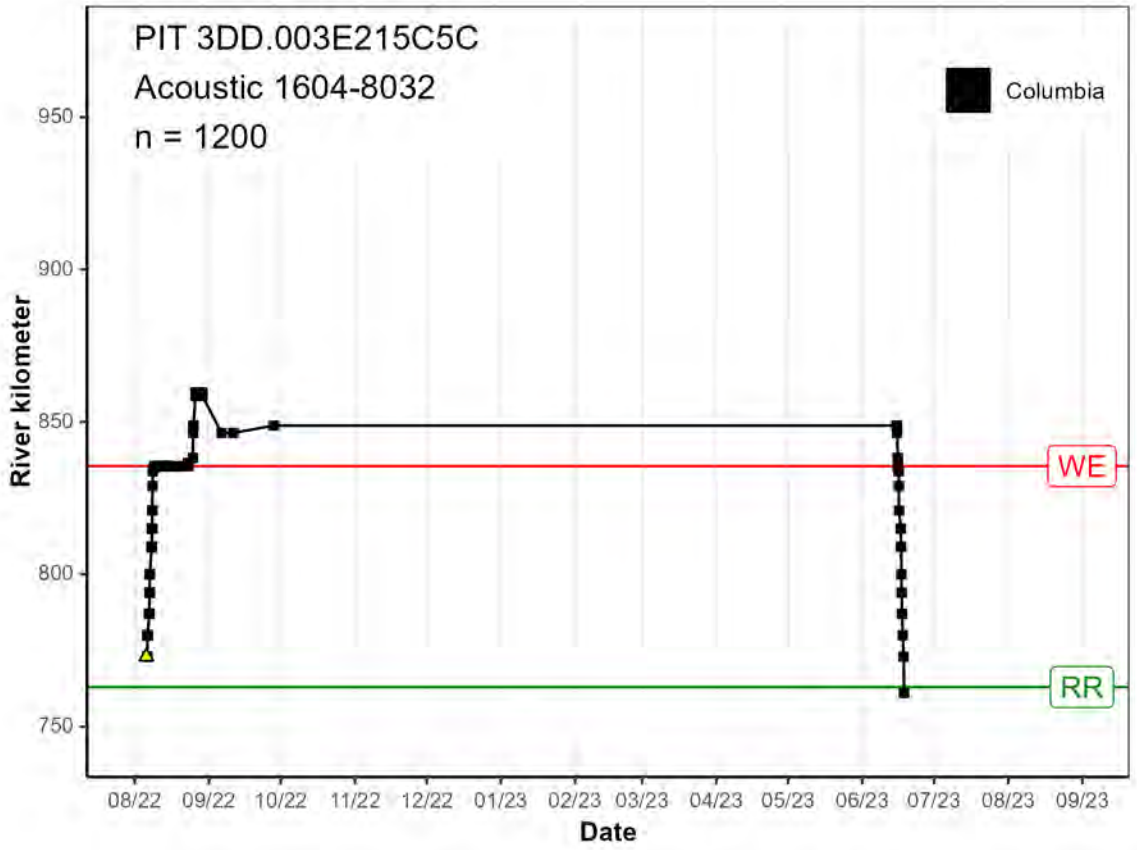

PIT 3DD.003E215C45
Acoustic 1604-8026
n = 131
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

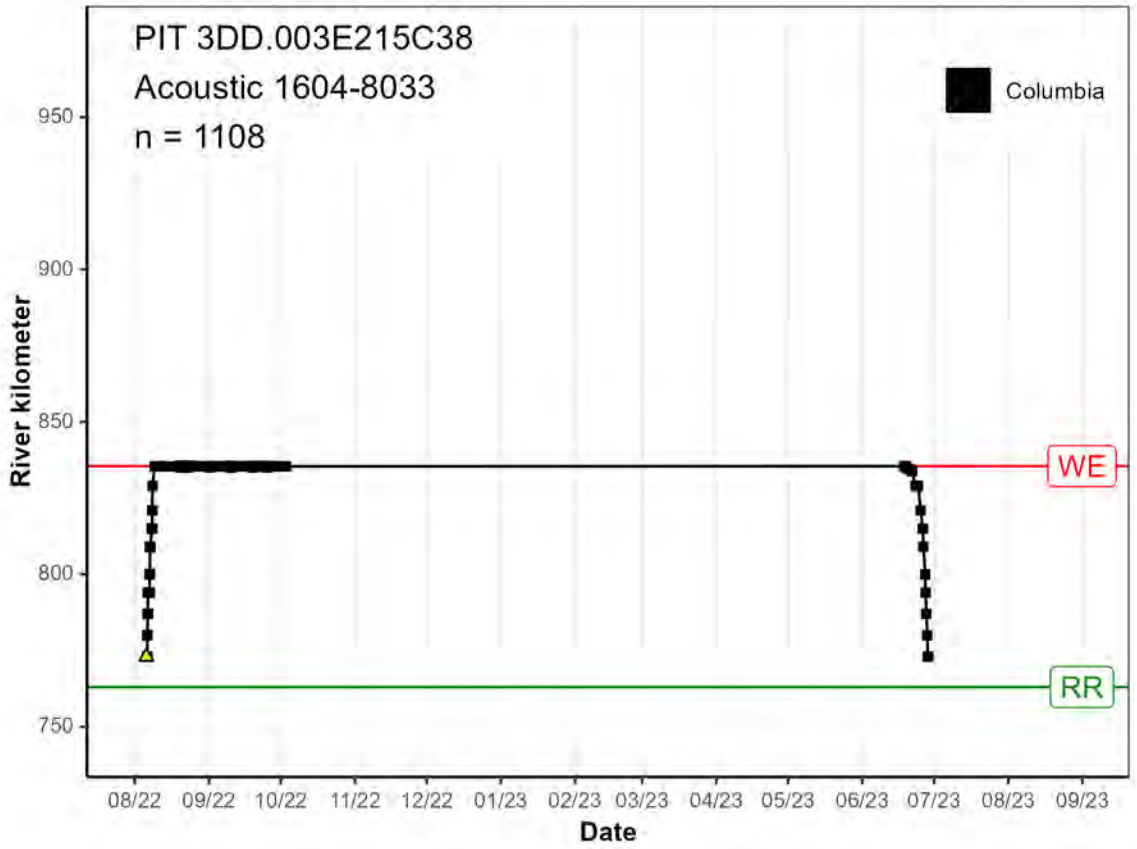

PIT 3DD.003E215C79
Acoustic 1604-8028
n = 333
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

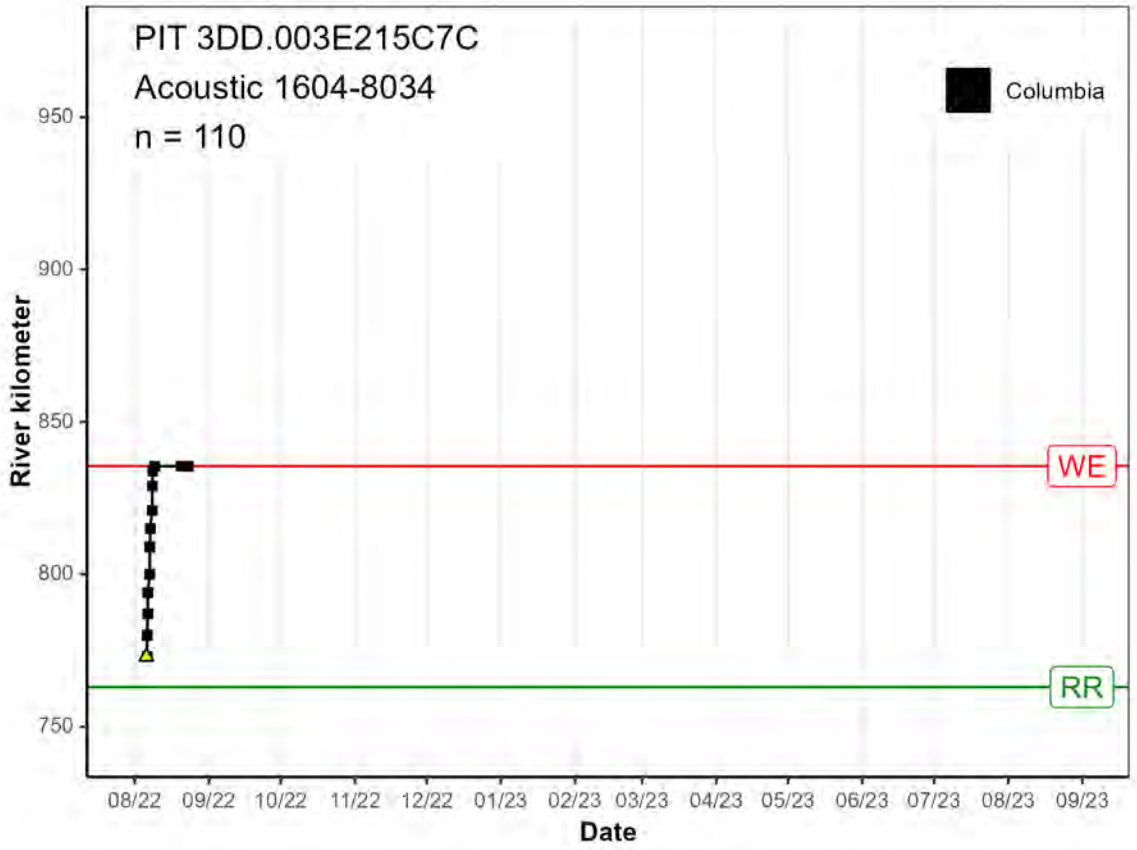

PIT 3DD.003E215C3D
Acoustic 1604-8029
n = 1136
Columbia
Methow
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

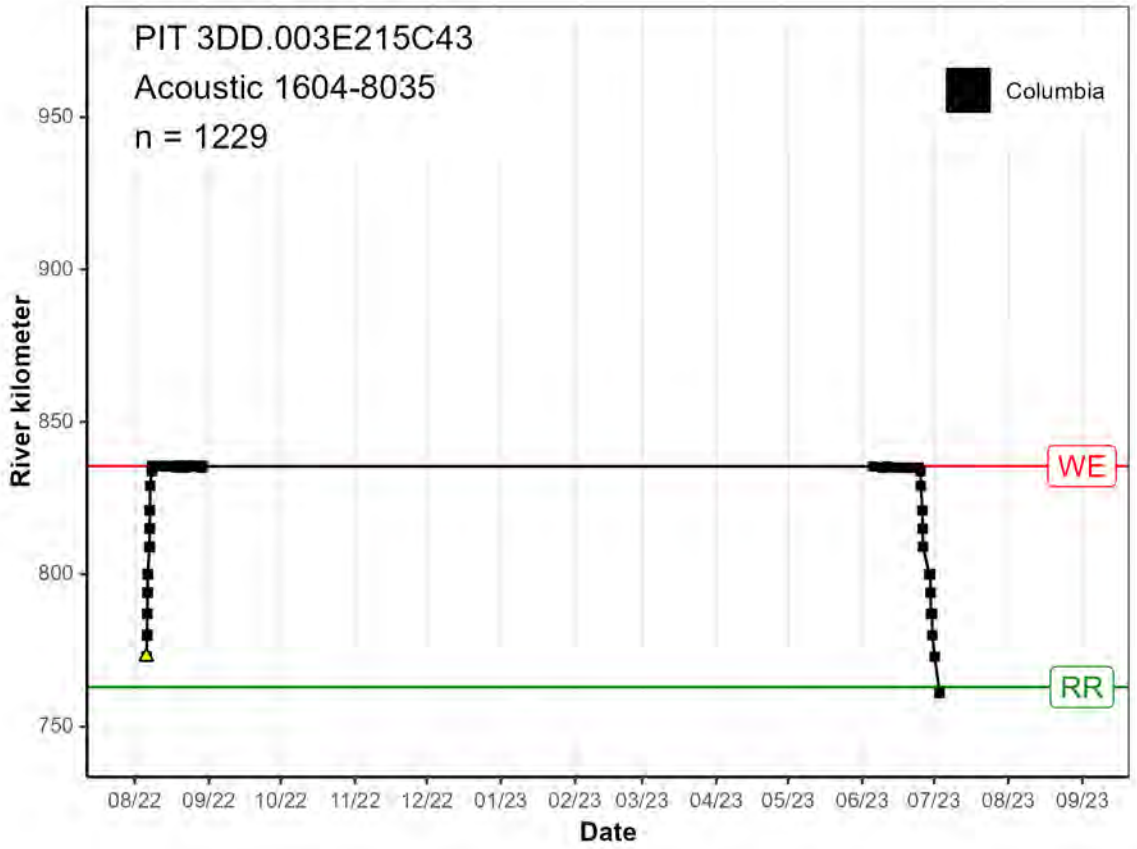

PIT 3DD.003E215C4E
Acoustic 1604-8030
n = 139
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

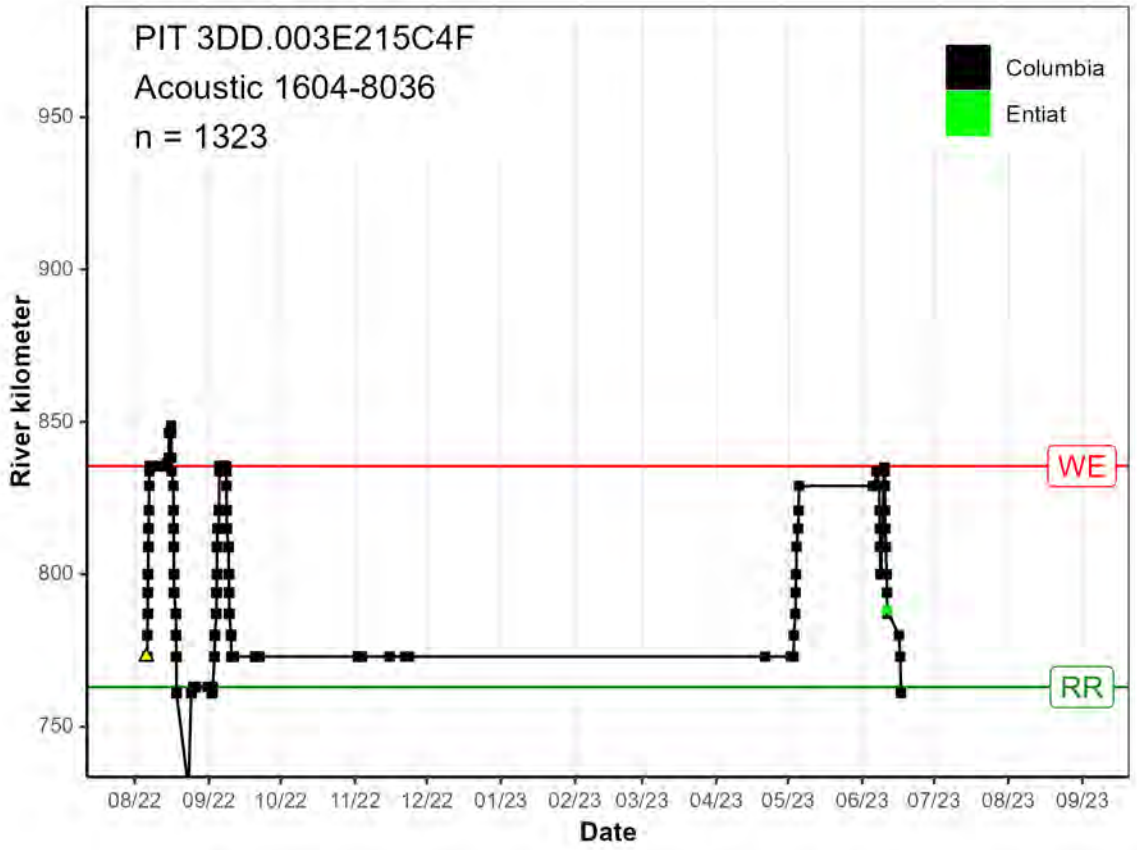

PIT 3DD.003D93773E
Acoustic 1604-8031
n = 51
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

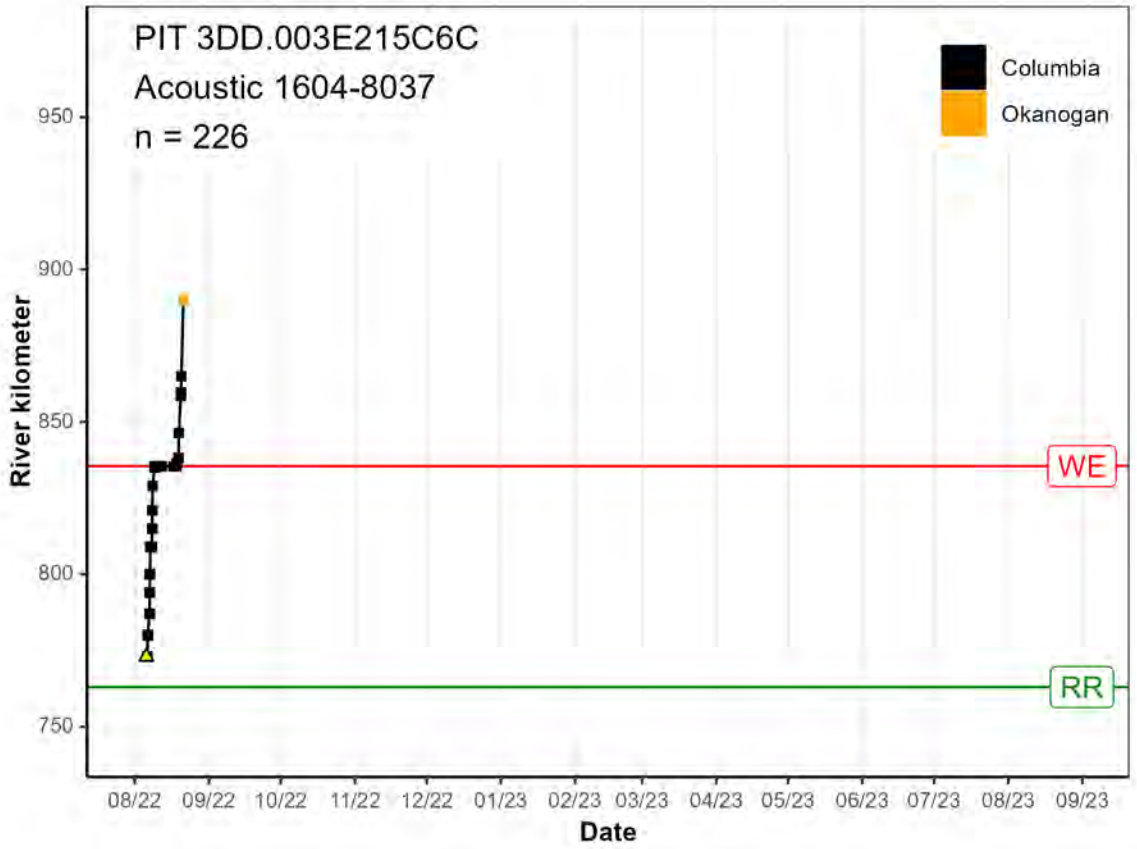

PIT 3DD.003E215C5C
Acoustic 1604-8032
n = 1200
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

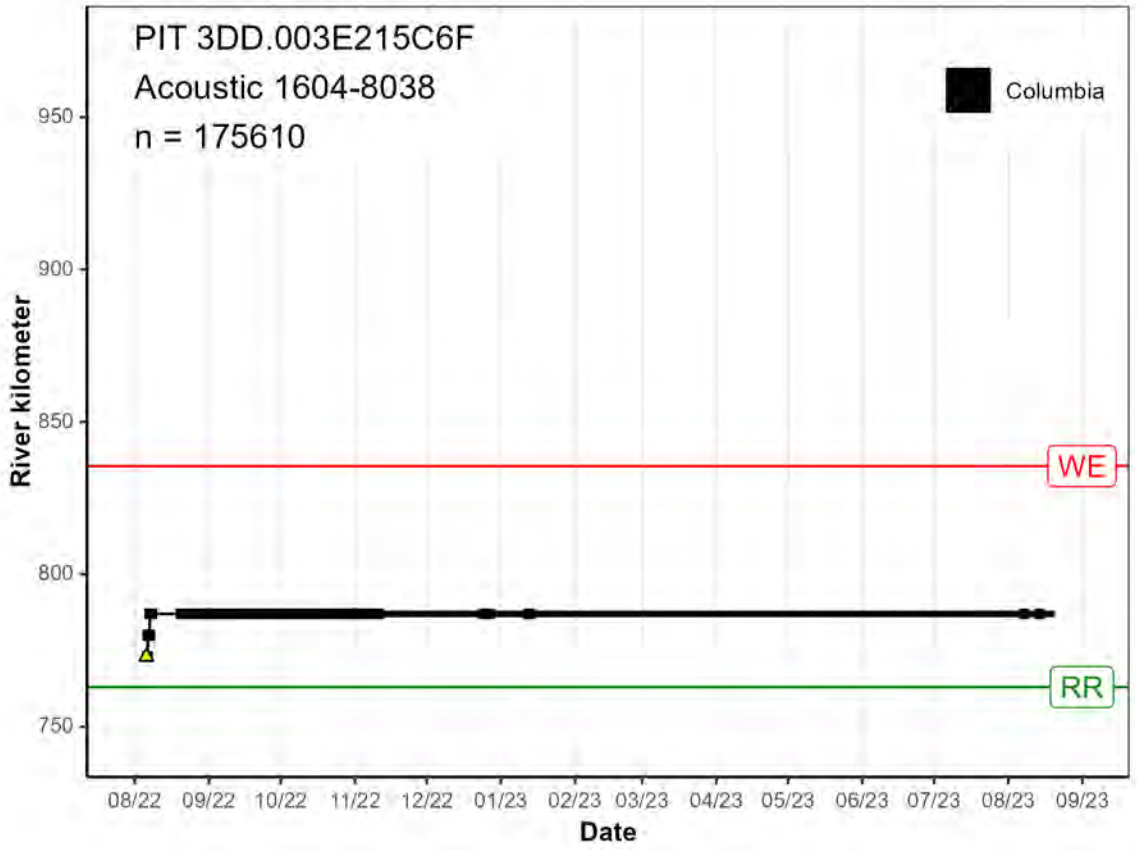

PIT 3DD.003E215C38
Acoustic 1604-8033
n = 1108
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

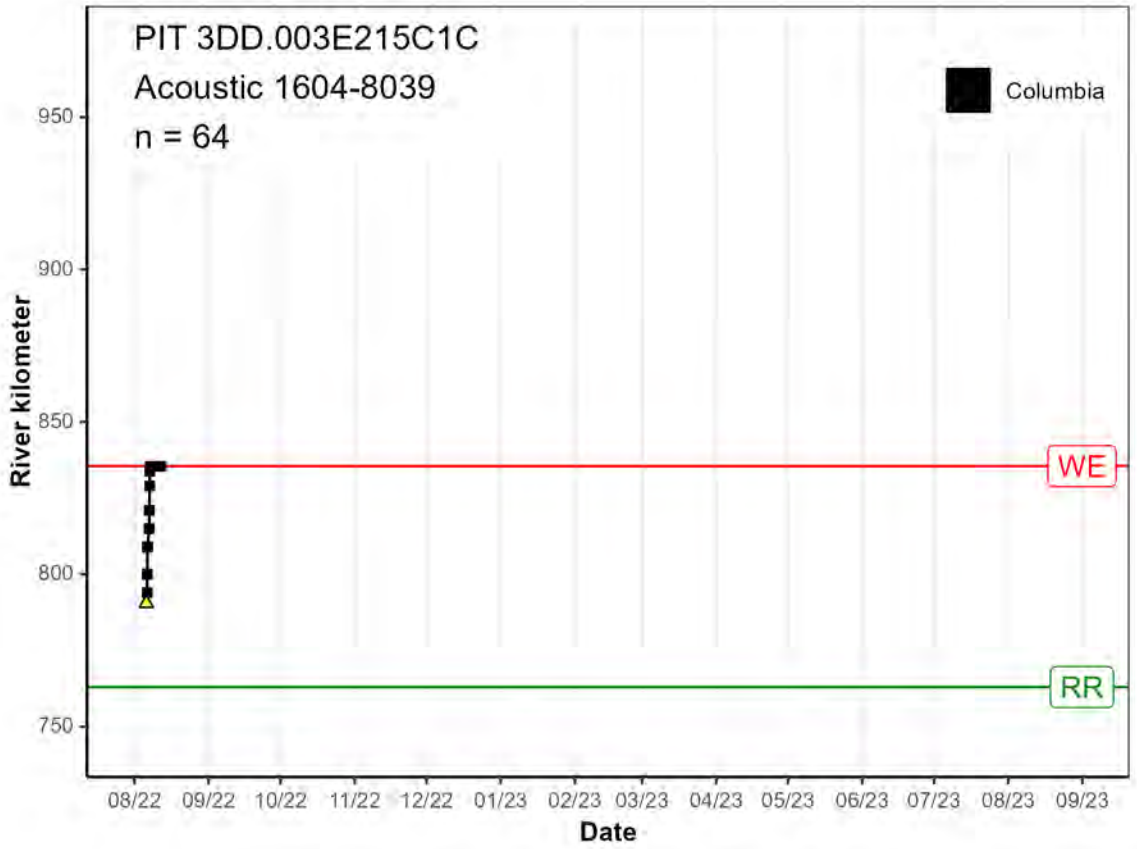

PIT 3DD.003E215C7C
Acoustic 1604-8034
n = 110
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

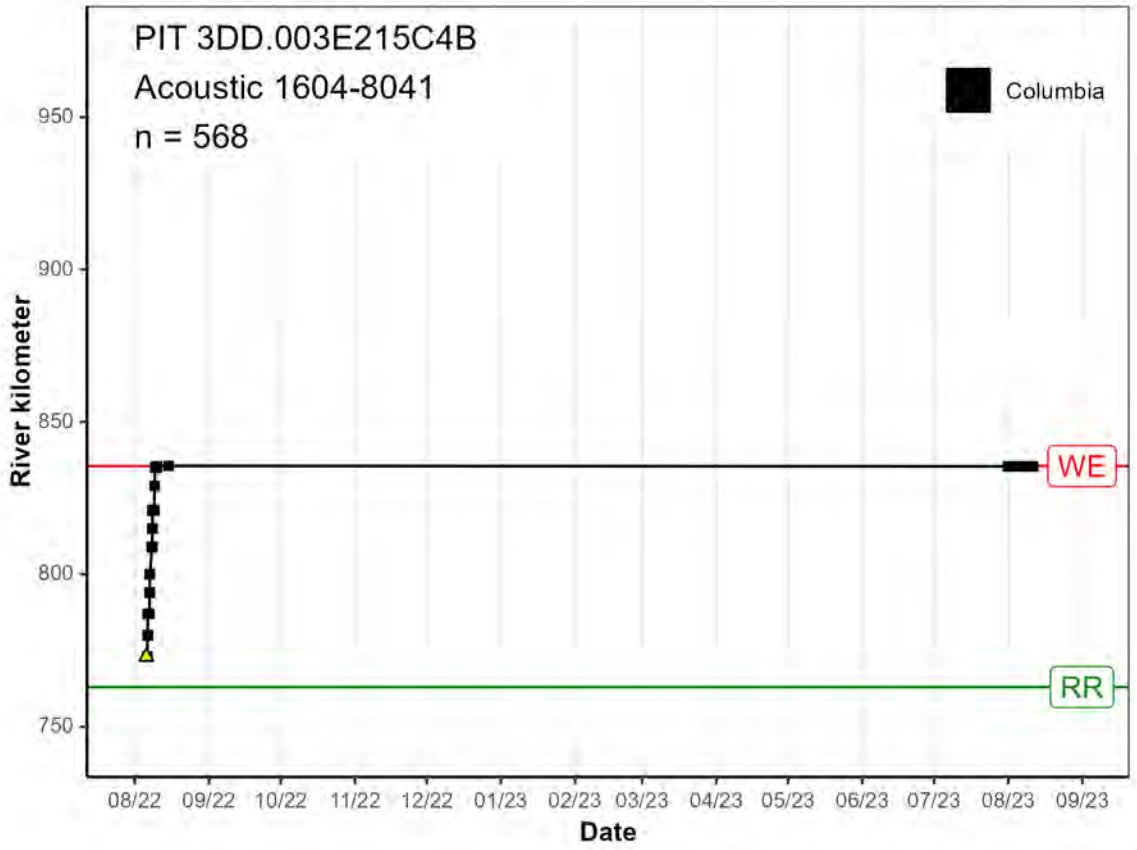

PIT 3DD.003E215C43
Acoustic 1604-8035
n = 1229
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date


PIT 3DD.003E215C4F
Acoustic 1604-8036
n = 1323
Columbia
Entiat
WE
RR
River kilometer
950
900
850
800
750
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

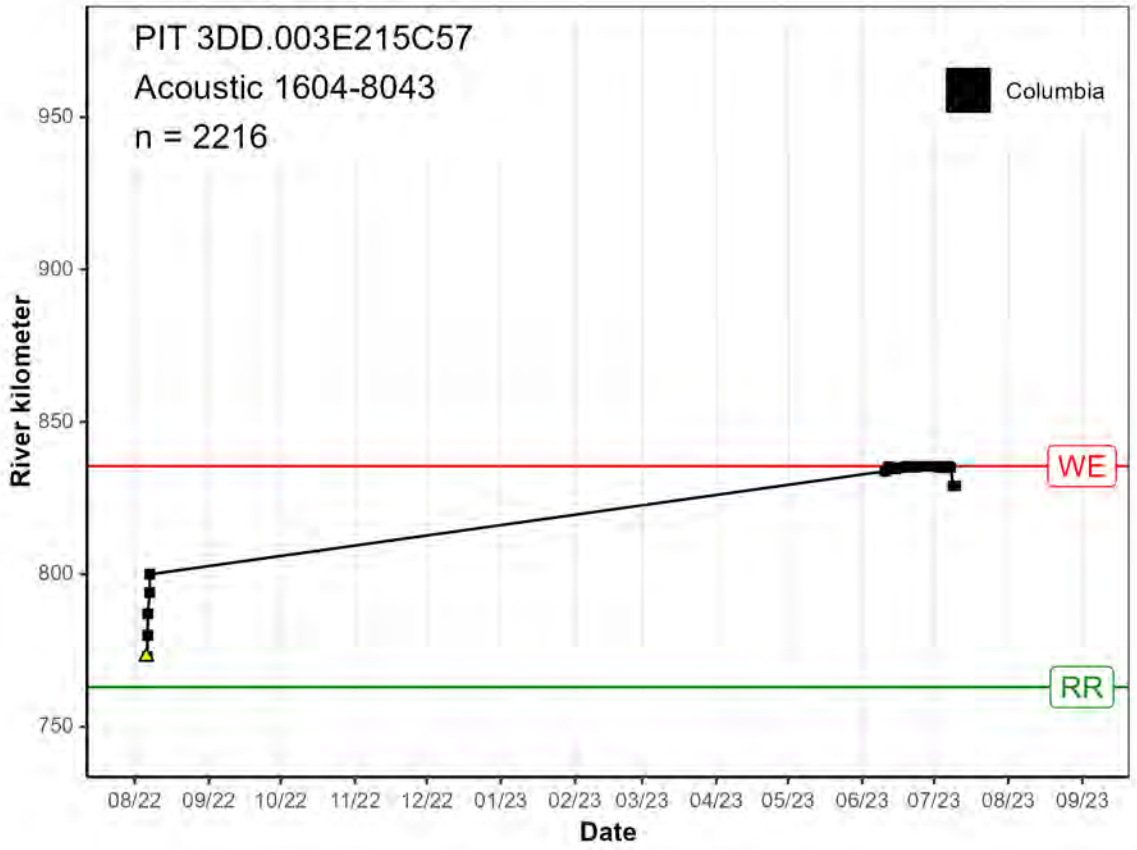

PIT 3DD.003E215C6C
Acoustic 1604-8037
n = 226
Columbia
Okanogan
WE
RR
River kilometer
950
900
850
800
750
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

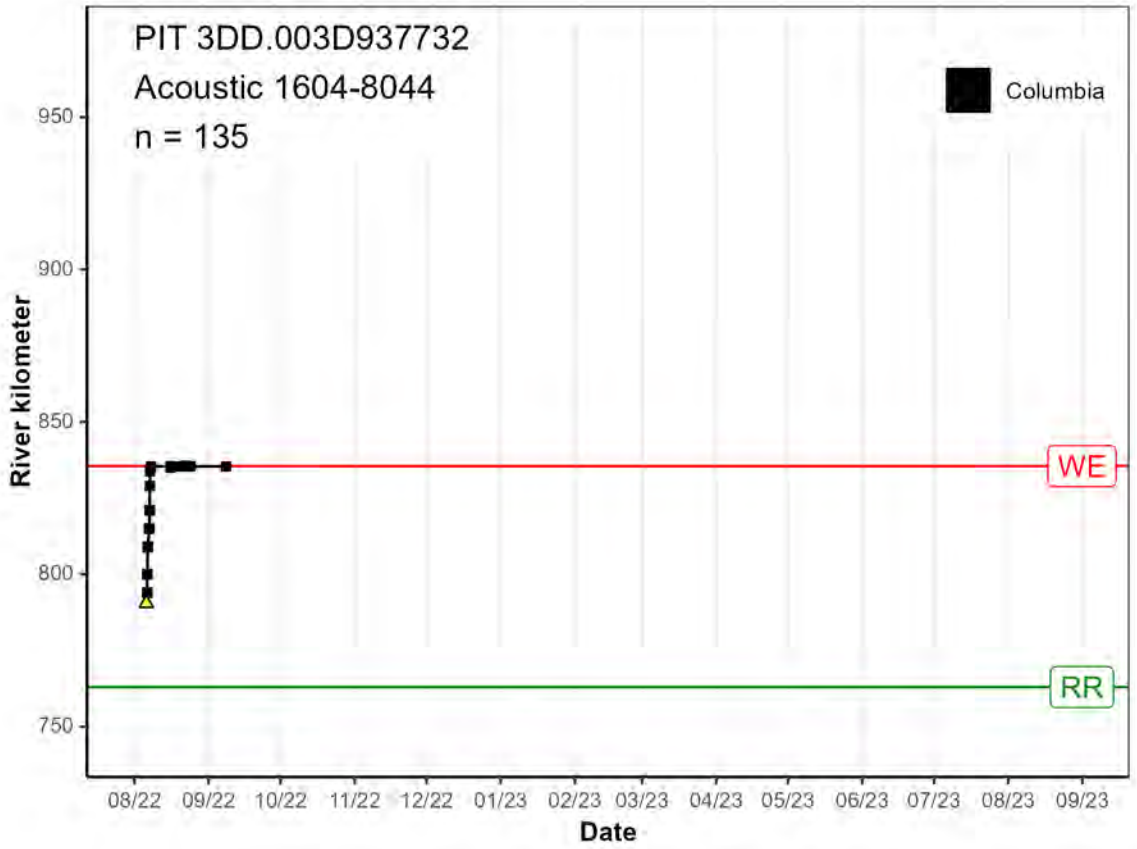

PIT 3DD.003E215C6F
Acoustic 1604-8038
n = 175610
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

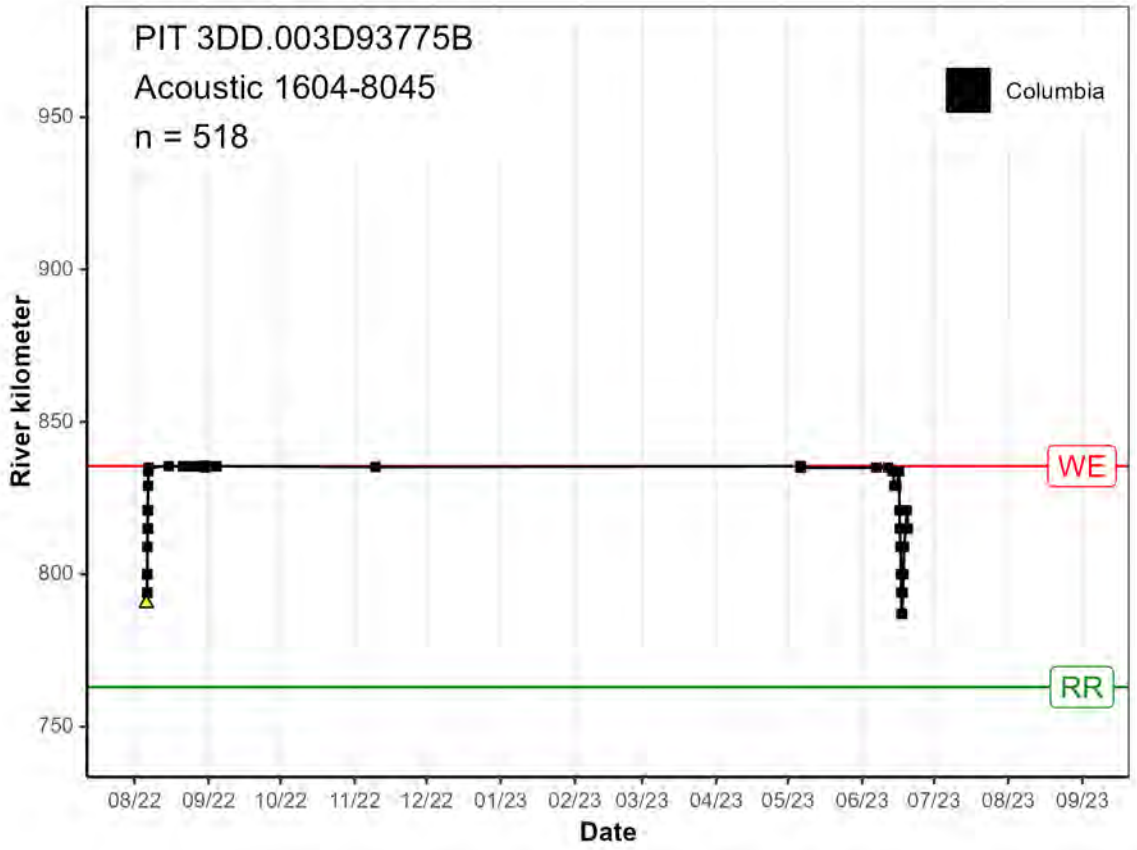

PIT 3DD.003E215C1C
Acoustic 1604-8039
n = 64
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

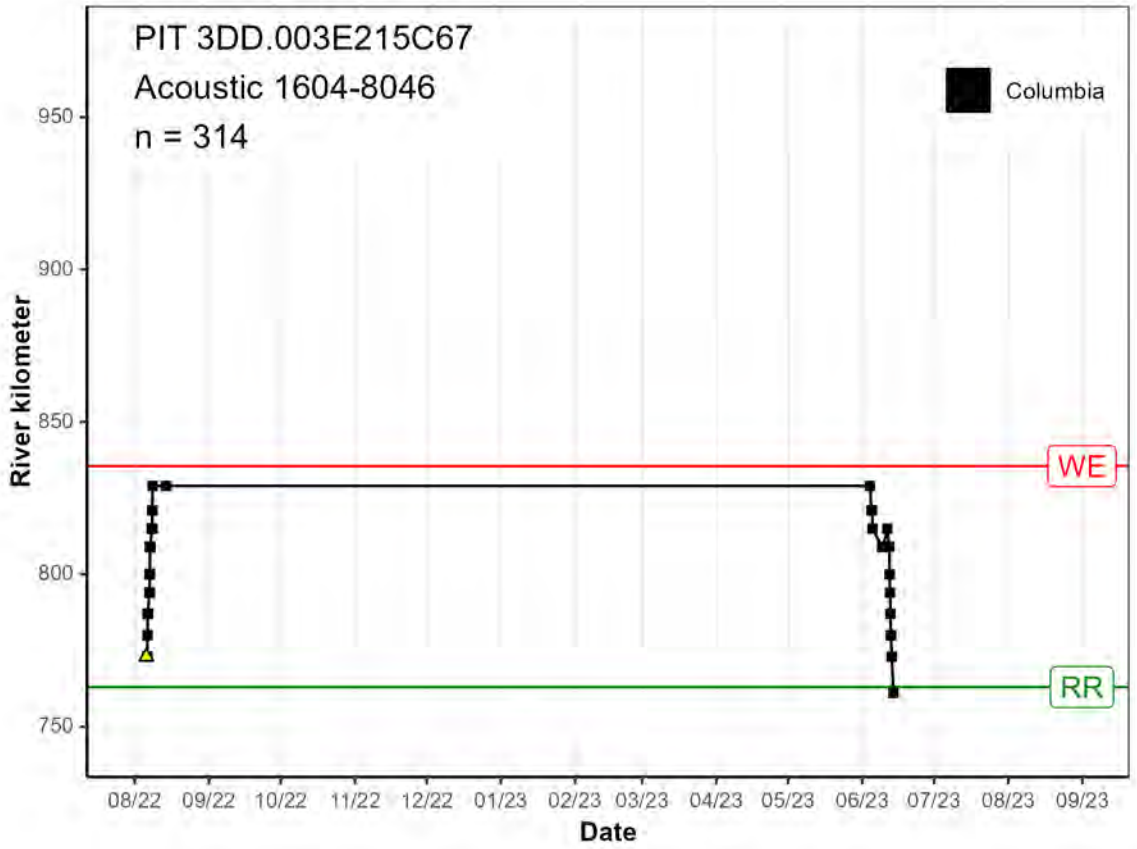

PIT 3DD.003E215C4B
Acoustic 1604-8041
n = 568
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

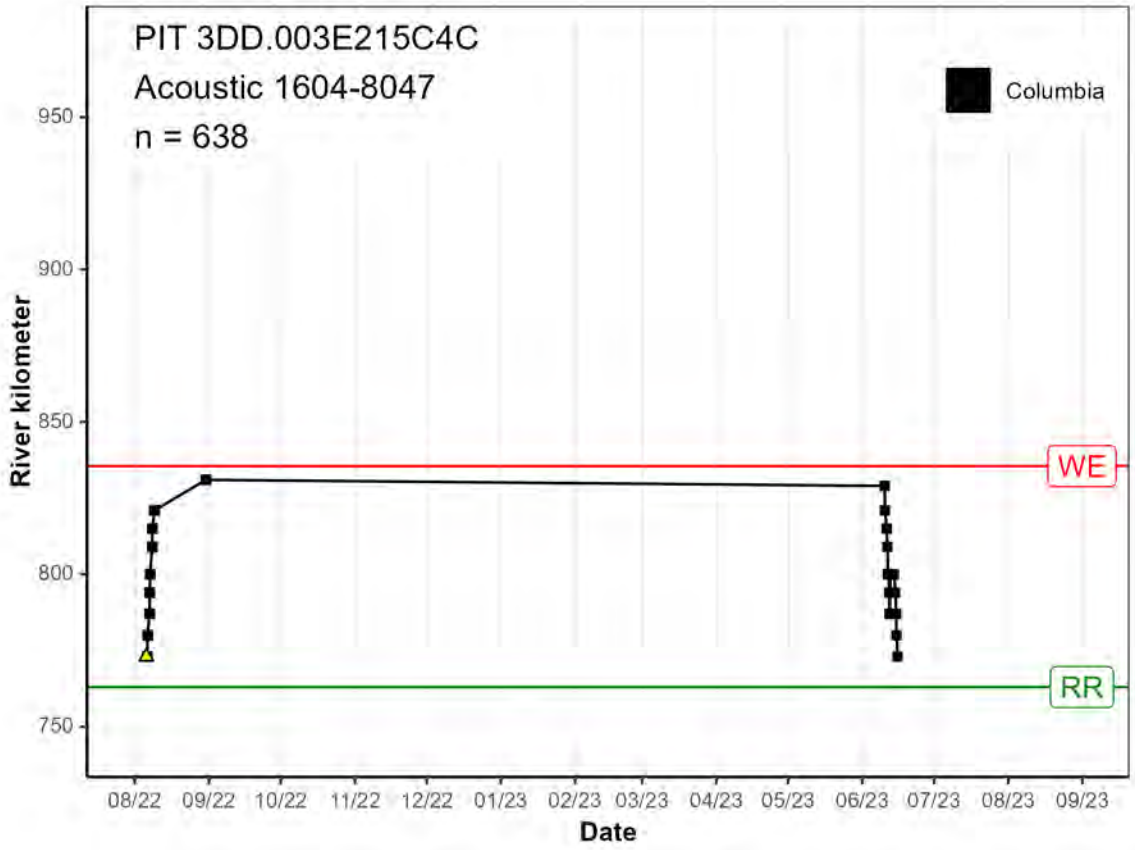
PIT 3DD.003E215C5D
Acoustic 1604-8042
n = 744
Columbia
Entiat
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

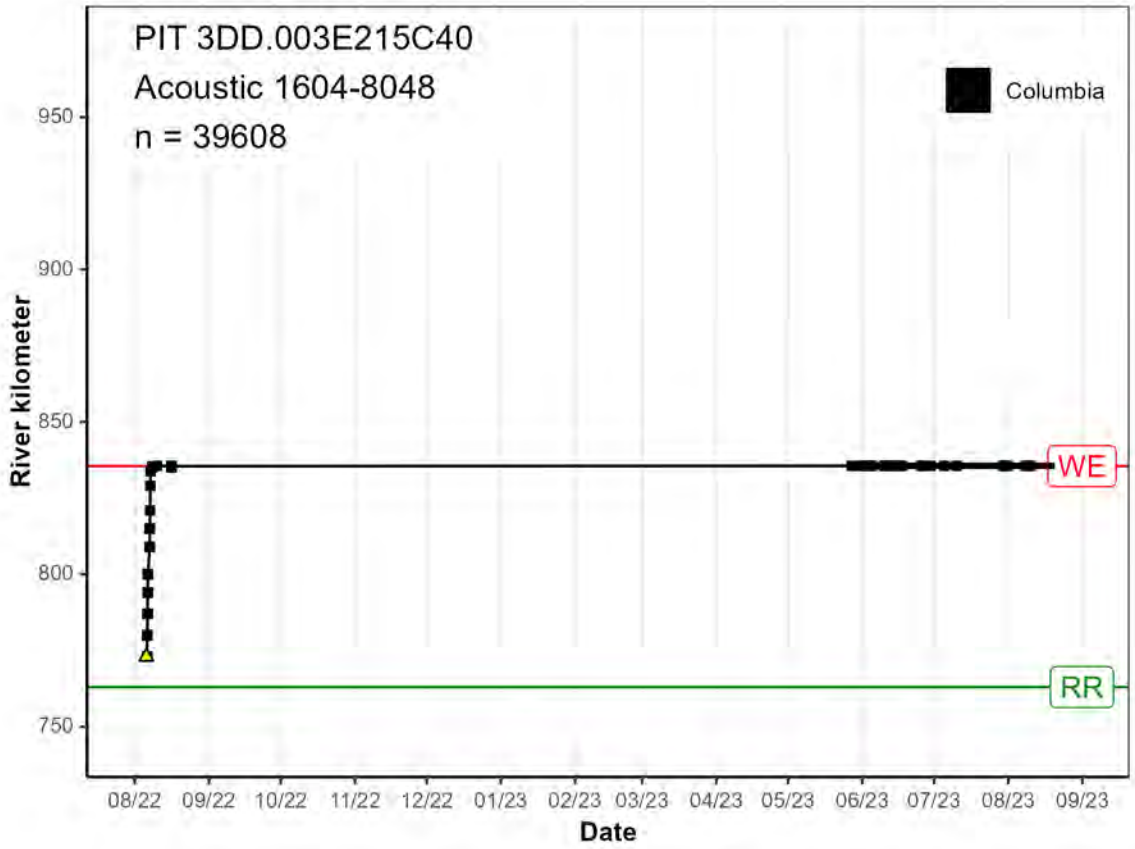

PIT 3DD.003E215C57
Acoustic 1604-8043
n = 2216
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

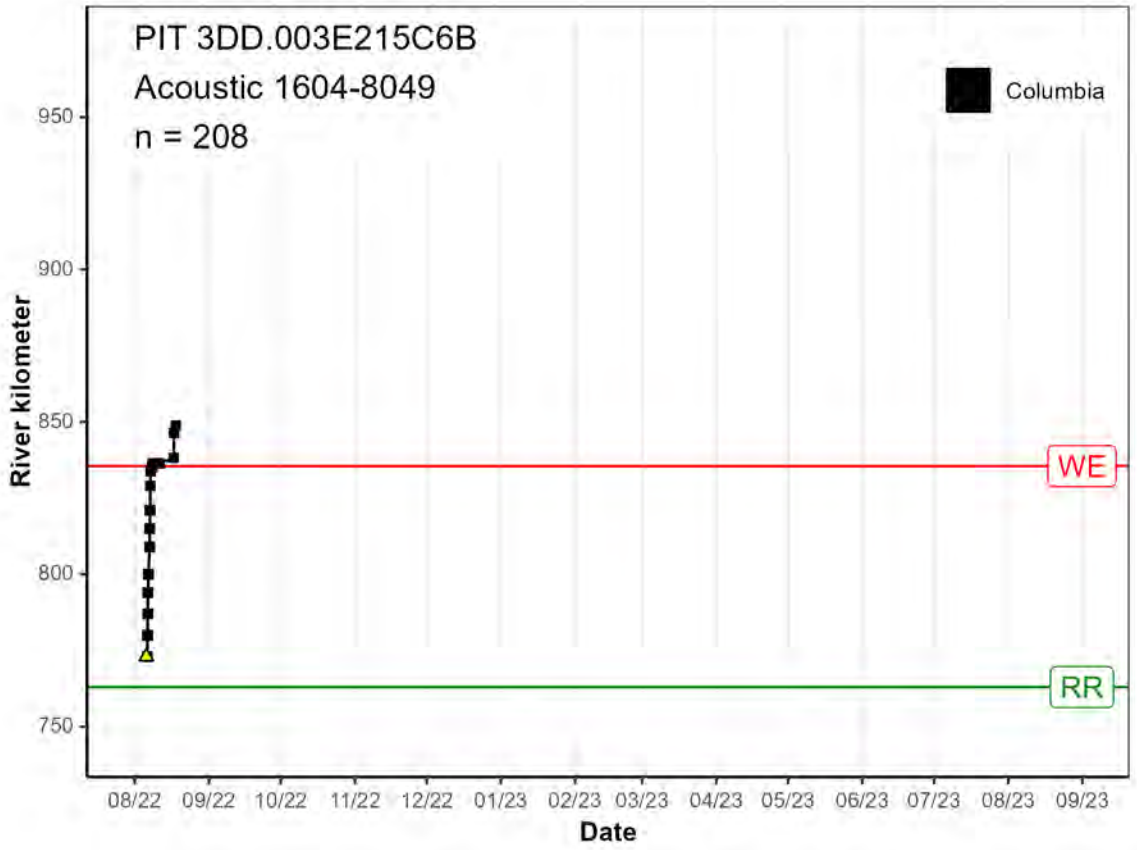

PIT 3DD.003D937732
Acoustic 1604-8044
n = 135
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

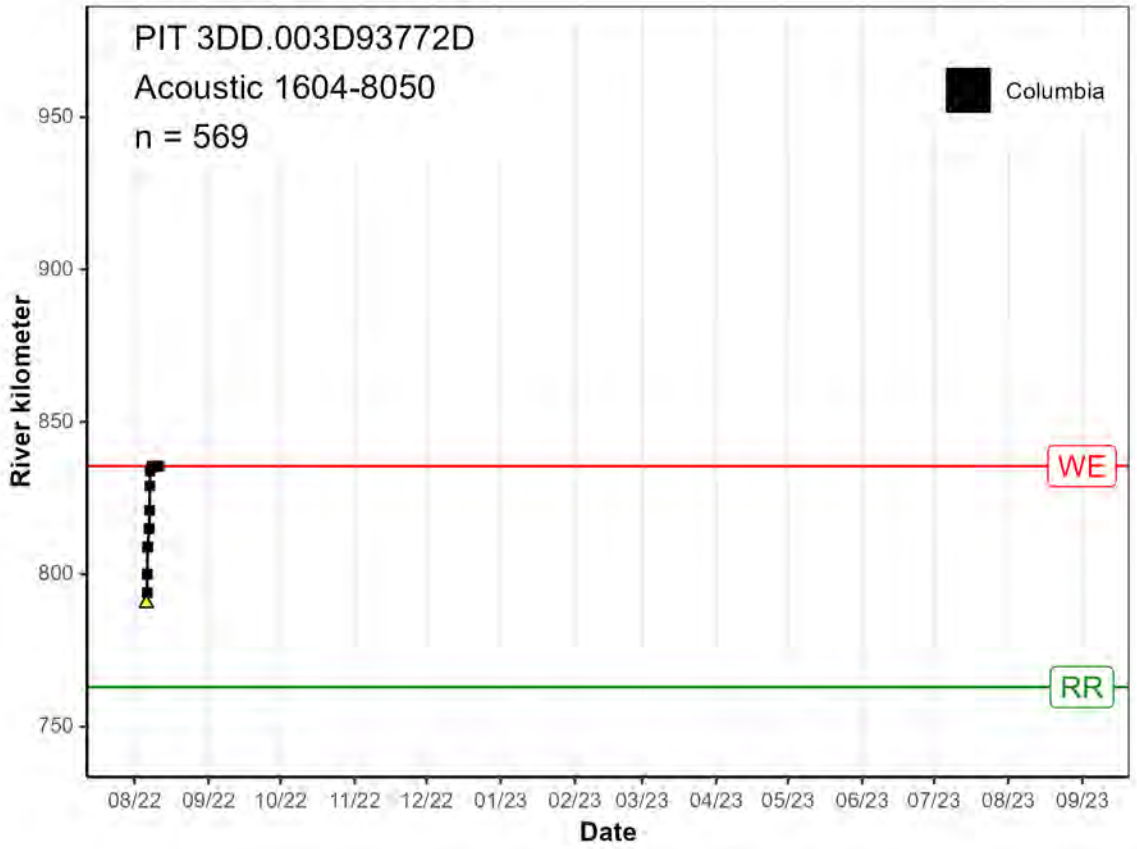

PIT 3DD.003D93775B
Acoustic 1604-8045
n = 518
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

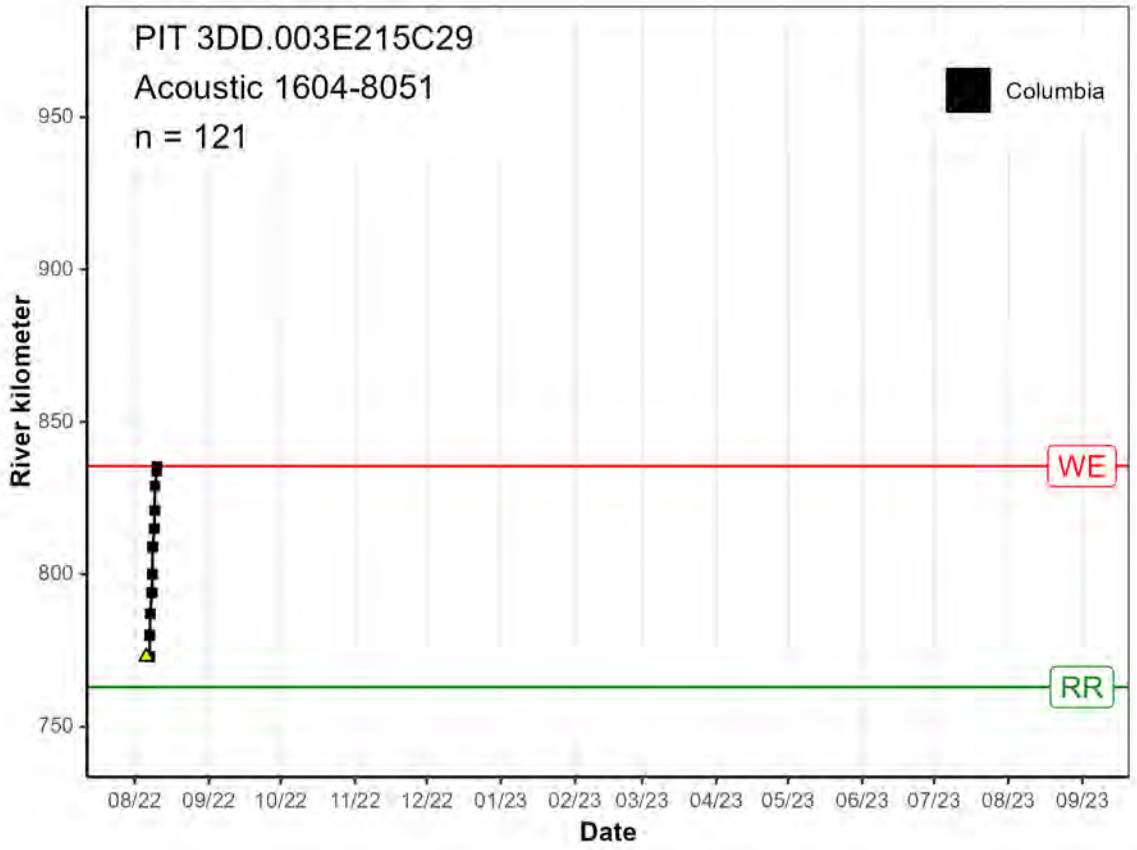

PIT 3DD.003E215C67
Acoustic 1604-8046
n = 314
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

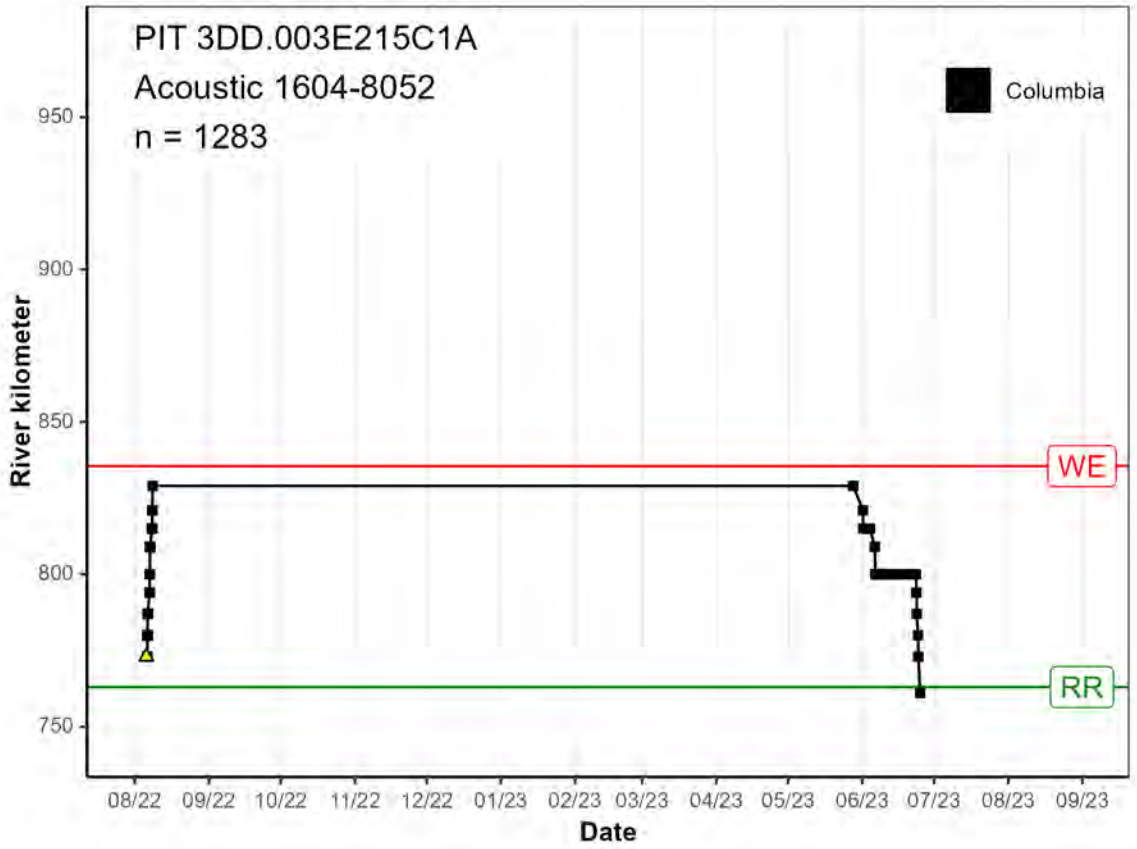

PIT 3DD.003E215C4C
Acoustic 1604-8047
n = 638
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

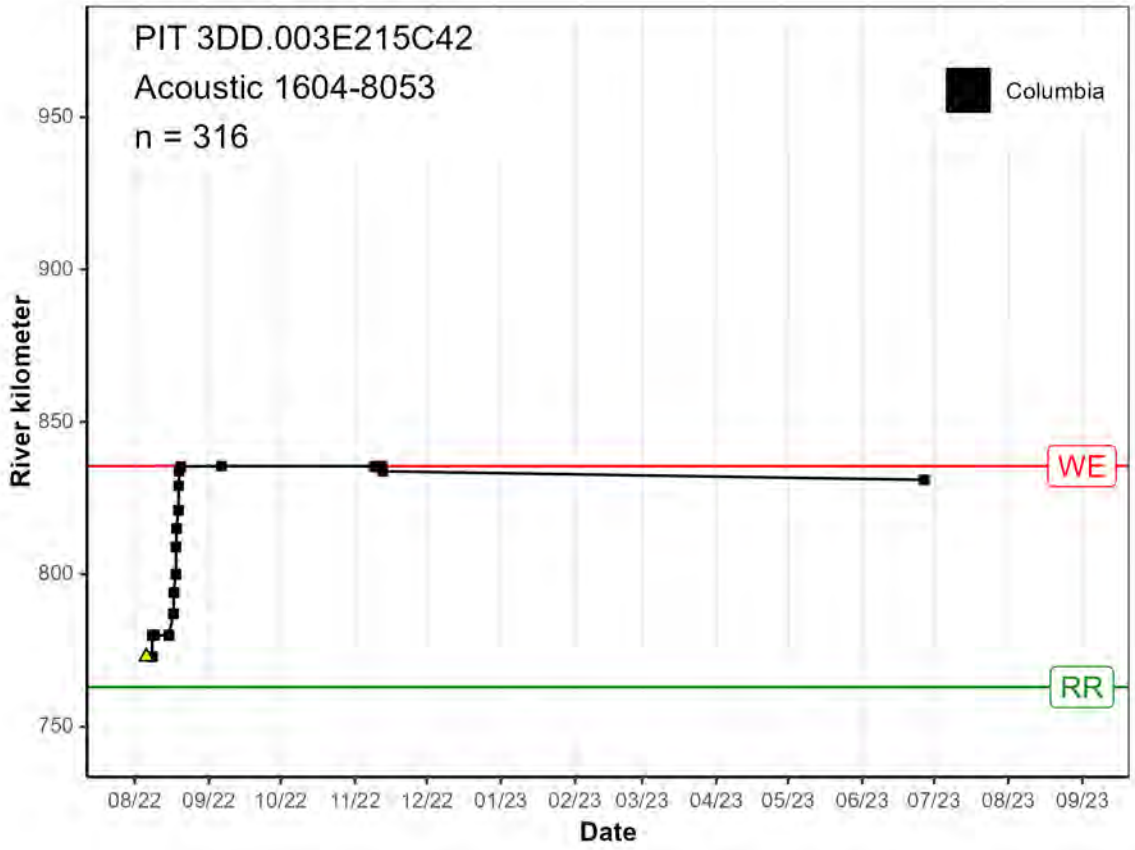

PIT 3DD.003E215C40
Acoustic 1604-8048
n = 39608
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

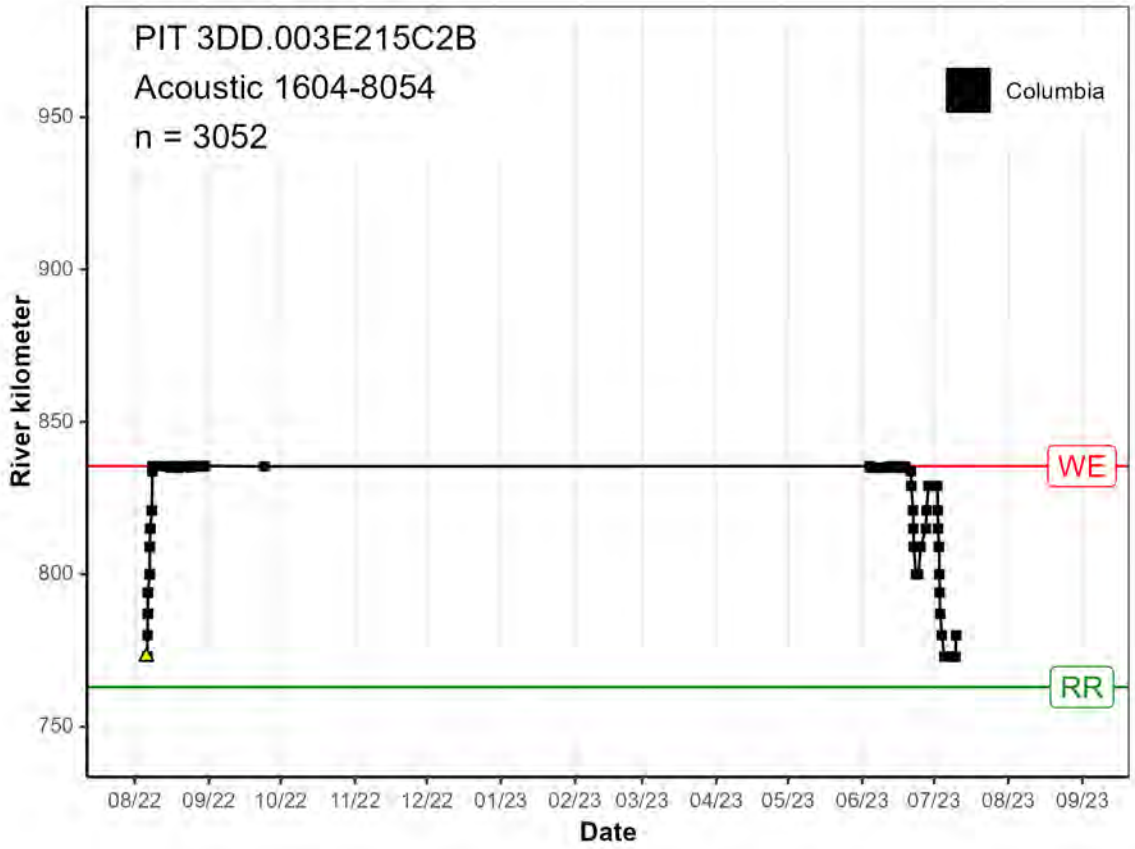

PIT 3DD.003E215C6B
Acoustic 1604-8049
n = 208
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

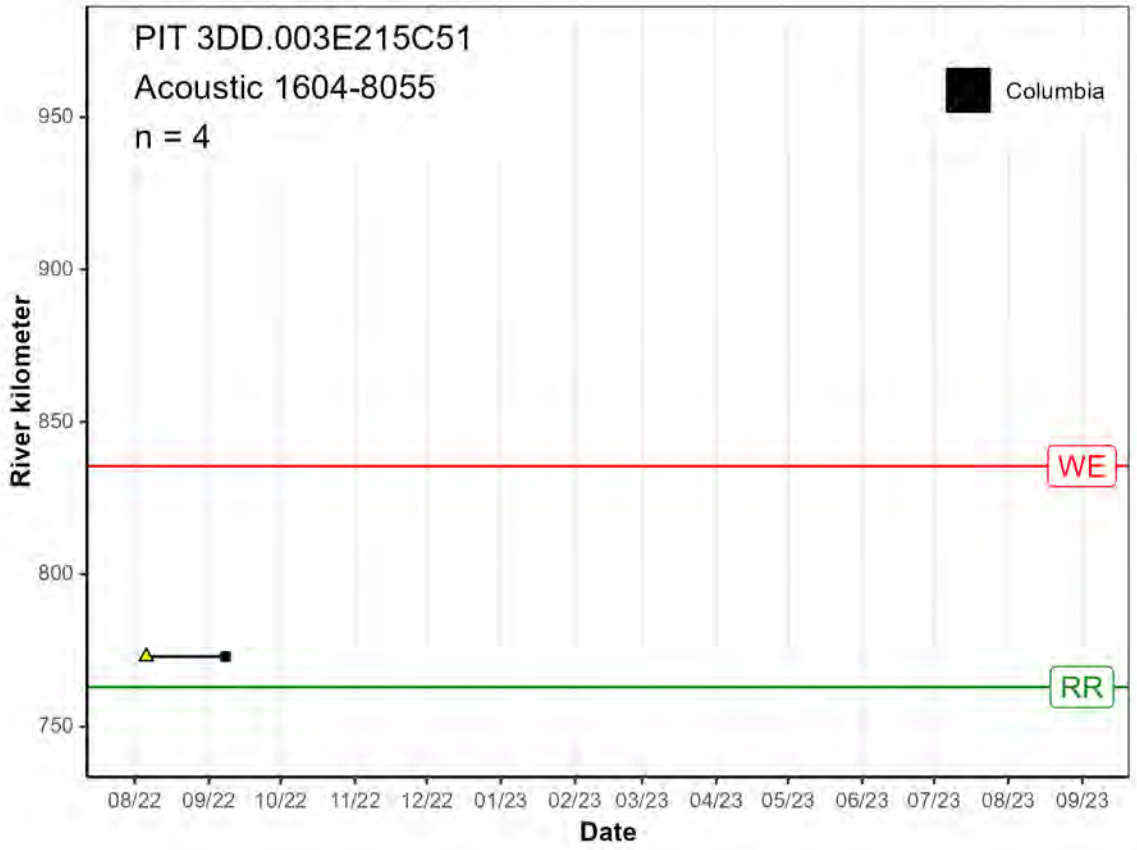

PIT 3DD.003D93772D
Acoustic 1604-8050
n = 569
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

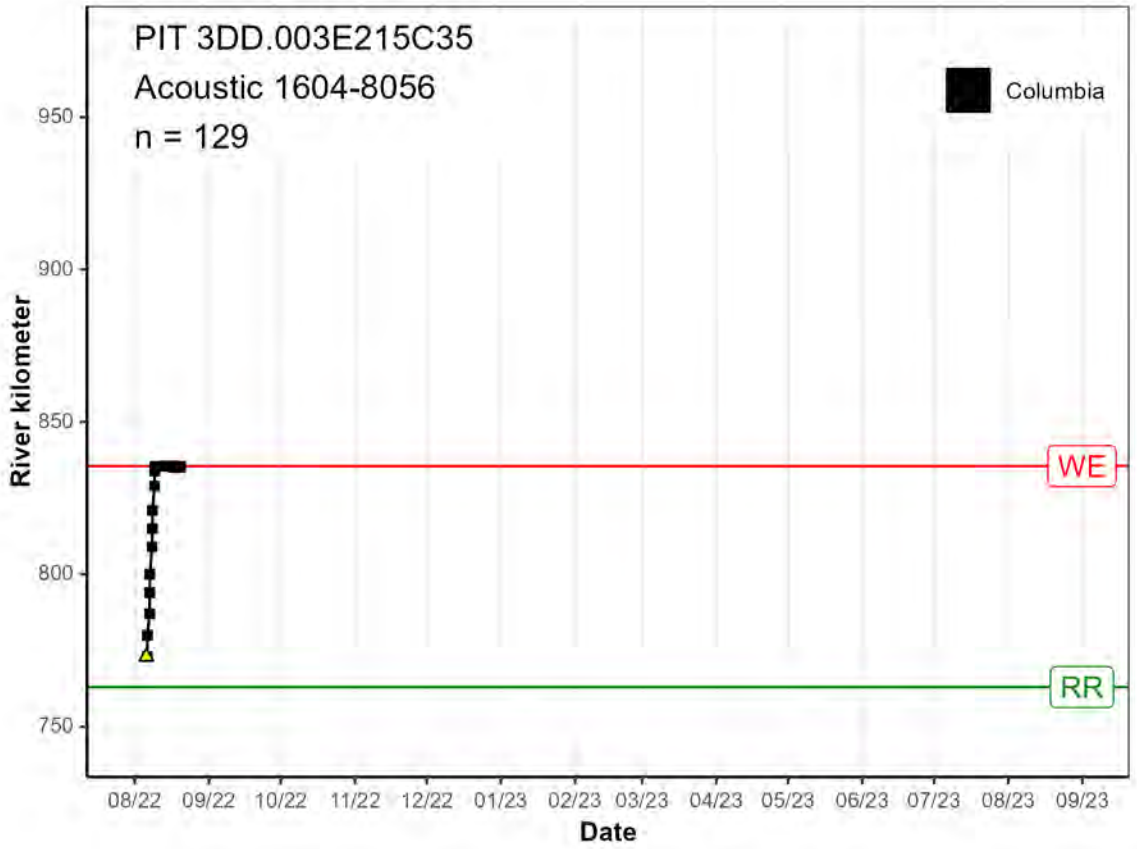

PIT 3DD.003E215C29
Acoustic 1604-8051
n = 121
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

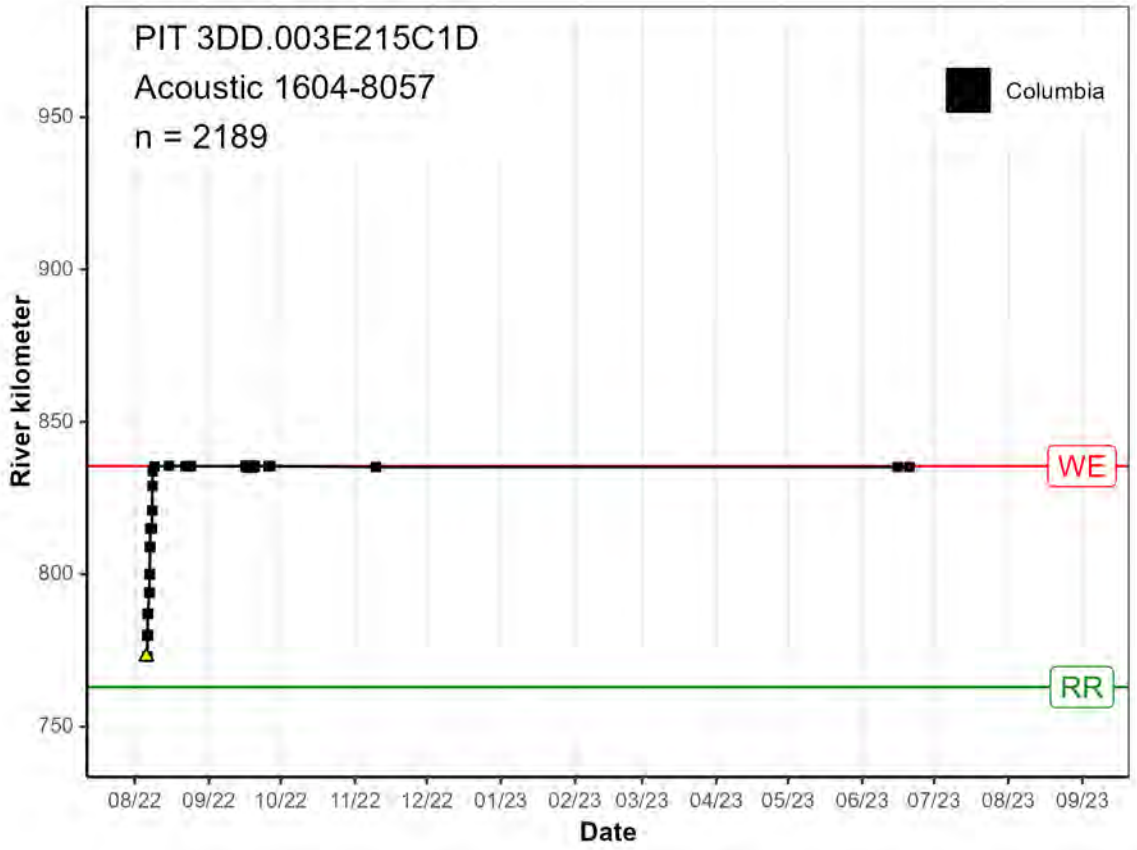

PIT 3DD.003E215C1A
Acoustic 1604-8052
n = 1283
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

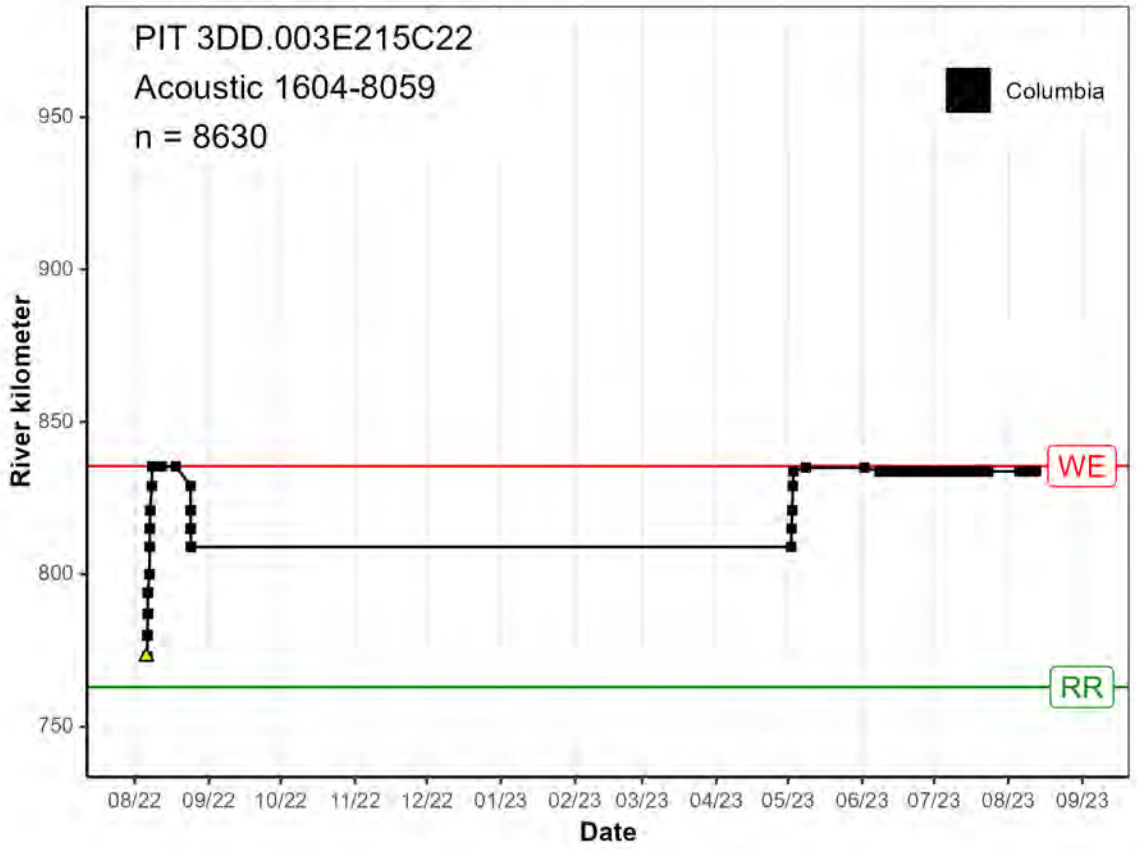

PIT 3DD.003E215C42
Acoustic 1604-8053
n = 316
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

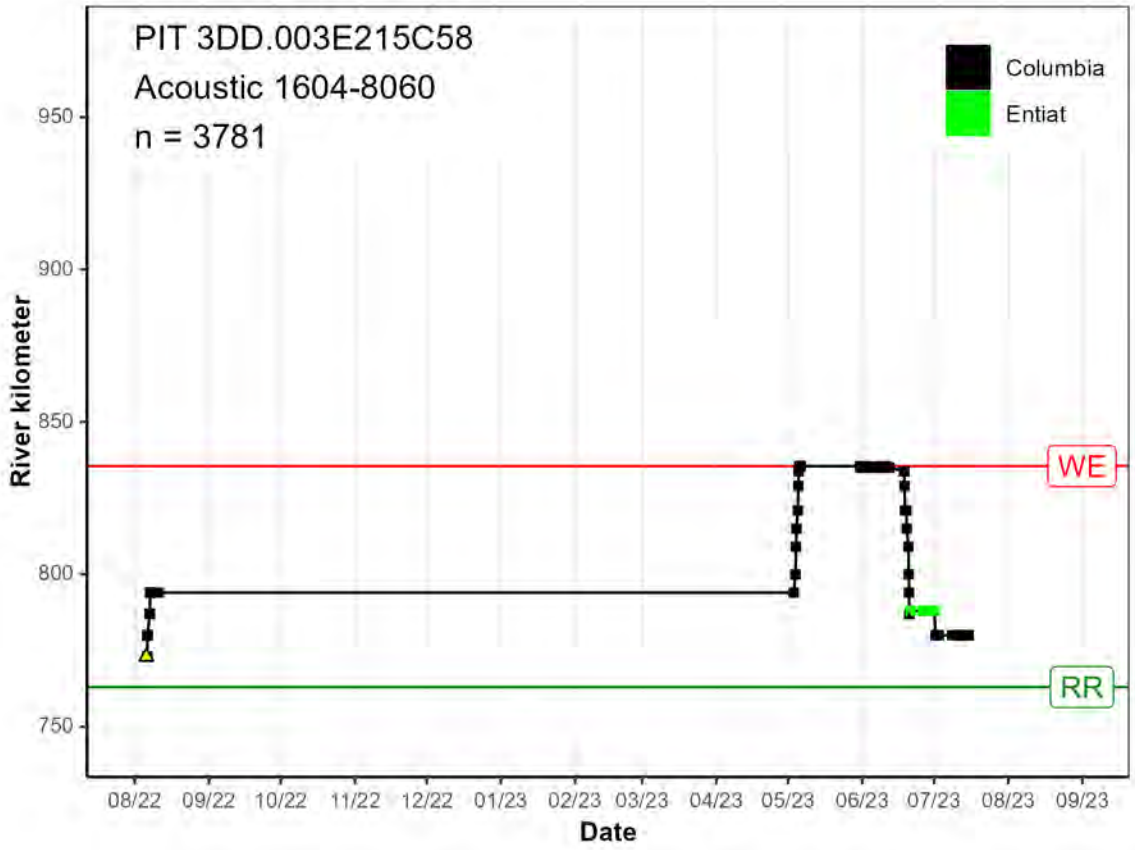

PIT 3DD.003E215C2B
Acoustic 1604-8054
n = 3052
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

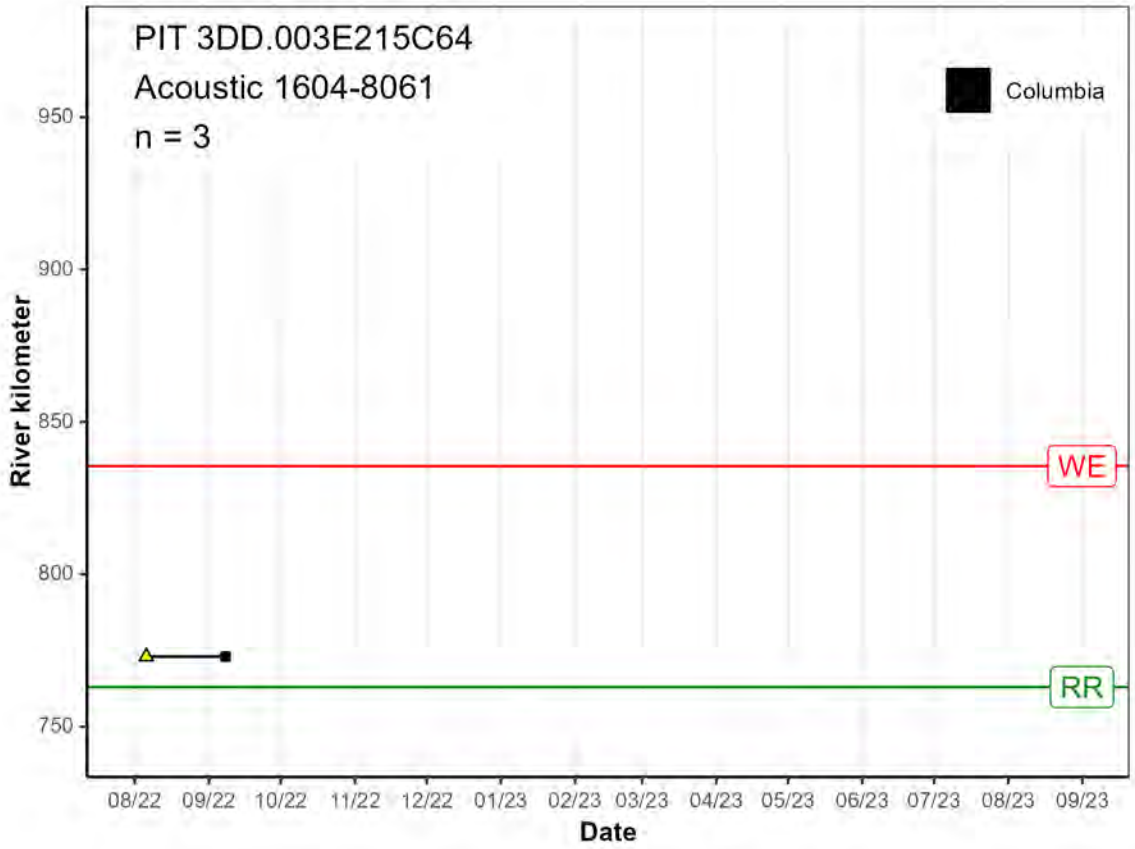

PIT 3DD.003E215C51
Acoustic 1604-8055
n = 4
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

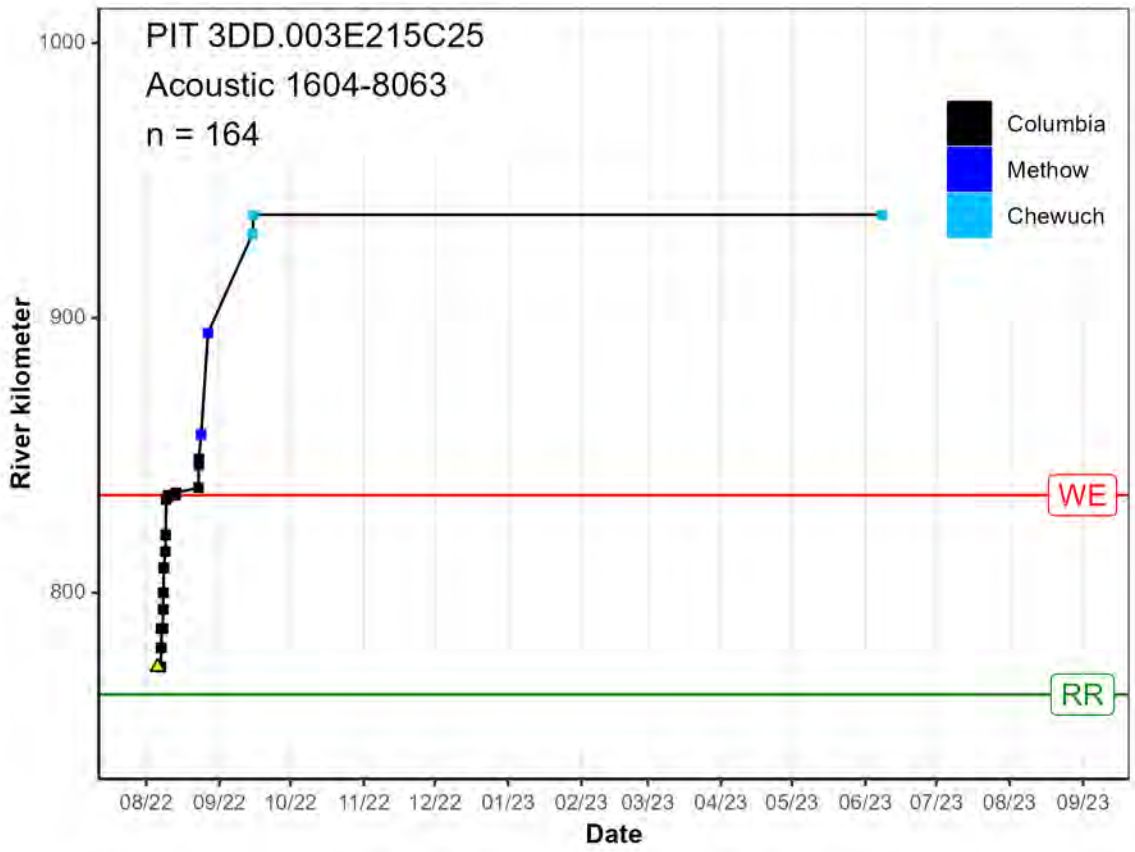

PIT 3DD.003E215C35
Acoustic 1604-8056
n = 129
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

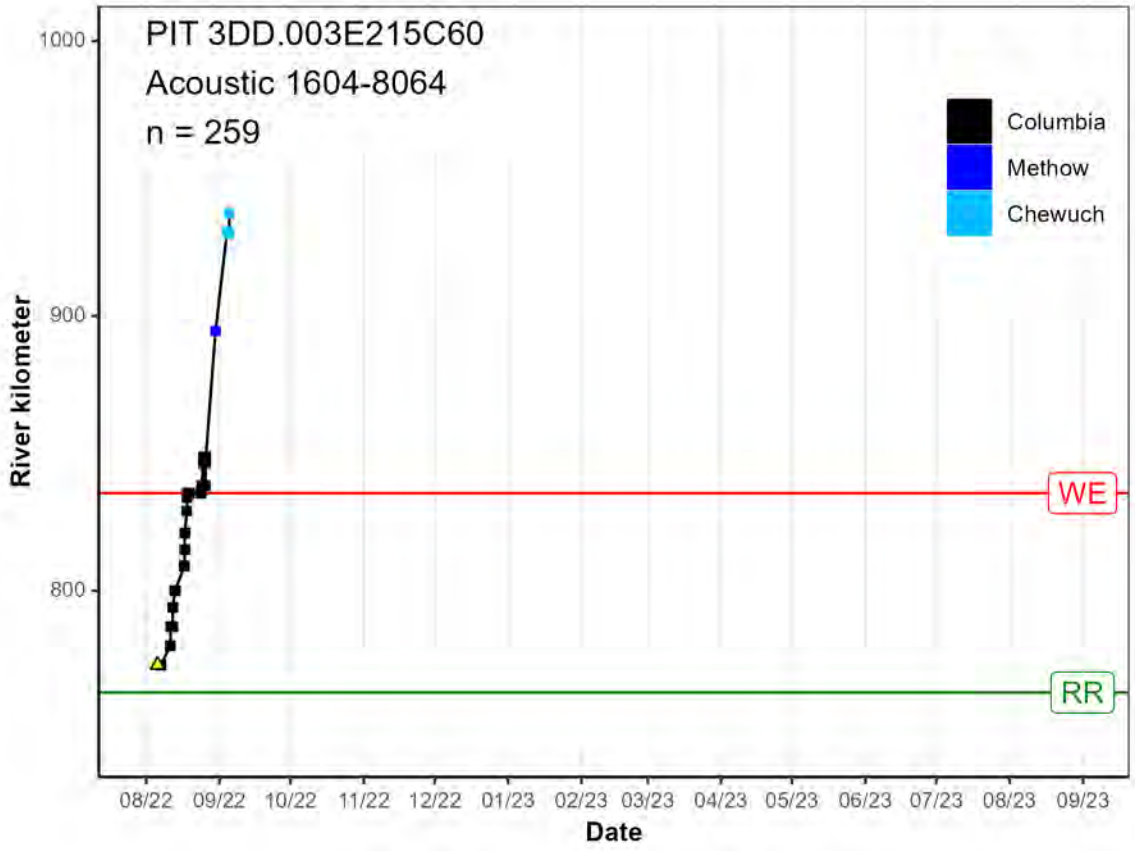

PIT 3DD.003E215C1D
Acoustic 1604-8057
n = 2189
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

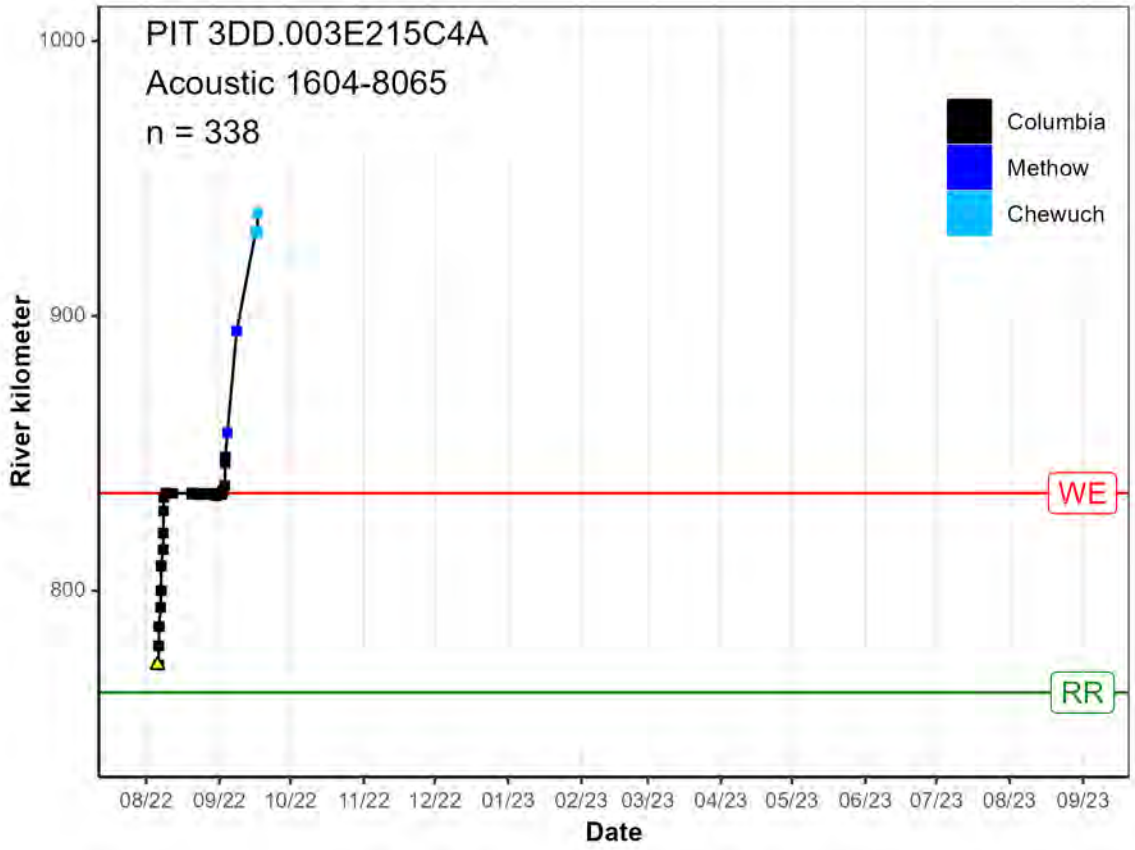

PIT 3DD.003E215C22
Acoustic 1604-8059
n = 8630
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

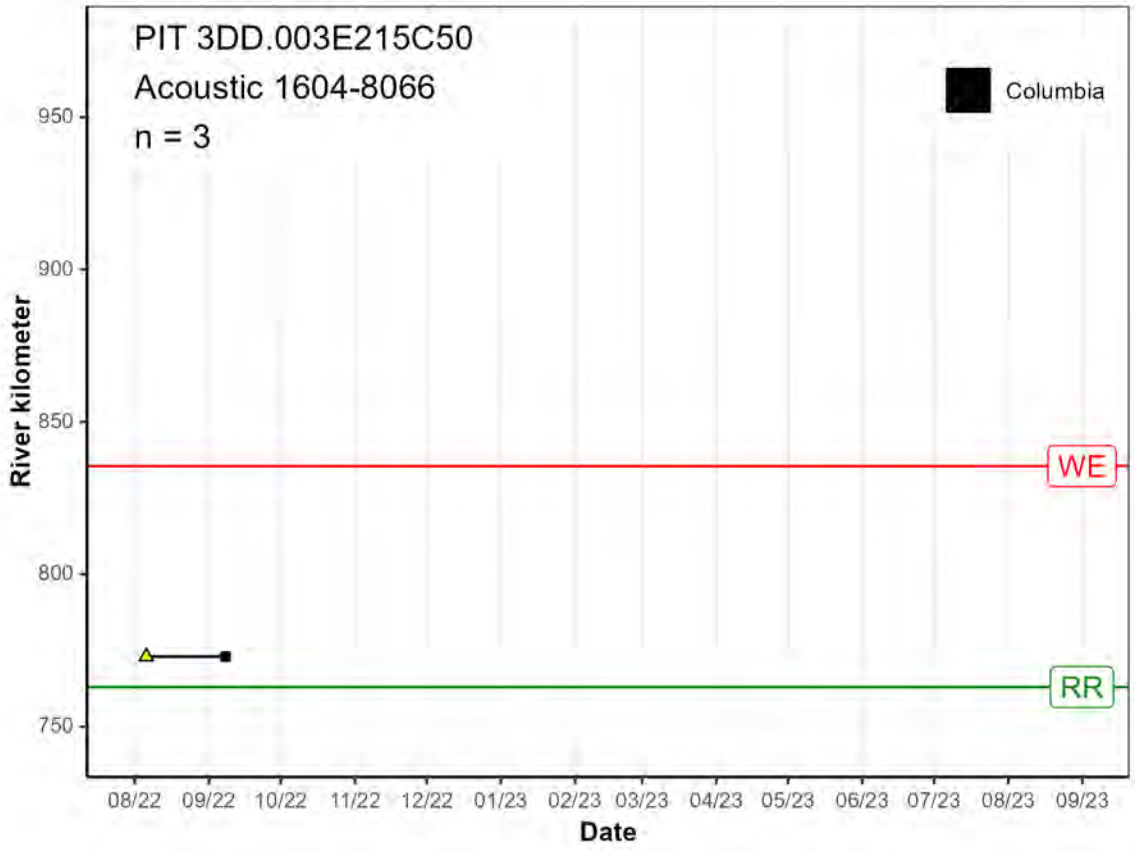

PIT 3DD.003E215C58
Acoustic 1604-8060
n = 3781
Columbia
Entiat
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

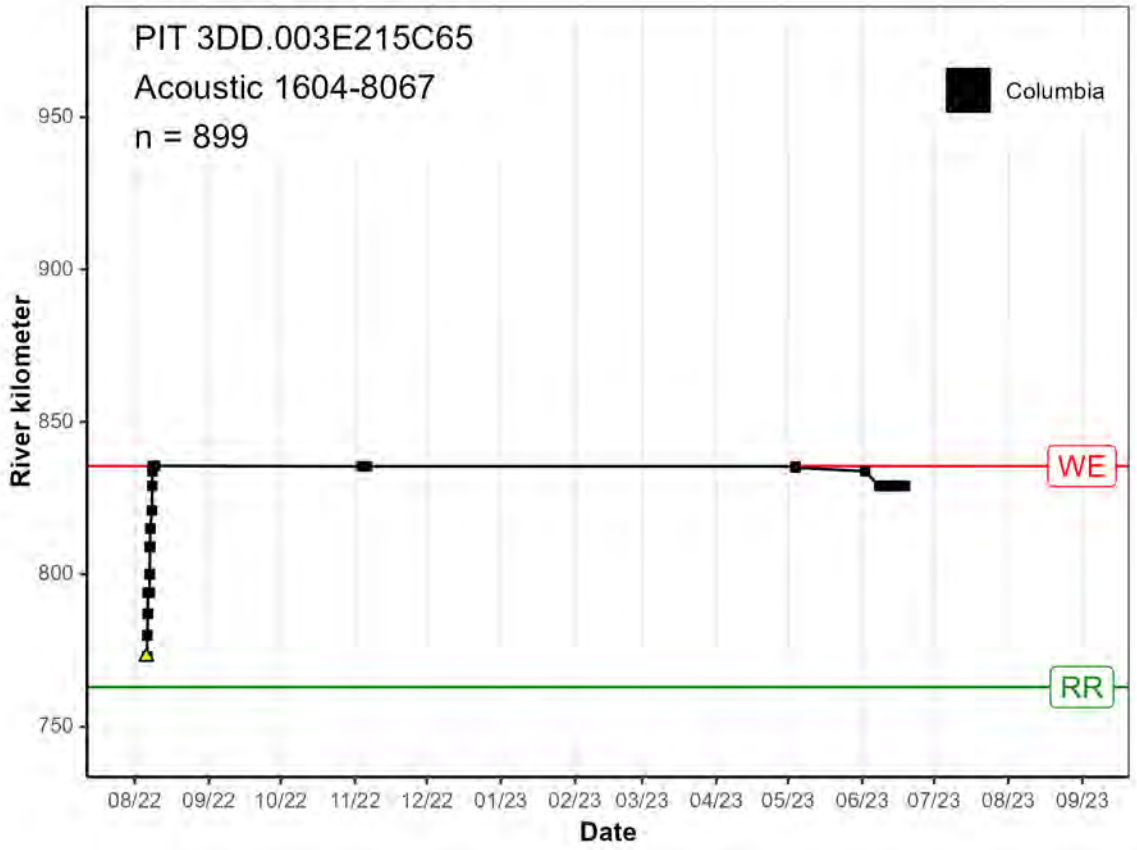

PIT 3DD.003E215C64
Acoustic 1604-8061
n = 3
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

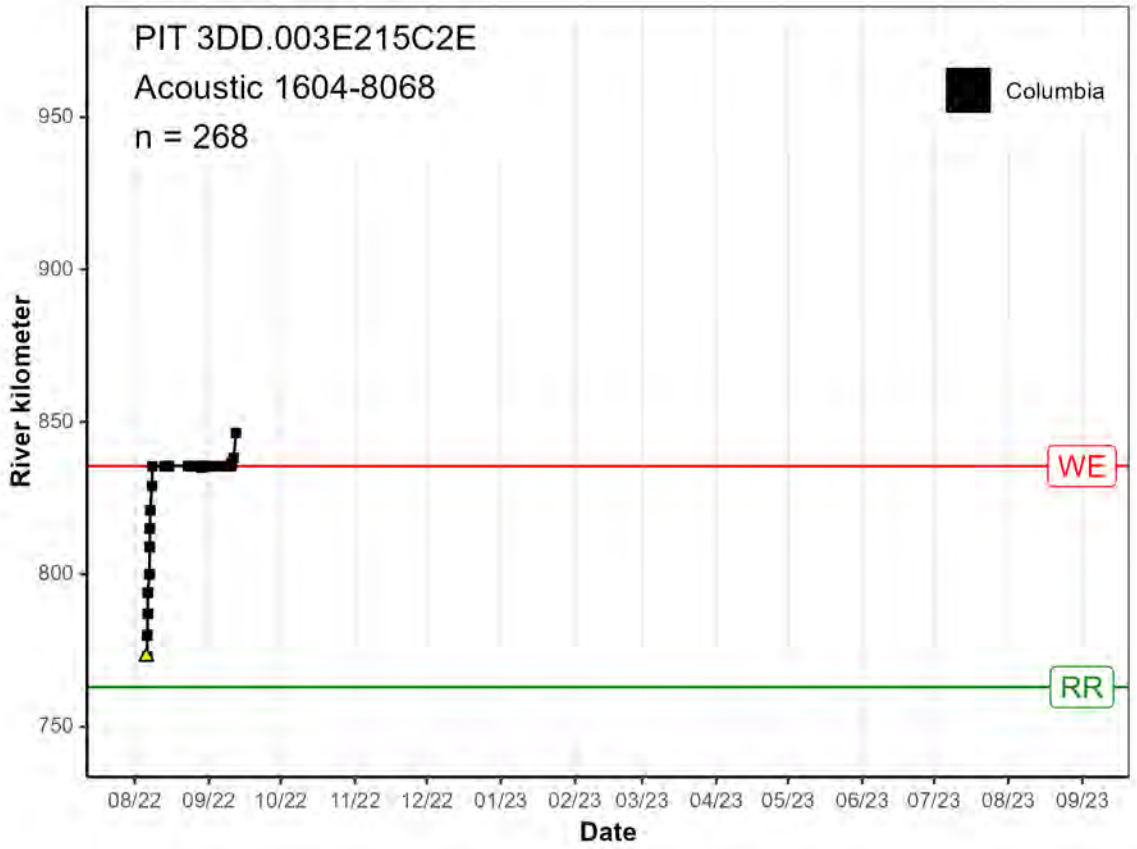

PIT 3DD.003E215C25
Acoustic 1604-8063
n = 164
Columbia
Methow
Chewuch
WE
RR
River kilometer
1000
900
800
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

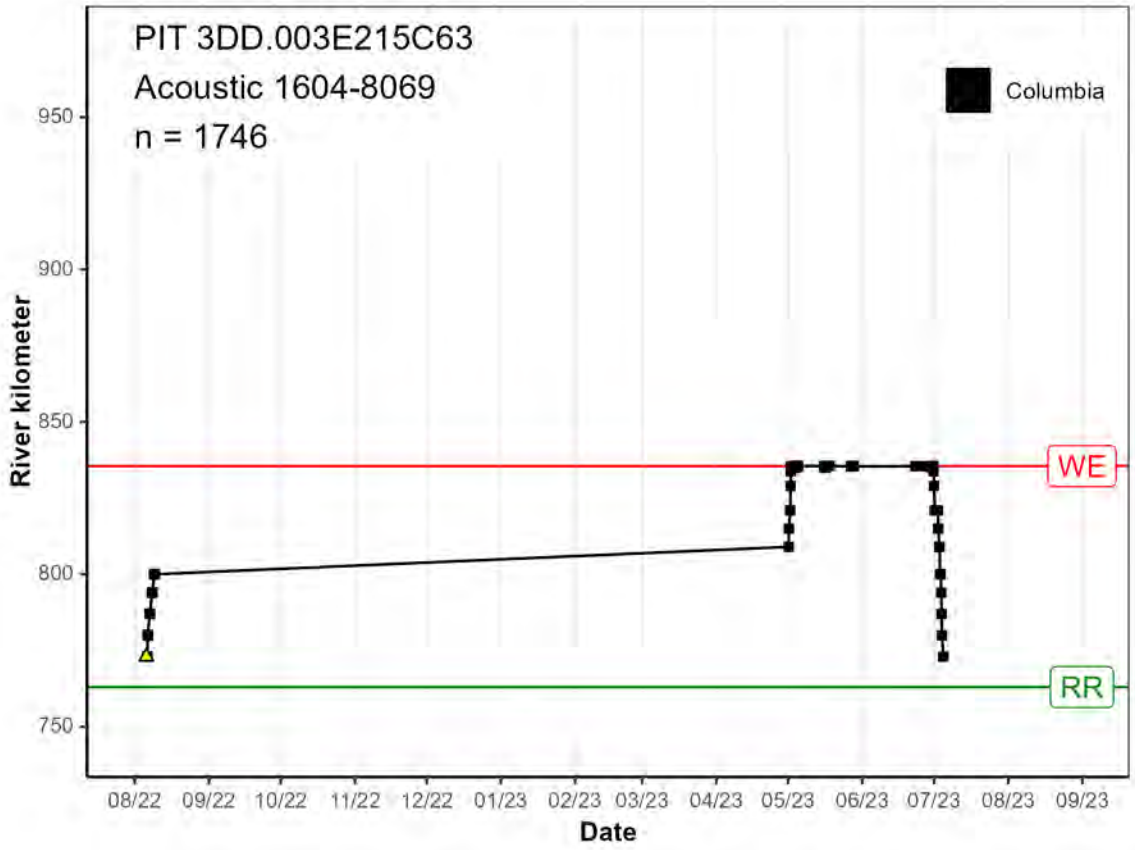

PIT 3DD.003E215C60
Acoustic 1604-8064
n = 259
Columbia
Methow
Chewuch
WE
RR
River kilometer
1000
900
800
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

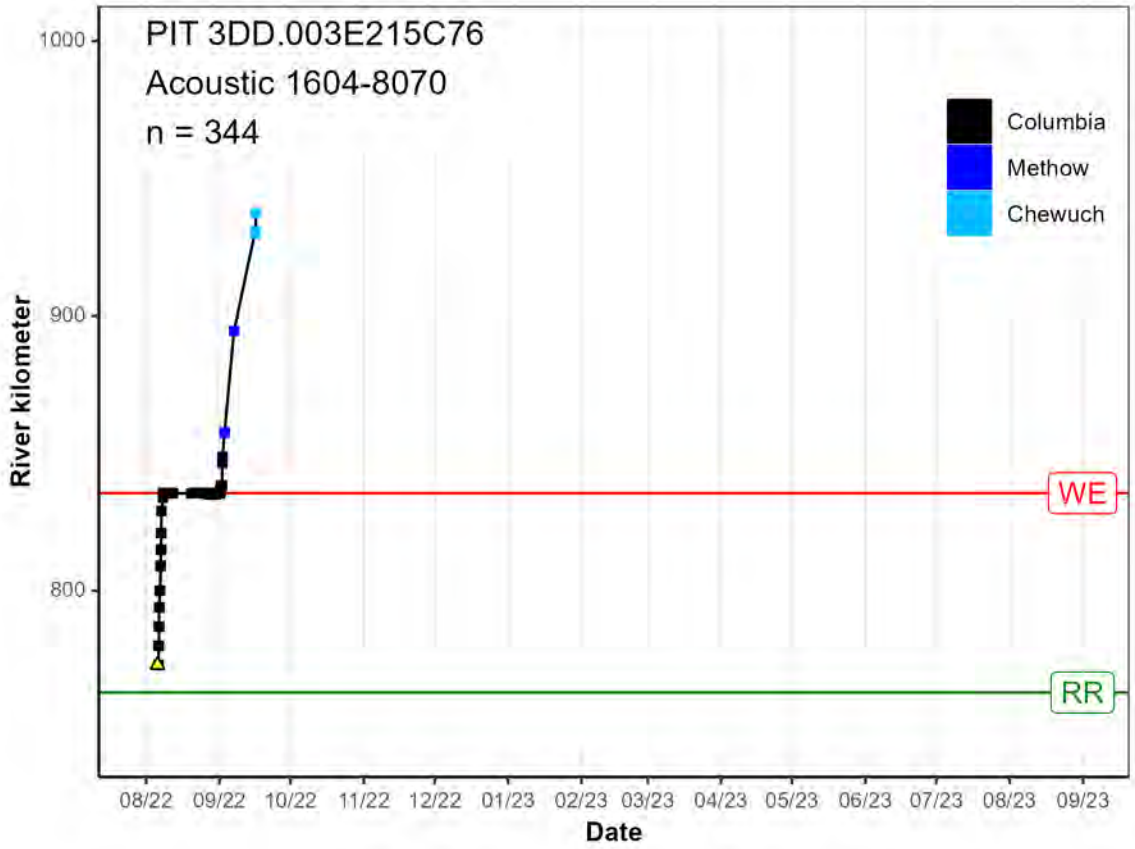

PIT 3DD.003E215C4A
Acoustic 1604-8065
n = 338
Columbia
Methow
Chewuch
River kilometer
1000
900
800
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

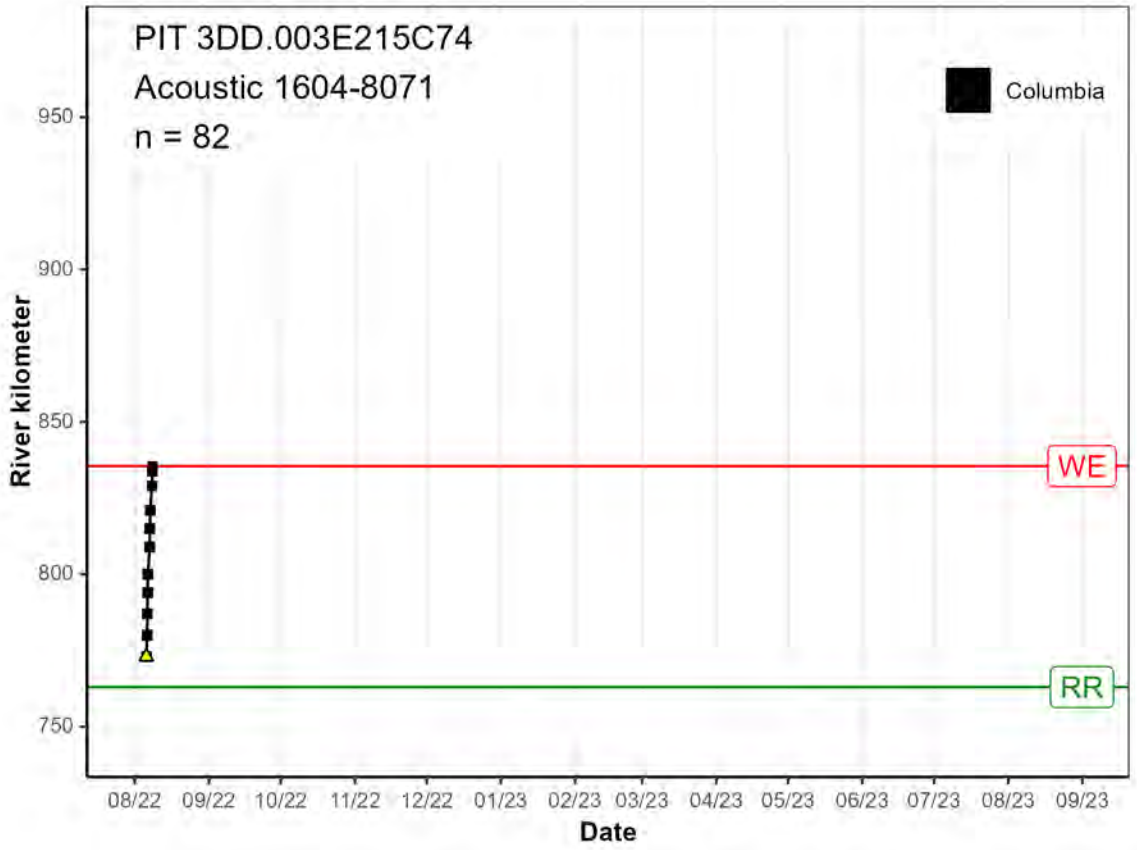

PIT 3DD.003E215C50
Acoustic 1604-8066
n = 3
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

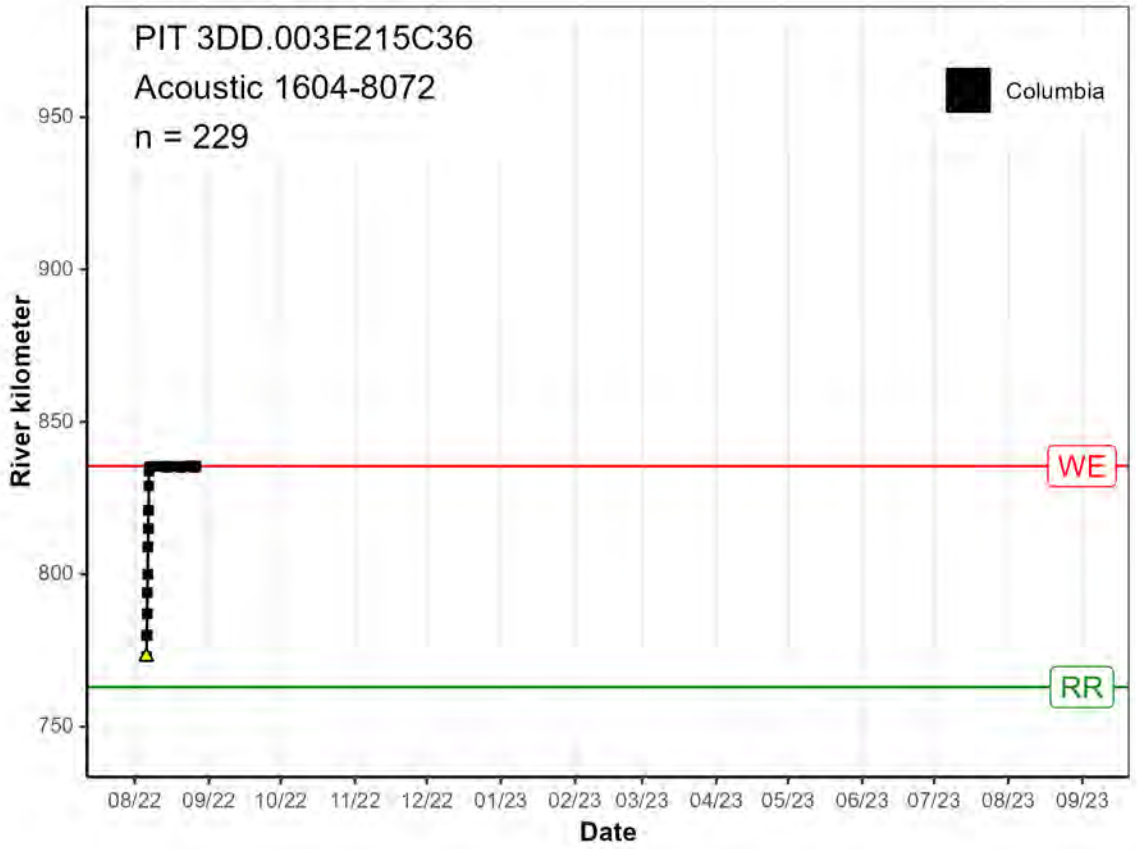

PIT 3DD.003E215C65
Acoustic 1604-8067
n = 899
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

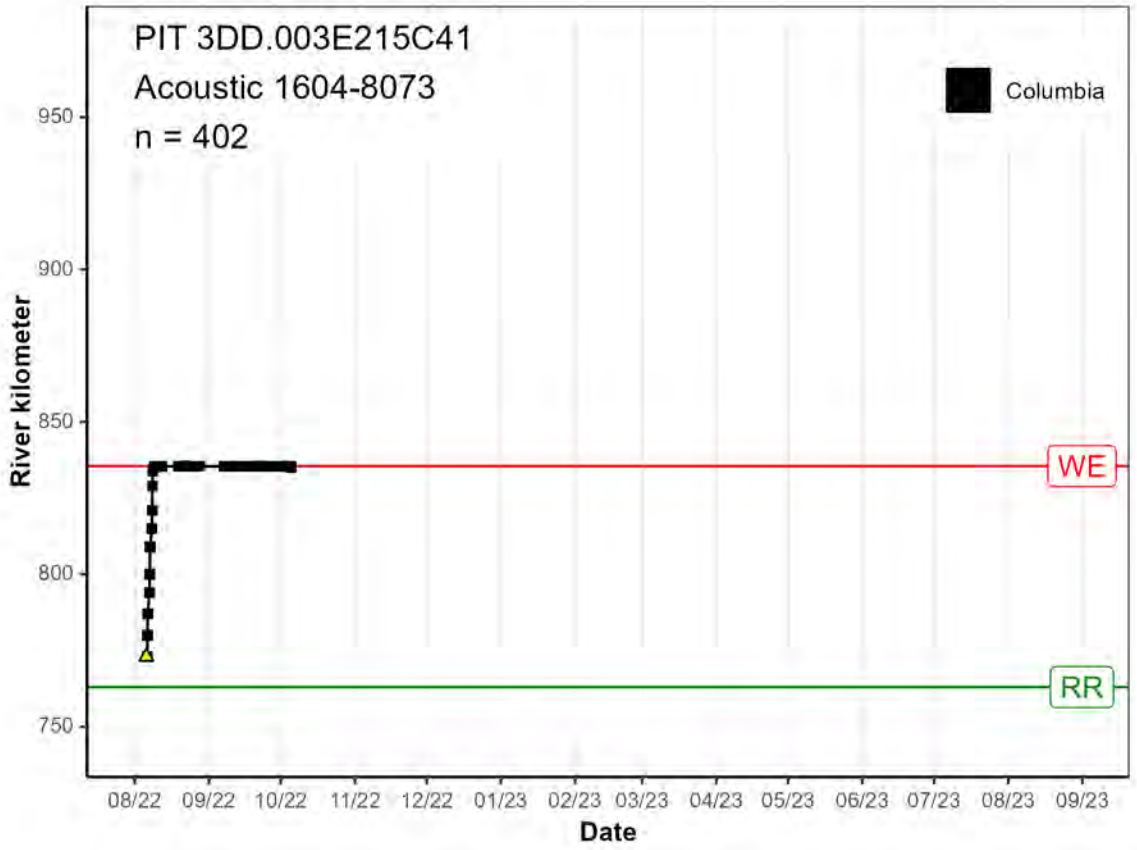

PIT 3DD.003E215C2E
Acoustic 1604-8068
n = 268
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

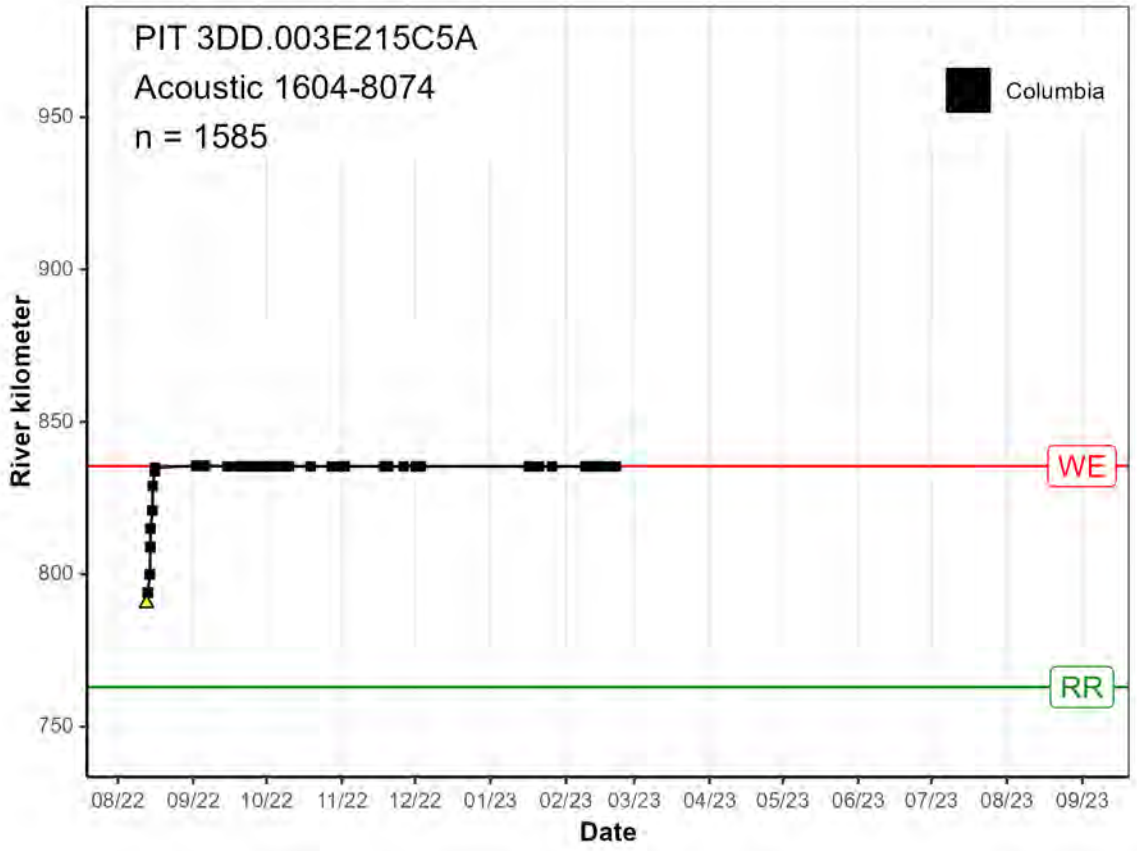

PIT 3DD.003E215C63
Acoustic 1604-8069
n = 1746
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

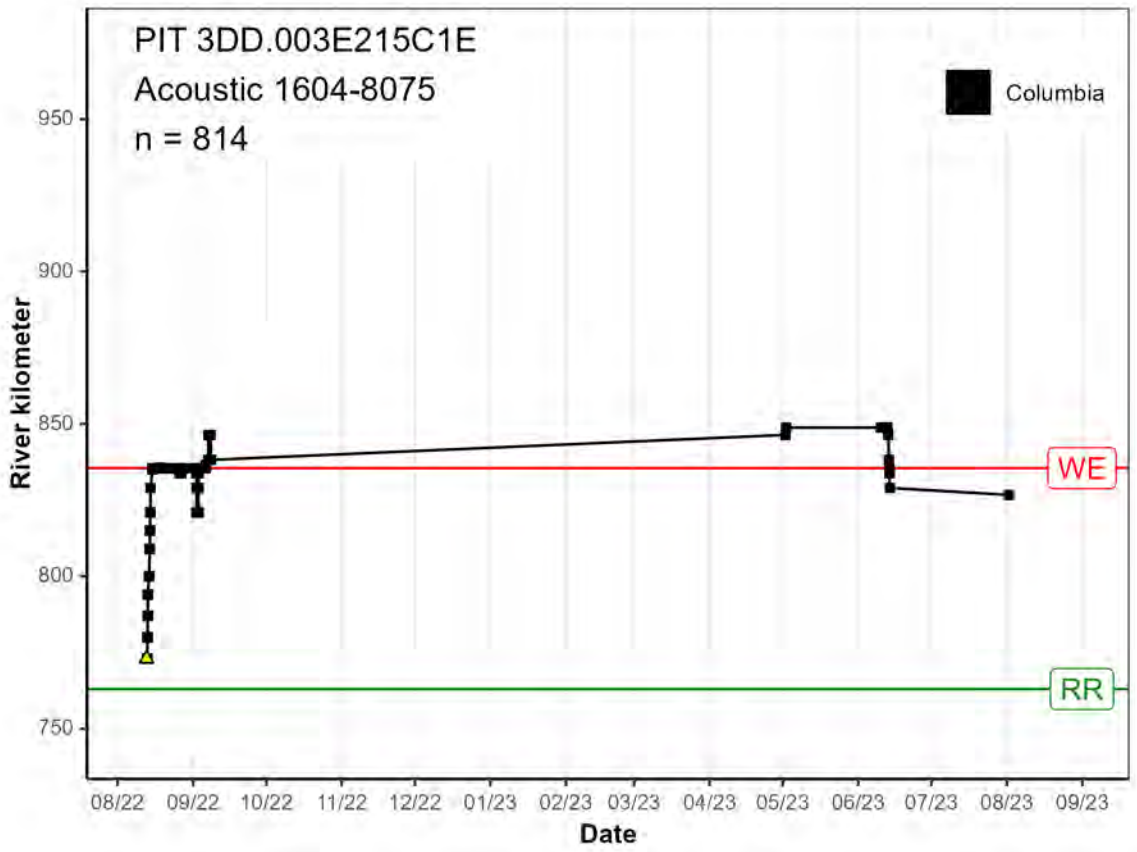

PIT 3DD.003E215C76
Acoustic 1604-8070
n = 344
Columbia
Methow
Chewuch
River kilometer
1000
900
800
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

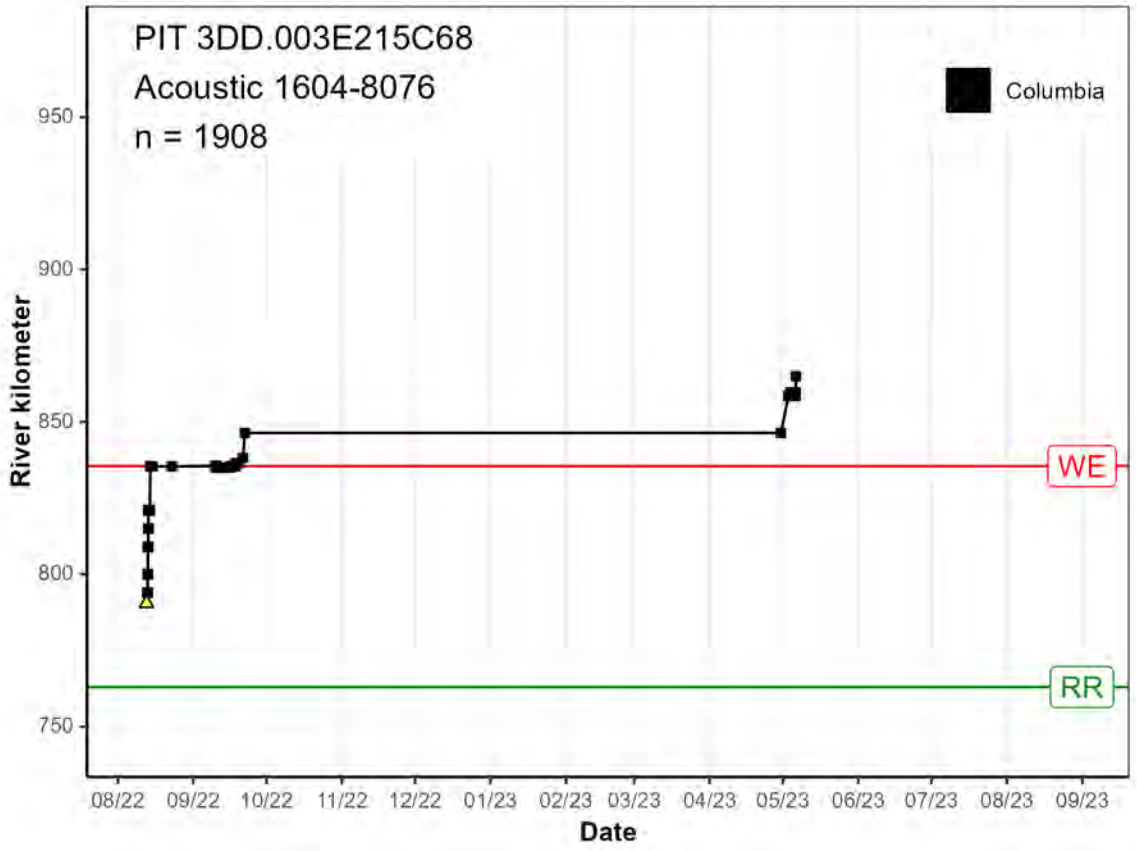

PIT 3DD.003E215C74
Acoustic 1604-8071
n = 82
Columbia
WE
RR
River kilometer
950
900
850
800
750
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

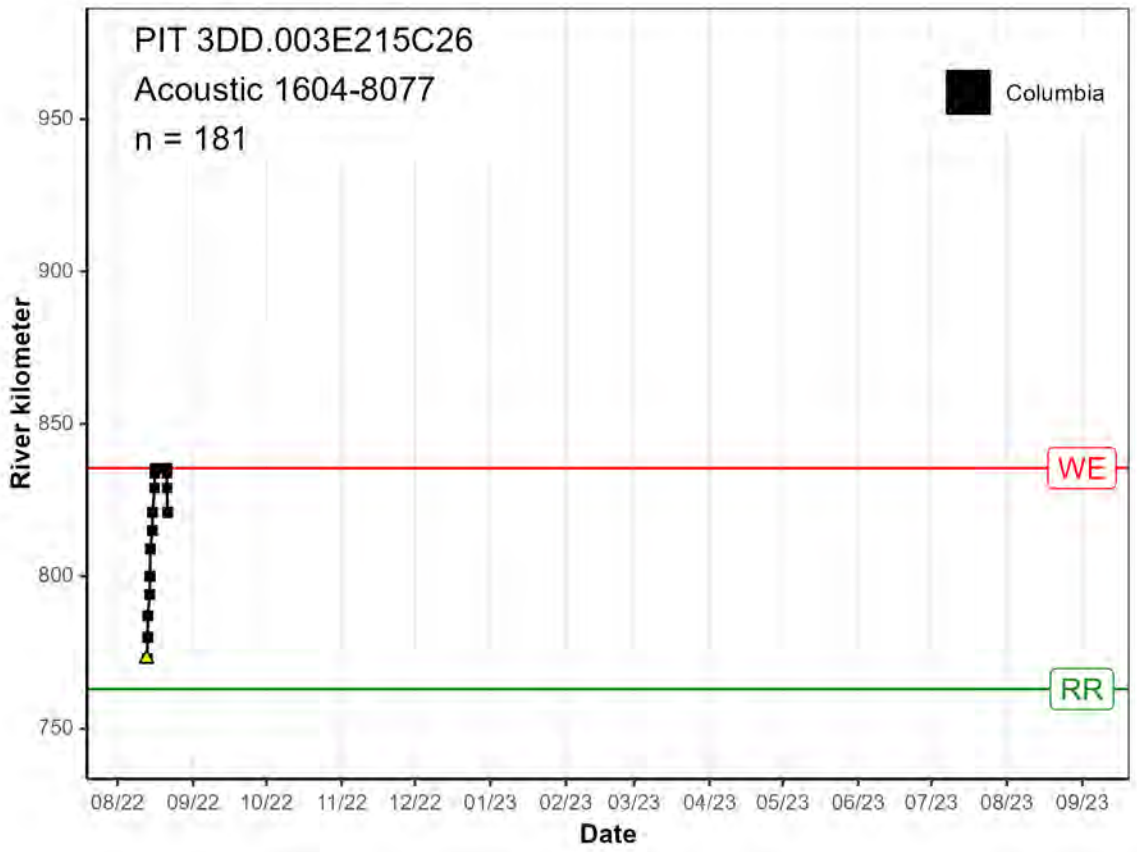

PIT 3DD.003E215C36
Acoustic 1604-8072
n = 229
Columbia
WE
RR
River kilometer
950
900
850
800
750
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

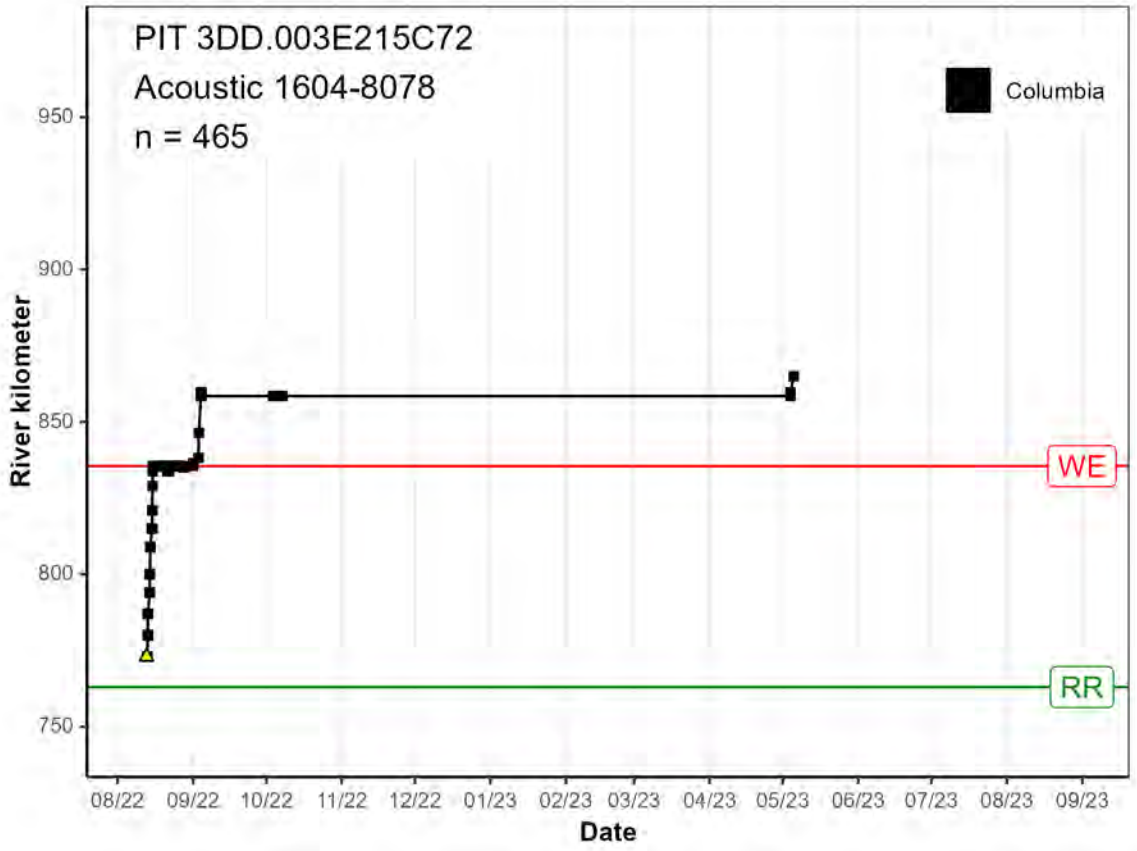

PIT 3DD.003E215C41
Acoustic 1604-8073
n = 402
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

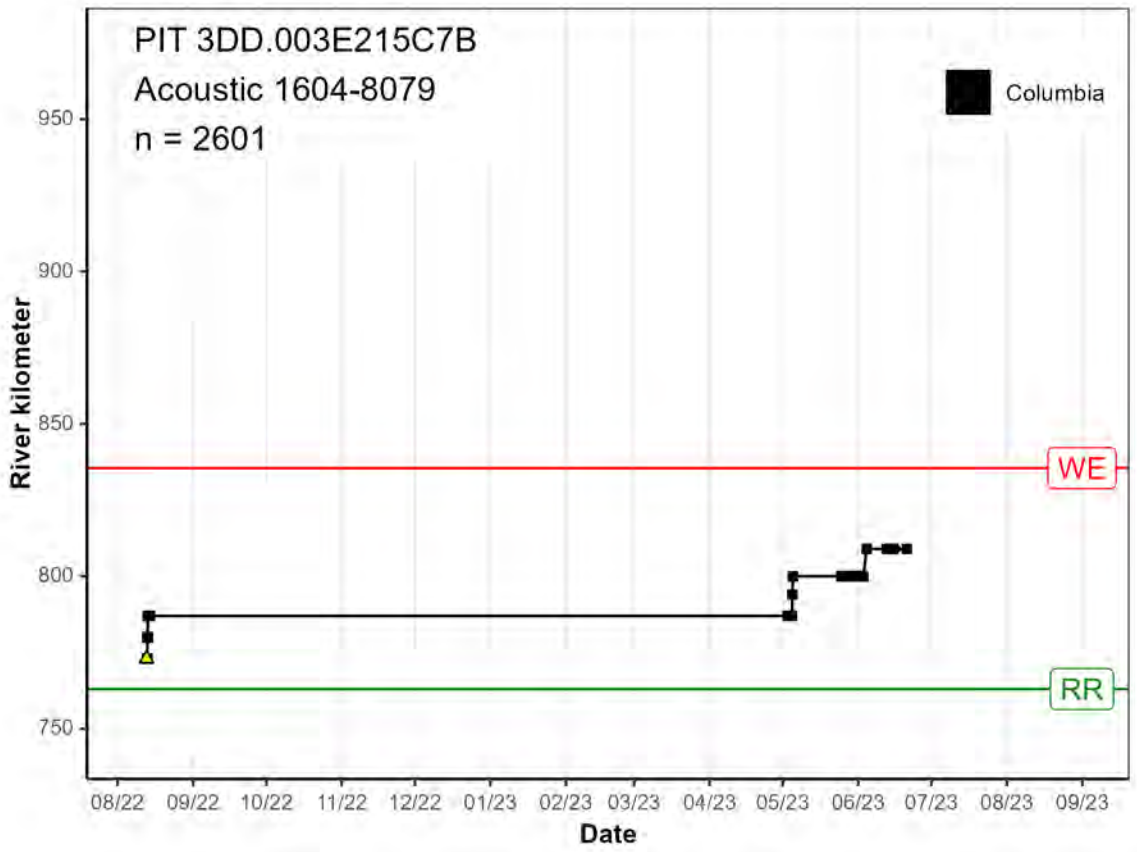

PIT 3DD.003E215C5A
Acoustic 1604-8074
n = 1585
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

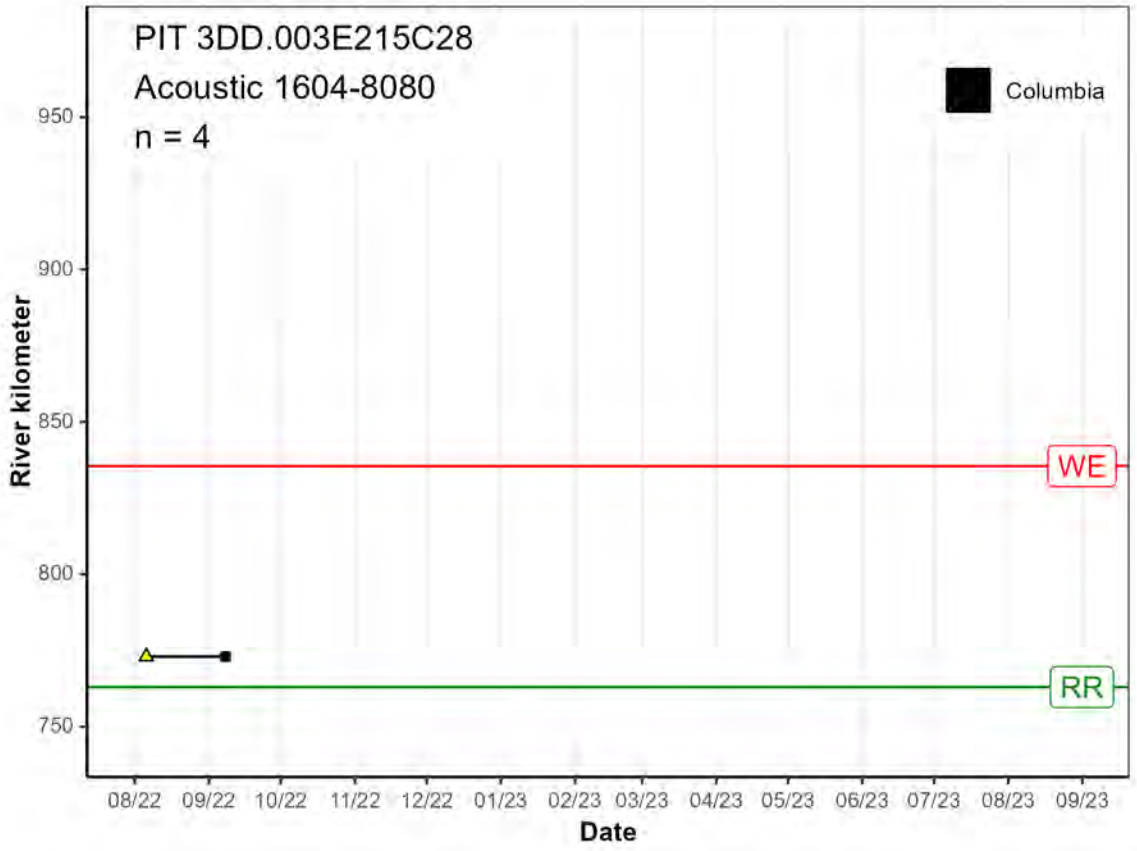

PIT 3DD.003E215C1E
Acoustic 1604-8075
n = 814
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

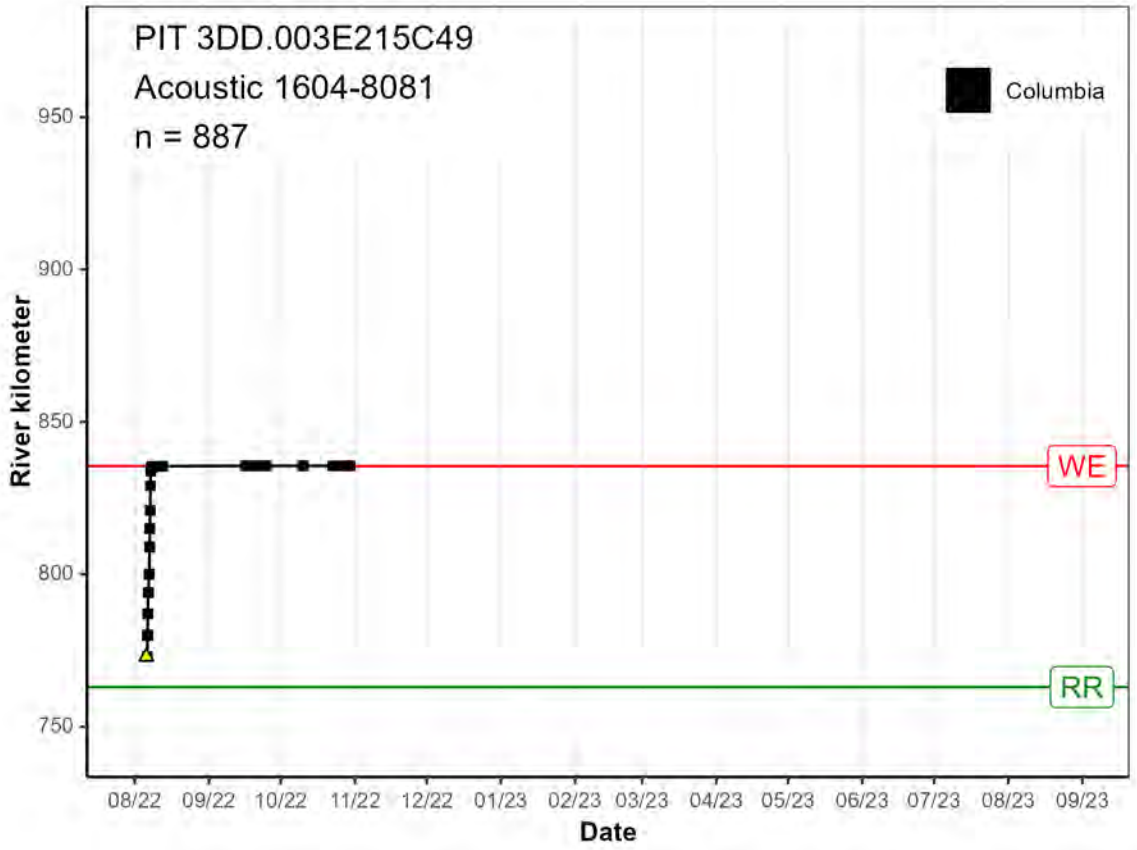

PIT 3DD.003E215C68
Acoustic 1604-8076
n = 1908
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

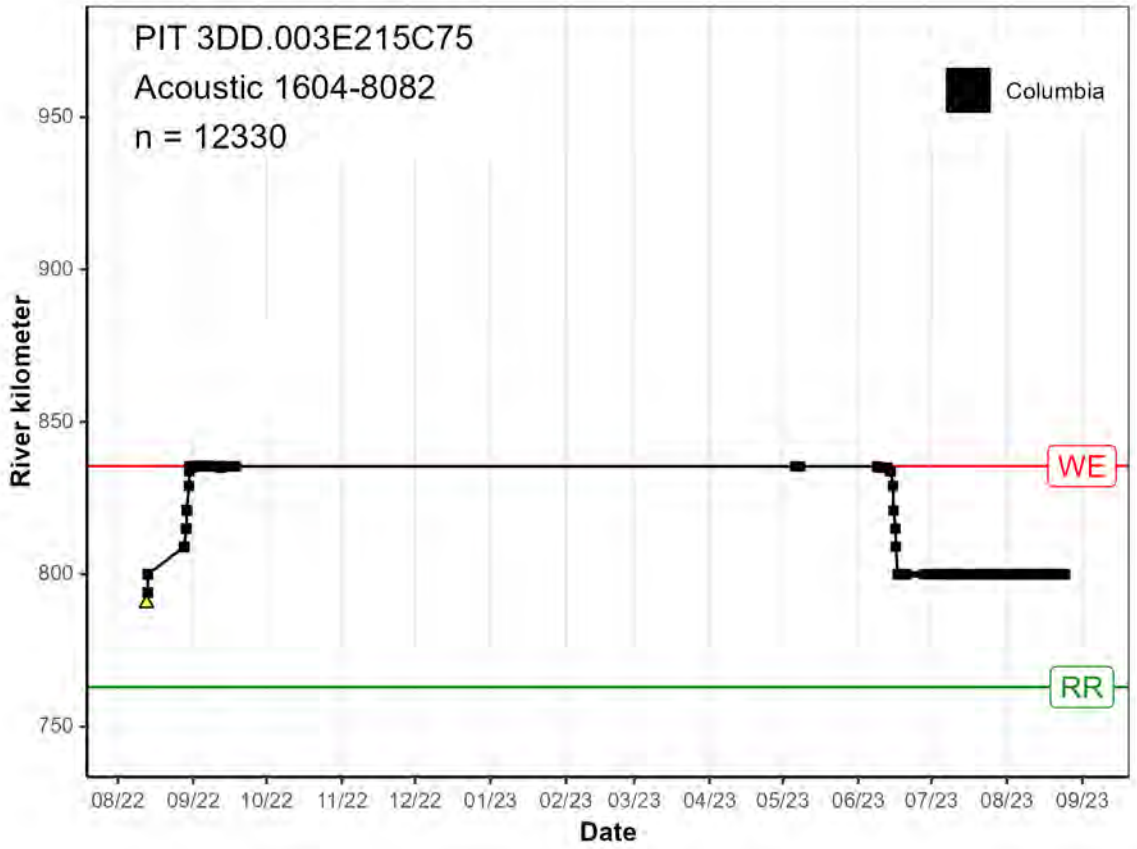

PIT 3DD.003E215C26
Acoustic 1604-8077
n = 181
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

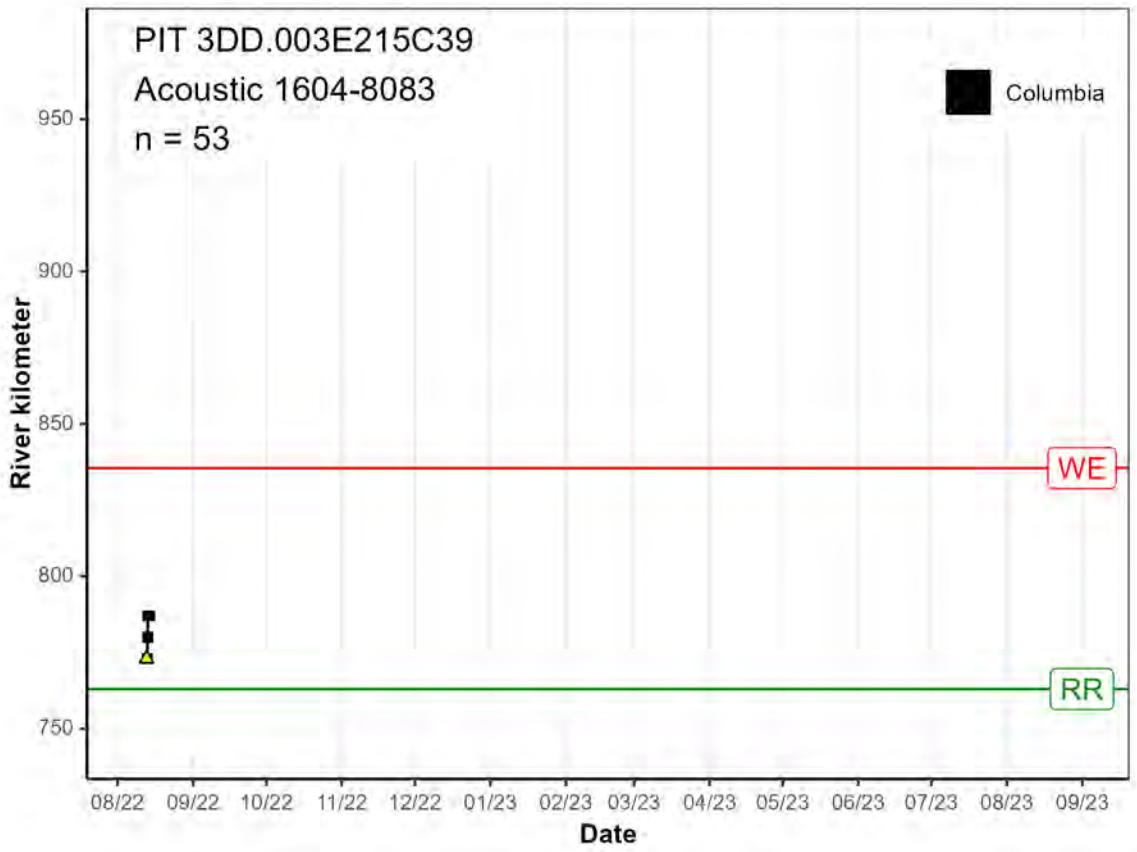

PIT 3DD.003E215C72
Acoustic 1604-8078
n = 465
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

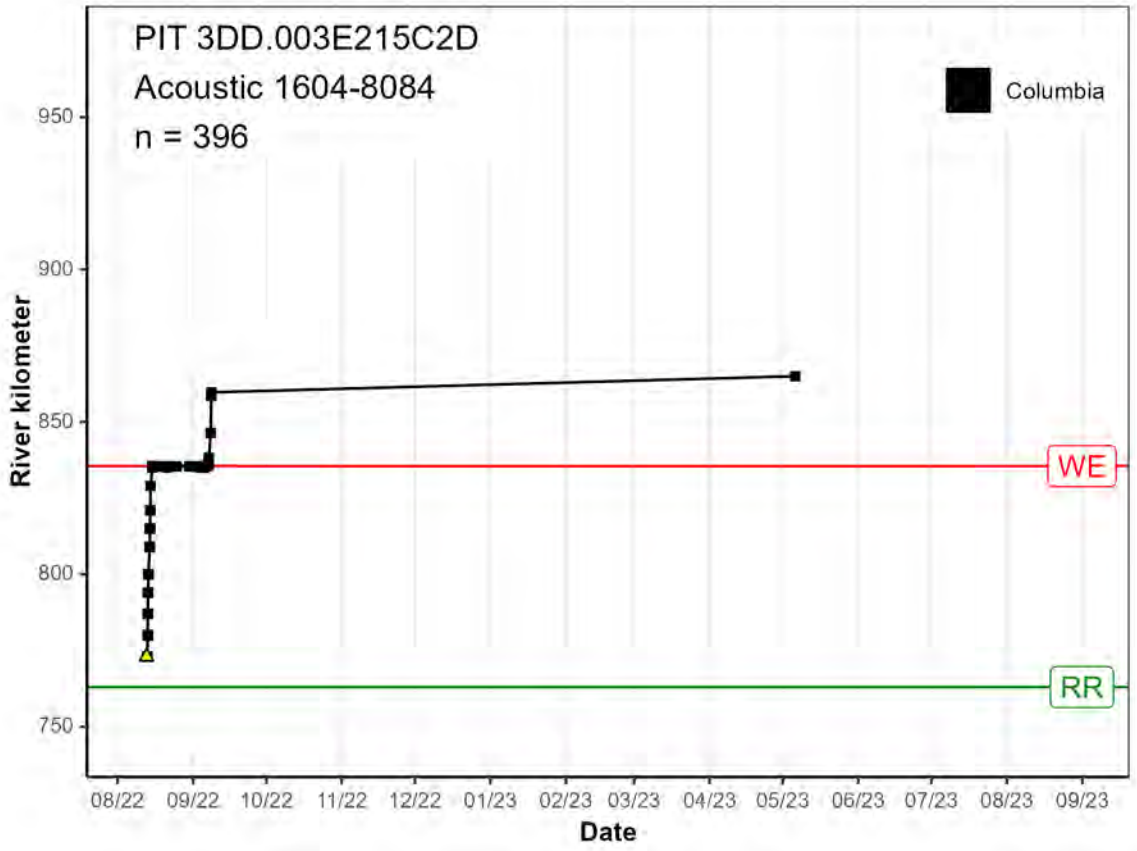

PIT 3DD.003E215C7B
Acoustic 1604-8079
n = 2601
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

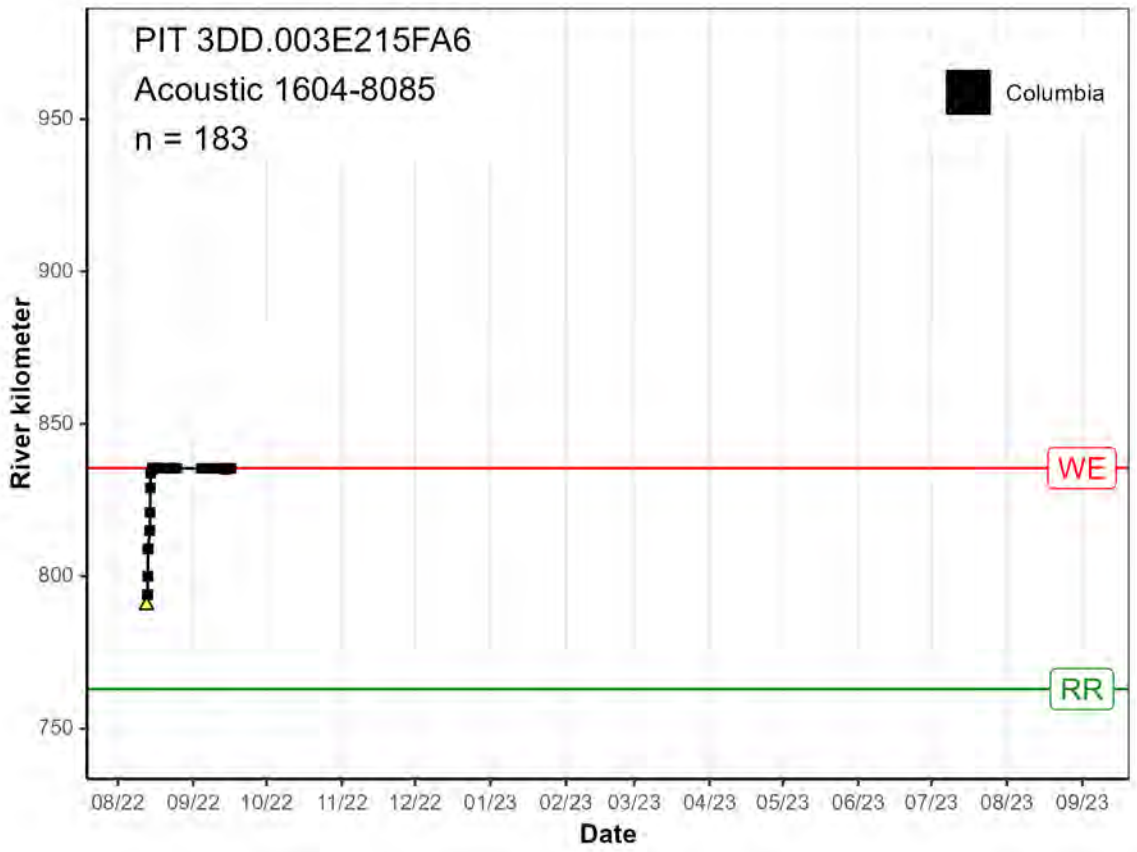

PIT 3DD.003E215C28
Acoustic 1604-8080
n = 4
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

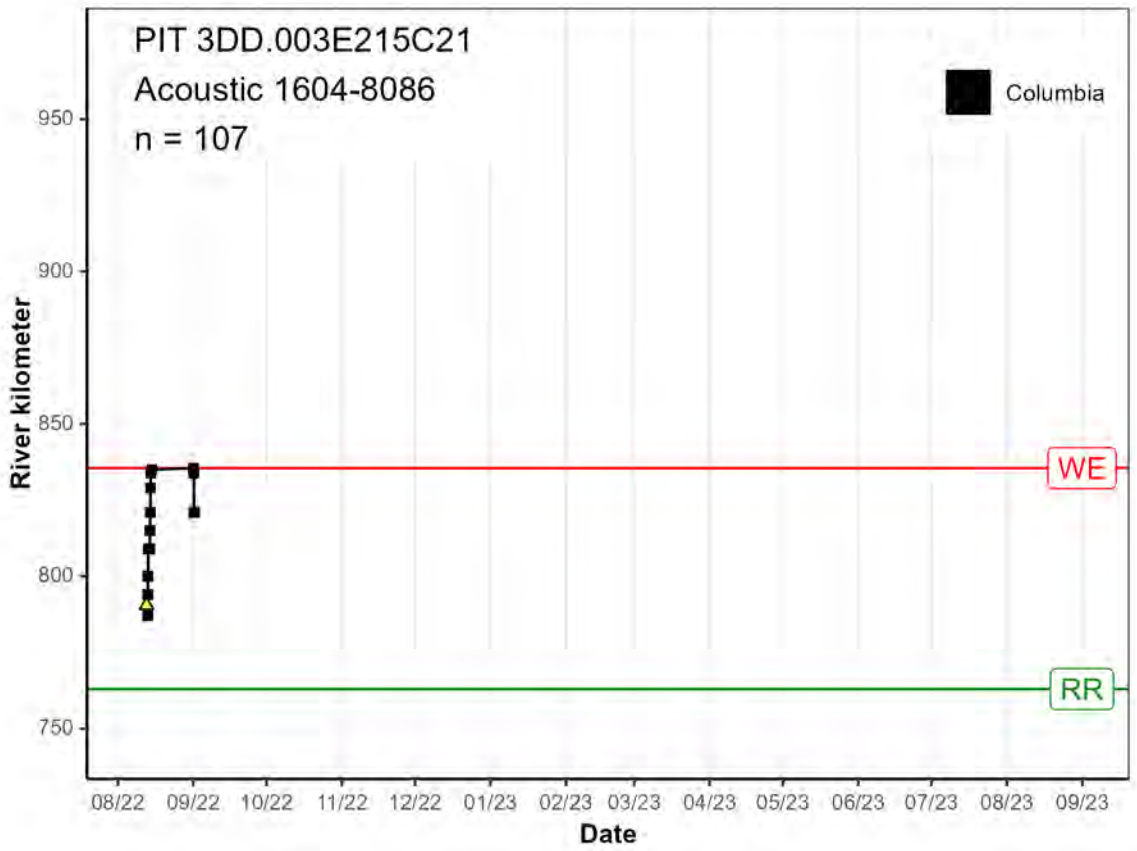

PIT 3DD.003E215C49
Acoustic 1604-8081
n = 887
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

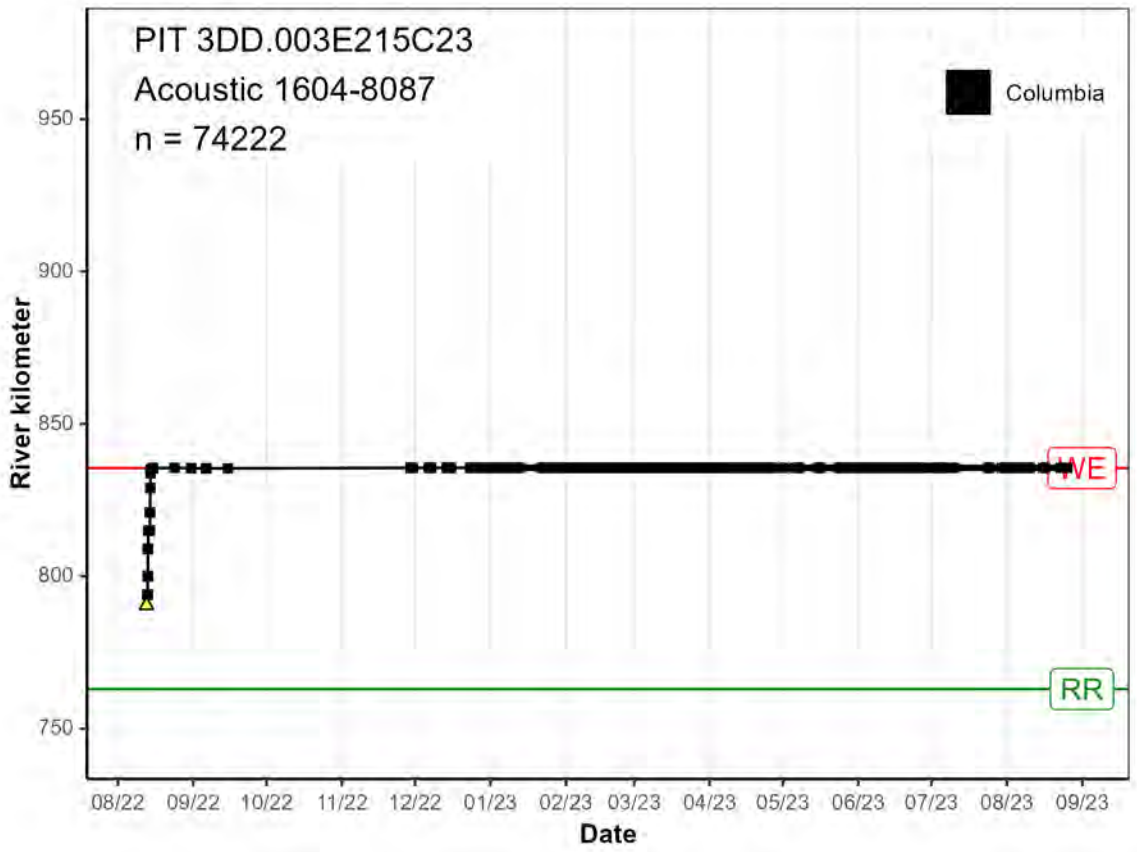

PIT 3DD.003E215C75
Acoustic 1604-8082
n = 12330
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date


PIT 3DD.003E215C39
Acoustic 1604-8083
n = 53
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

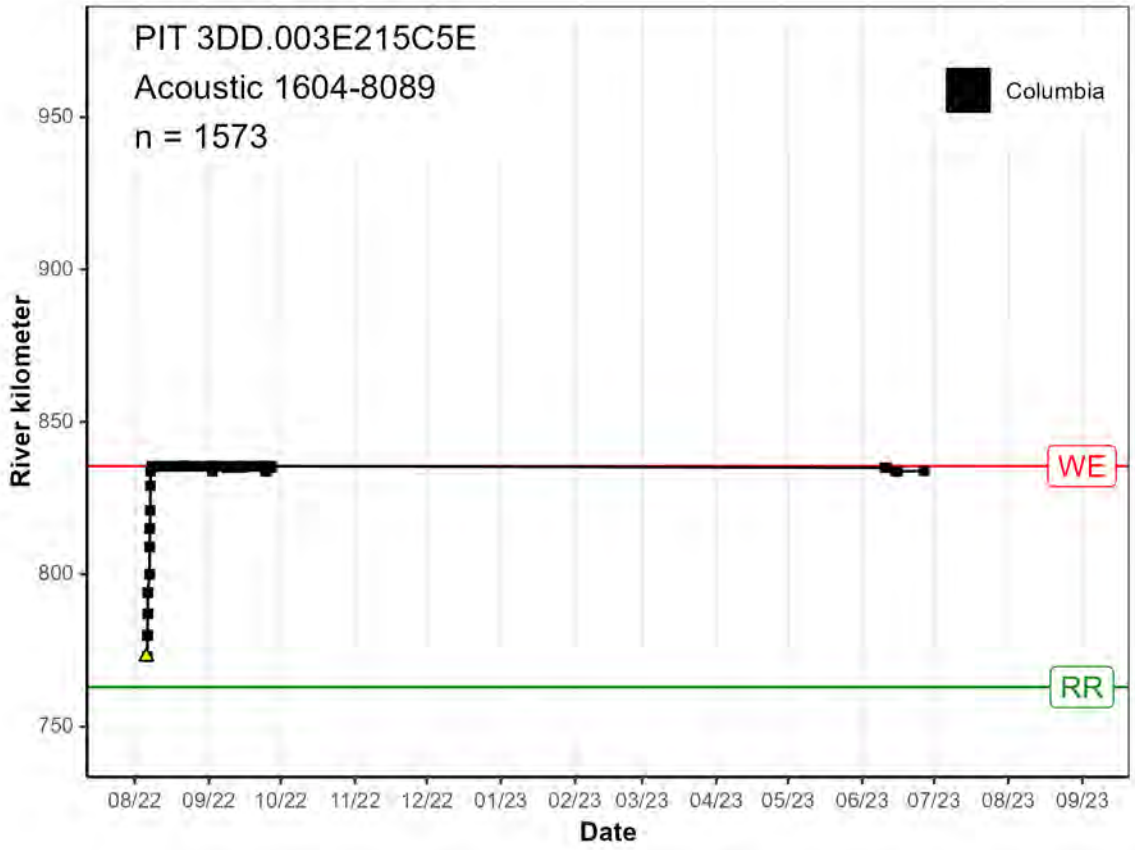

PIT 3DD.003E215C2D
Acoustic 1604-8084
n = 396
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

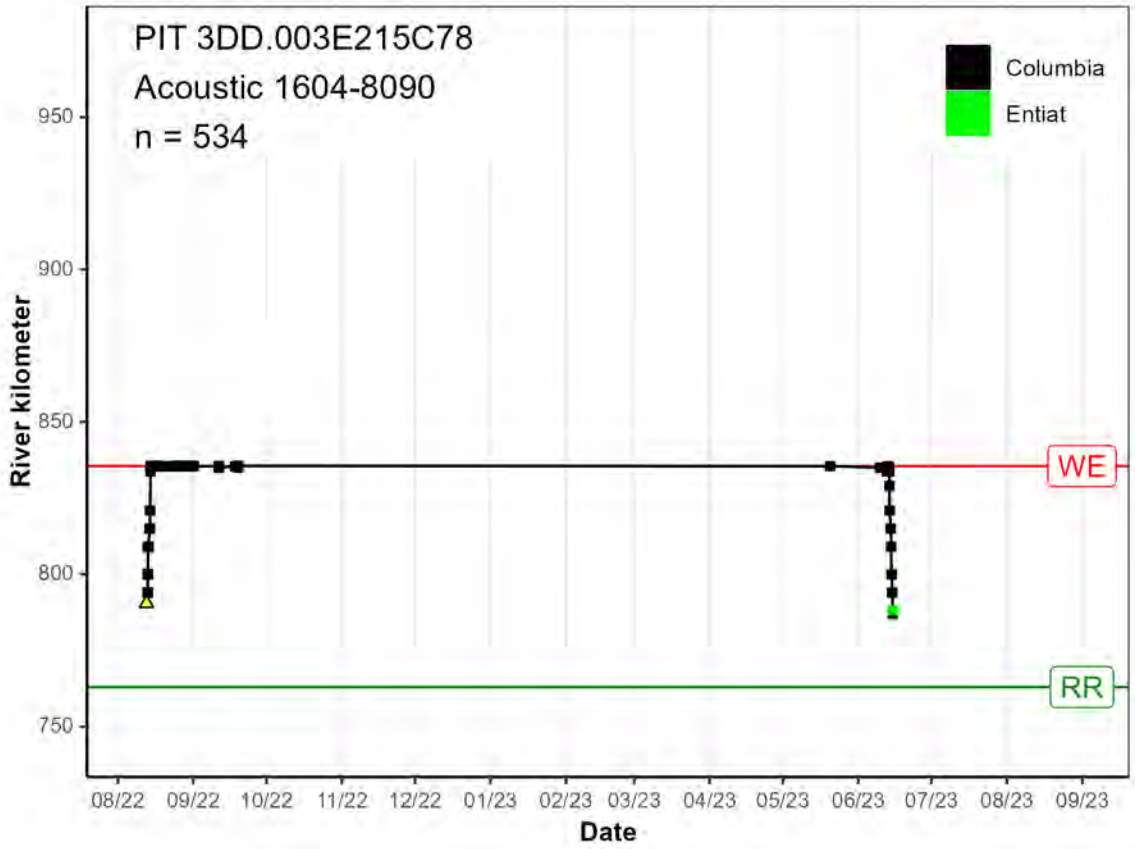

PIT 3DD.003E215FA6
Acoustic 1604-8085
n = 183
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

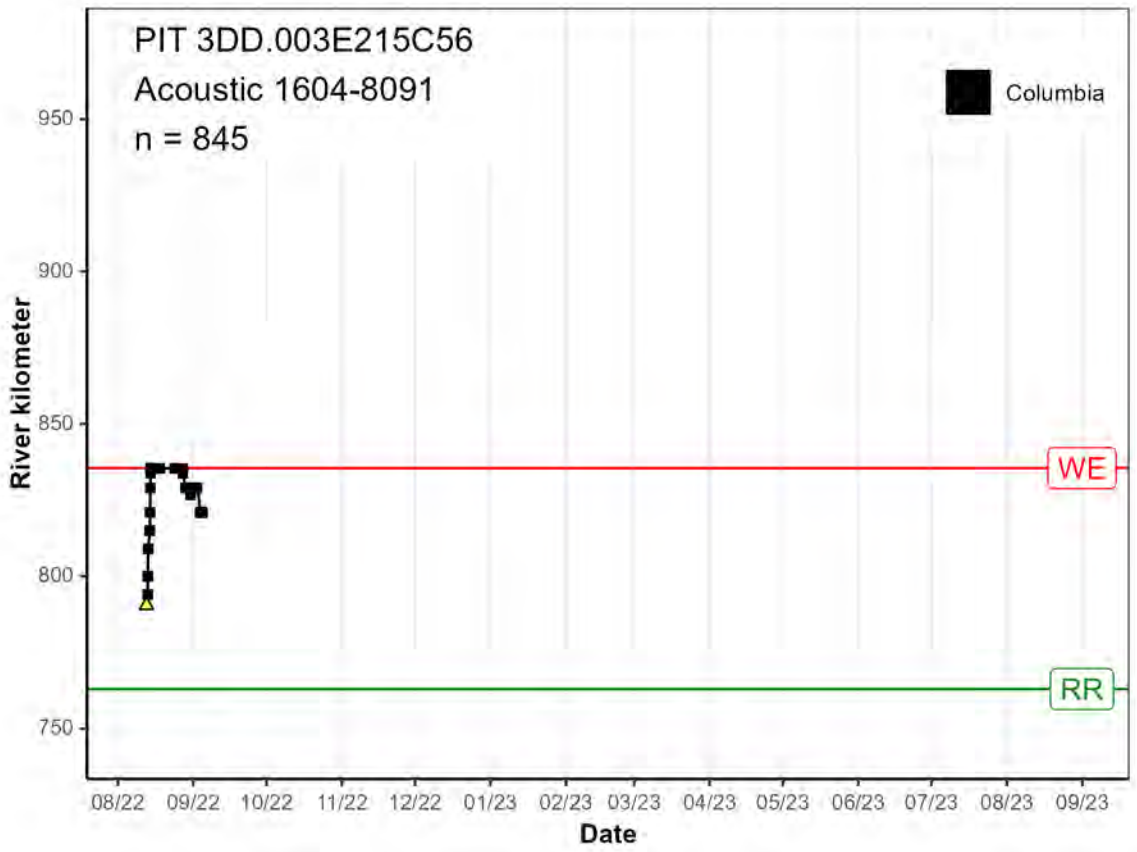

PIT 3DD.003E215C21
Acoustic 1604-8086
n = 107
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

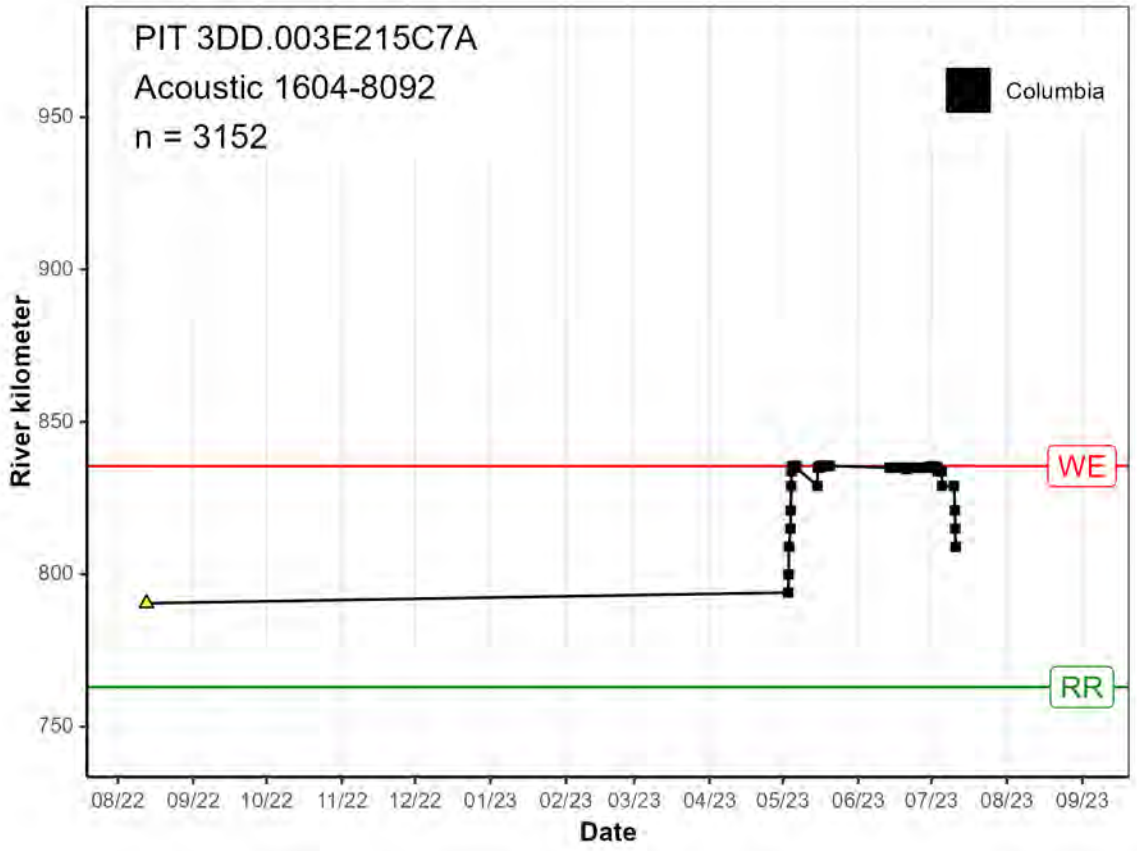

PIT 3DD.003E215C23
Acoustic 1604-8087
n = 74222
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

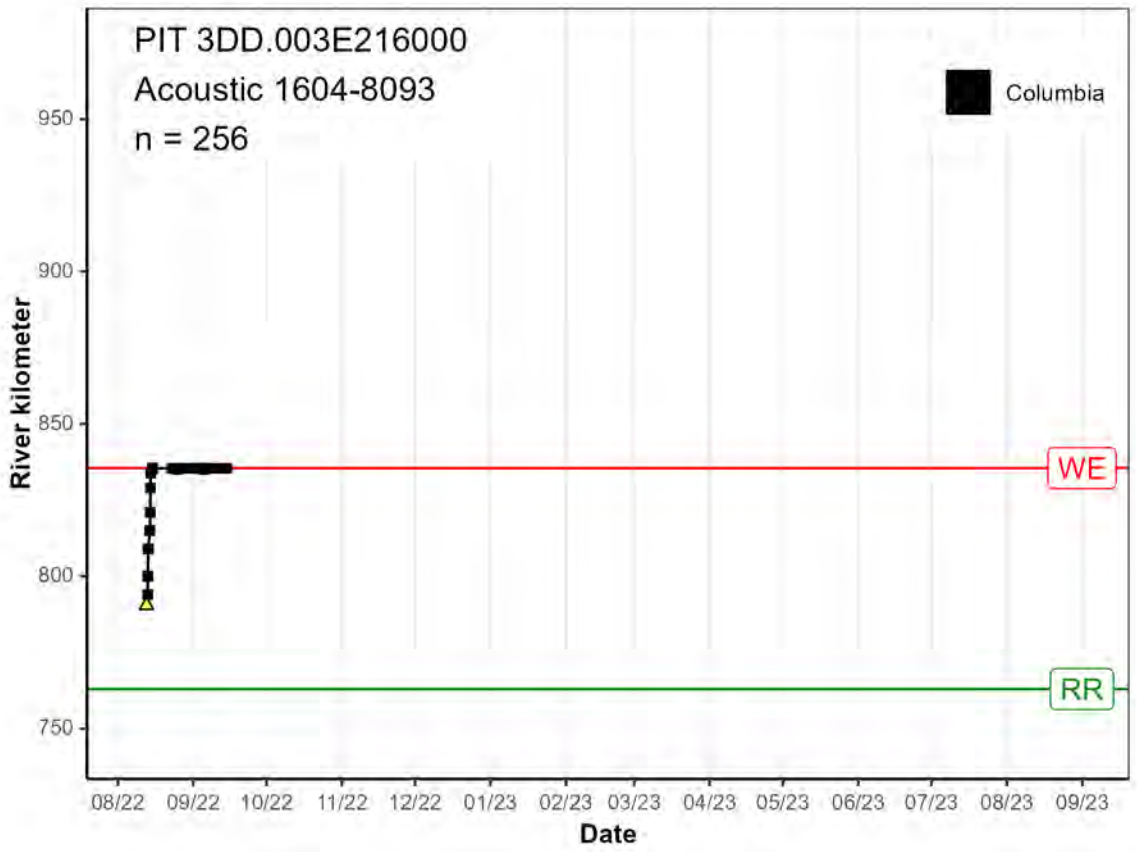
PIT 3DD.003E215C70
Acoustic 1604-8088
n = 1896
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

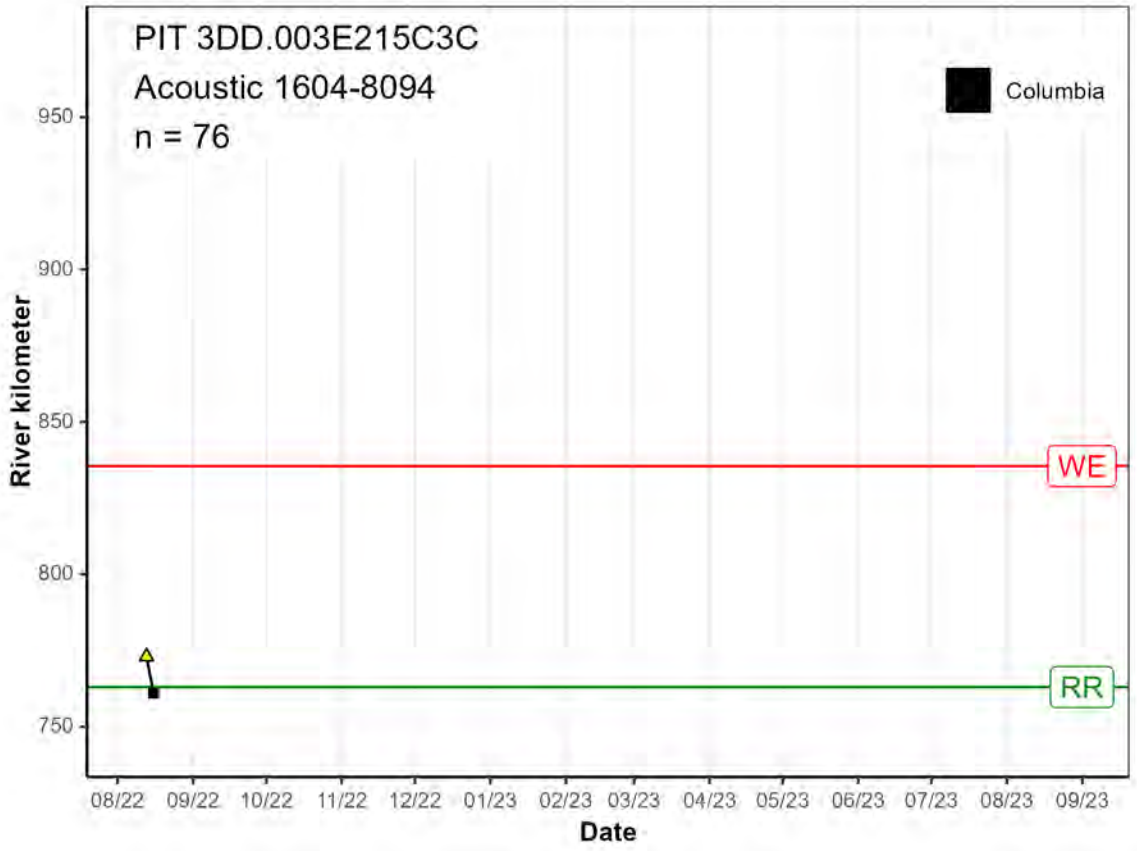

PIT 3DD.003E215C5E
Acoustic 1604-8089
n = 1573
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

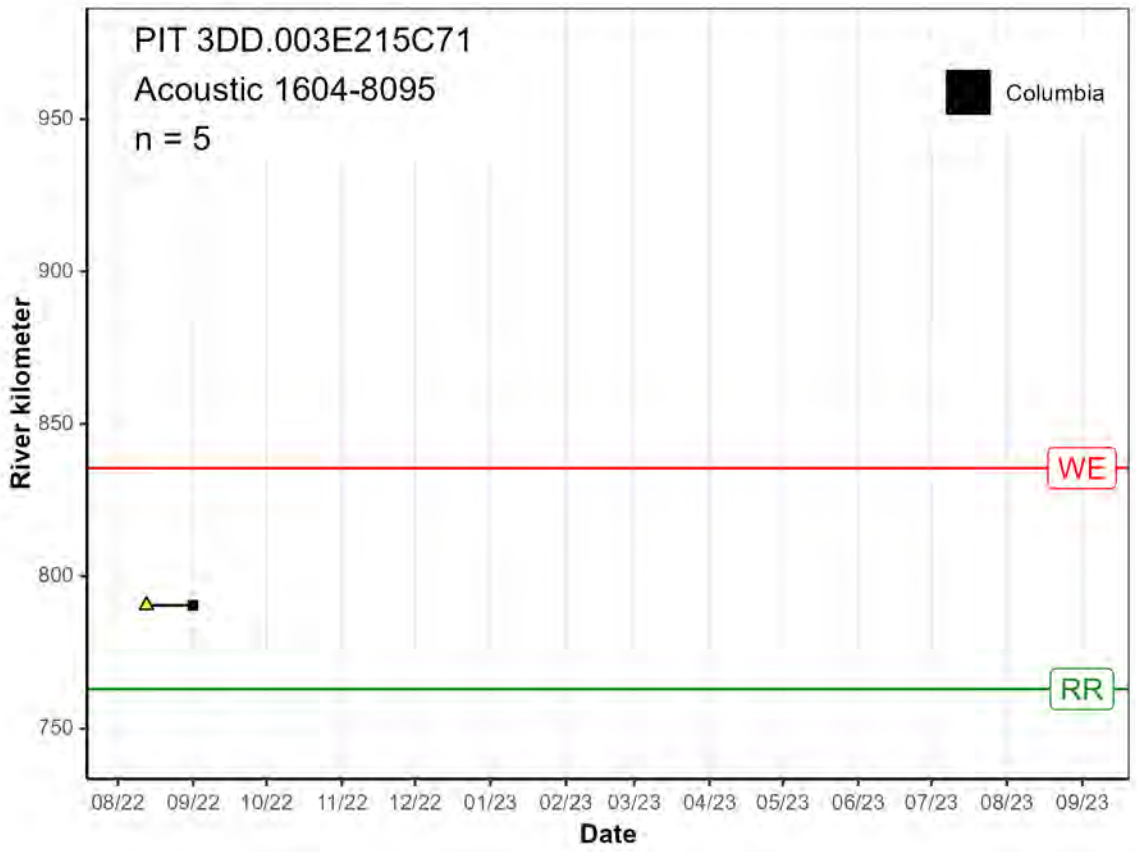

PIT 3DD.003E215C78
Acoustic 1604-8090
n = 534
Columbia
Entiat
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

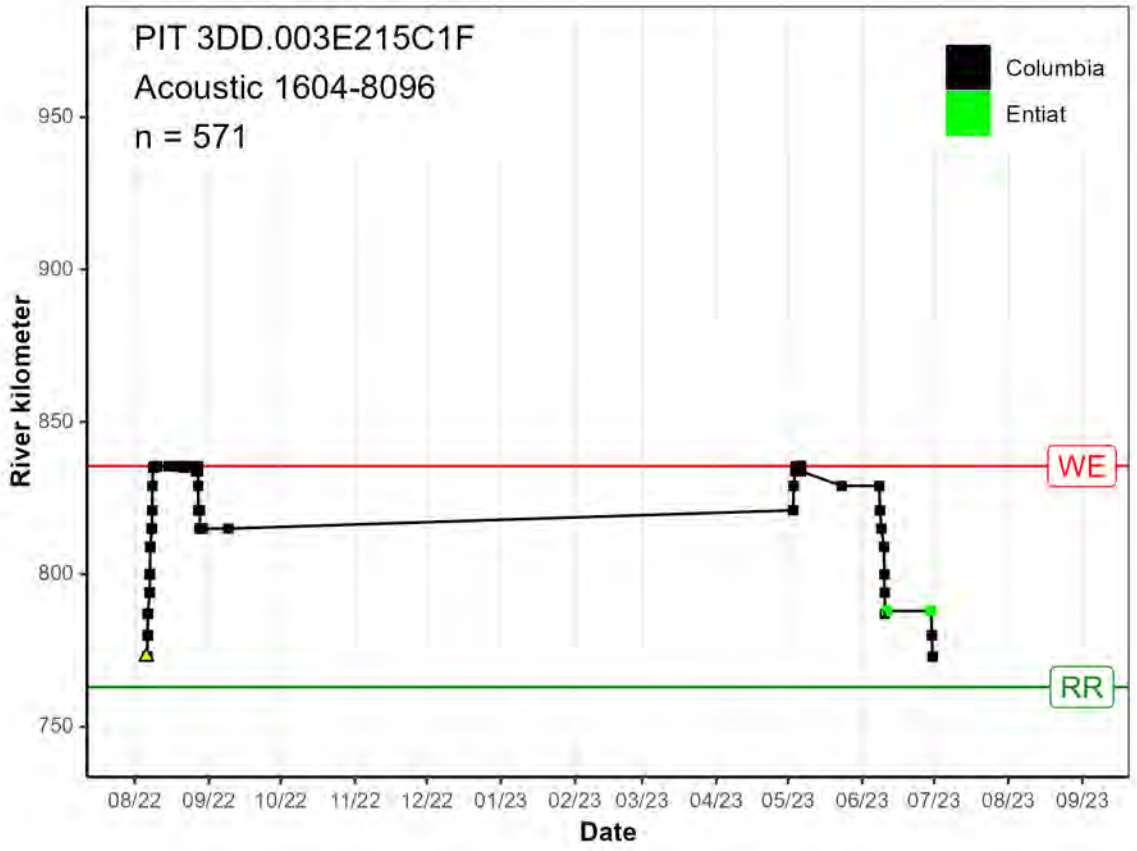

PIT 3DD.003E215C56
Acoustic 1604-8091
n = 845
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

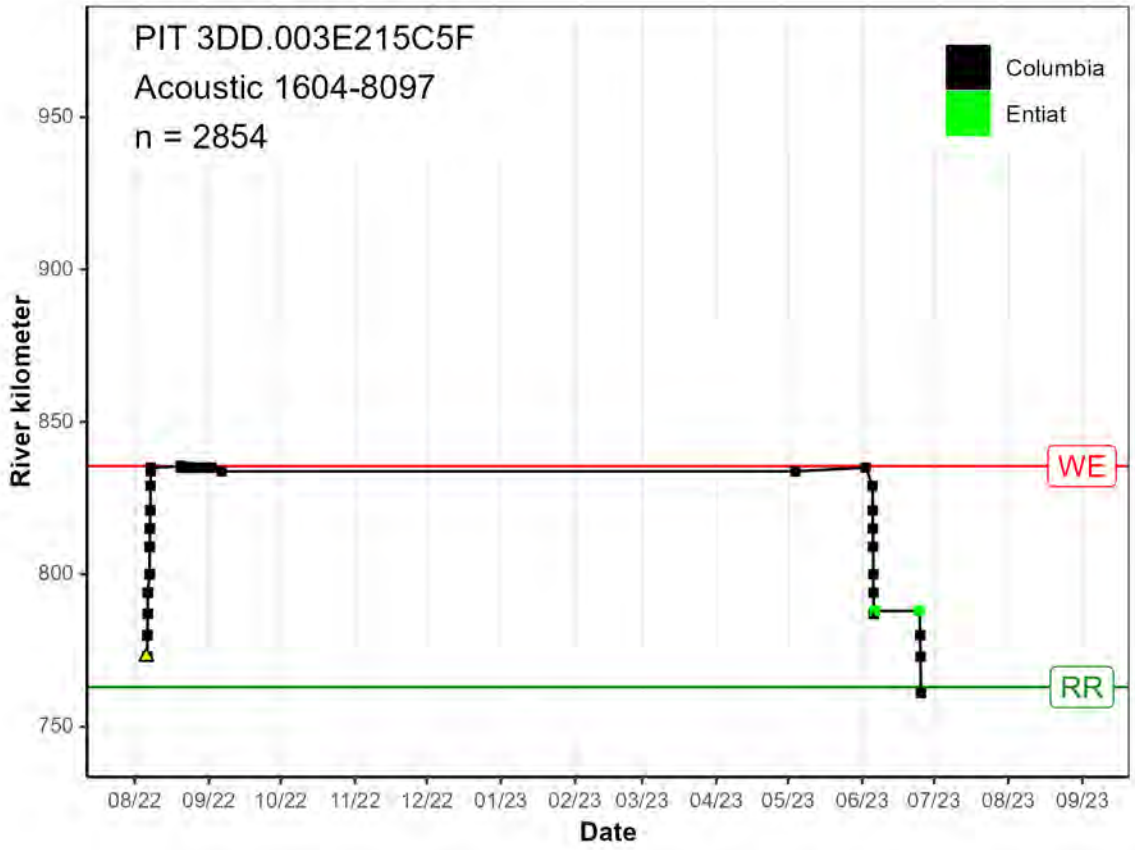

PIT 3DD.003E215C7A
Acoustic 1604-8092
n = 3152
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

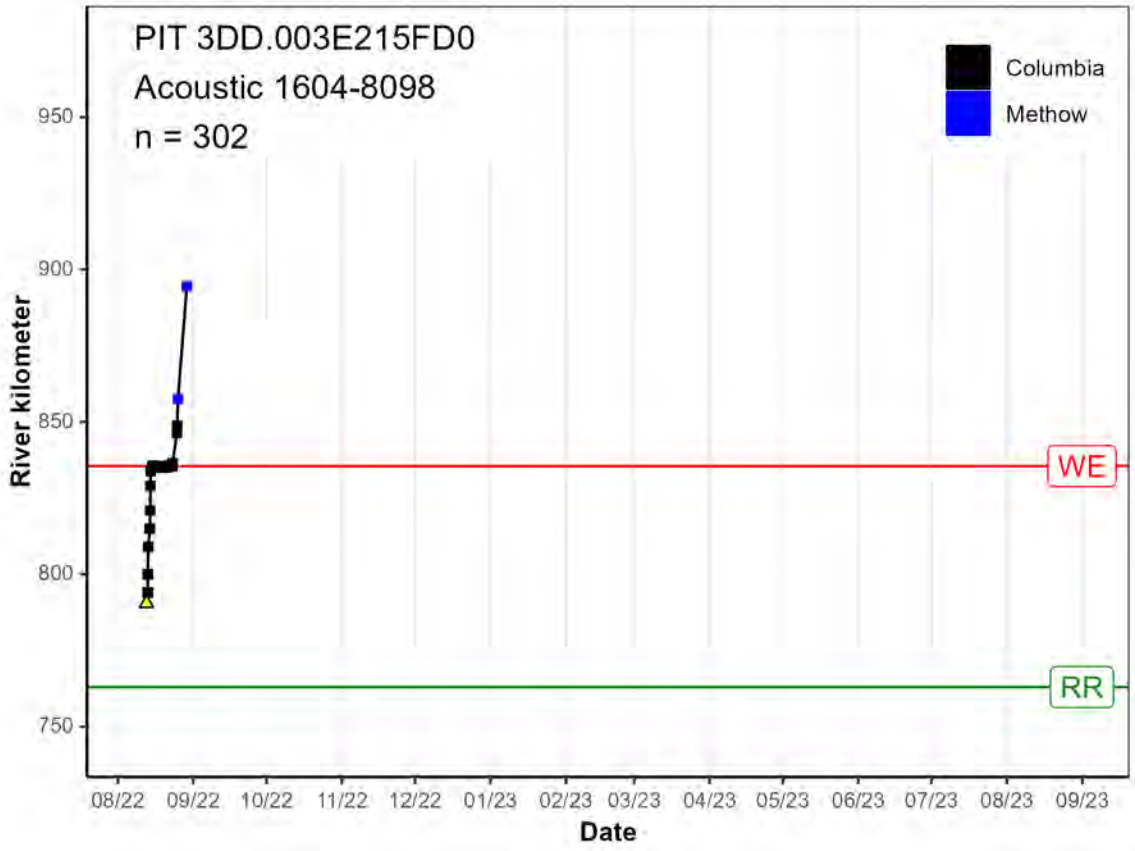

PIT 3DD.003E216000
Acoustic 1604-8093
n = 256
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

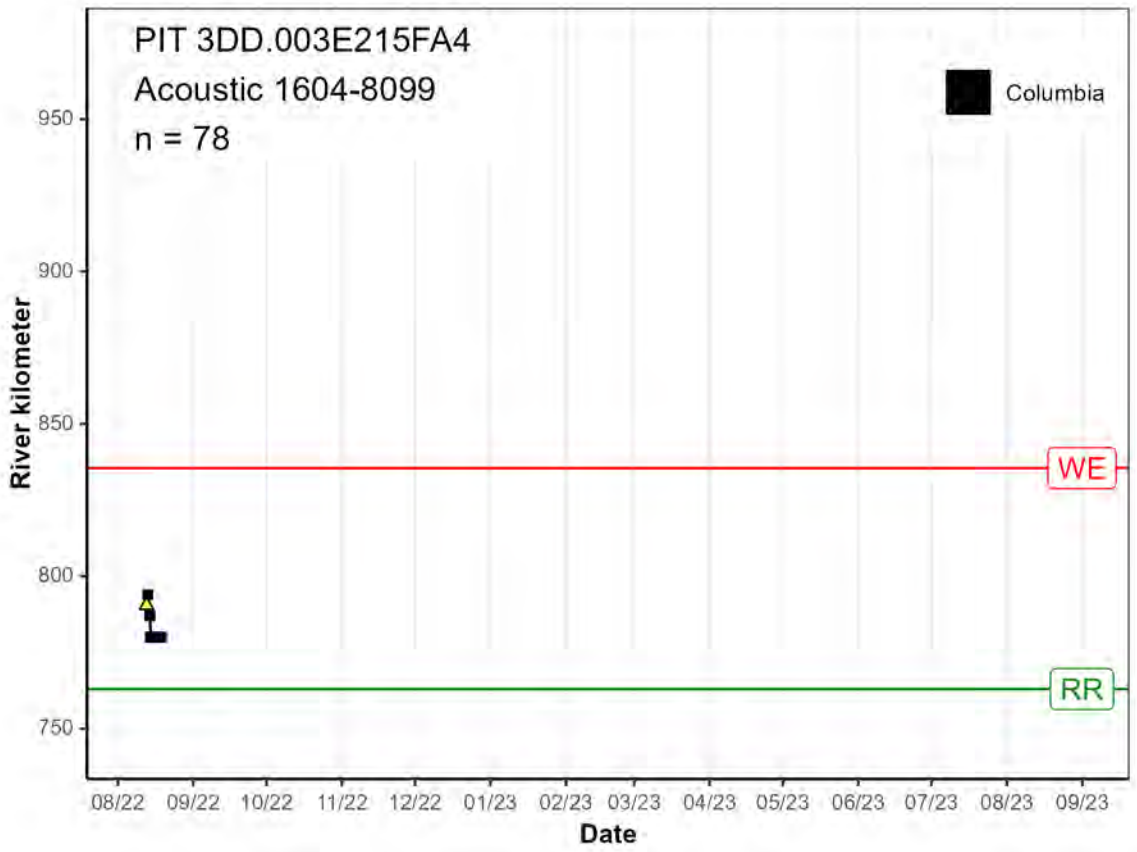

PIT 3DD.003E215C3C
Acoustic 1604-8094
n = 76
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

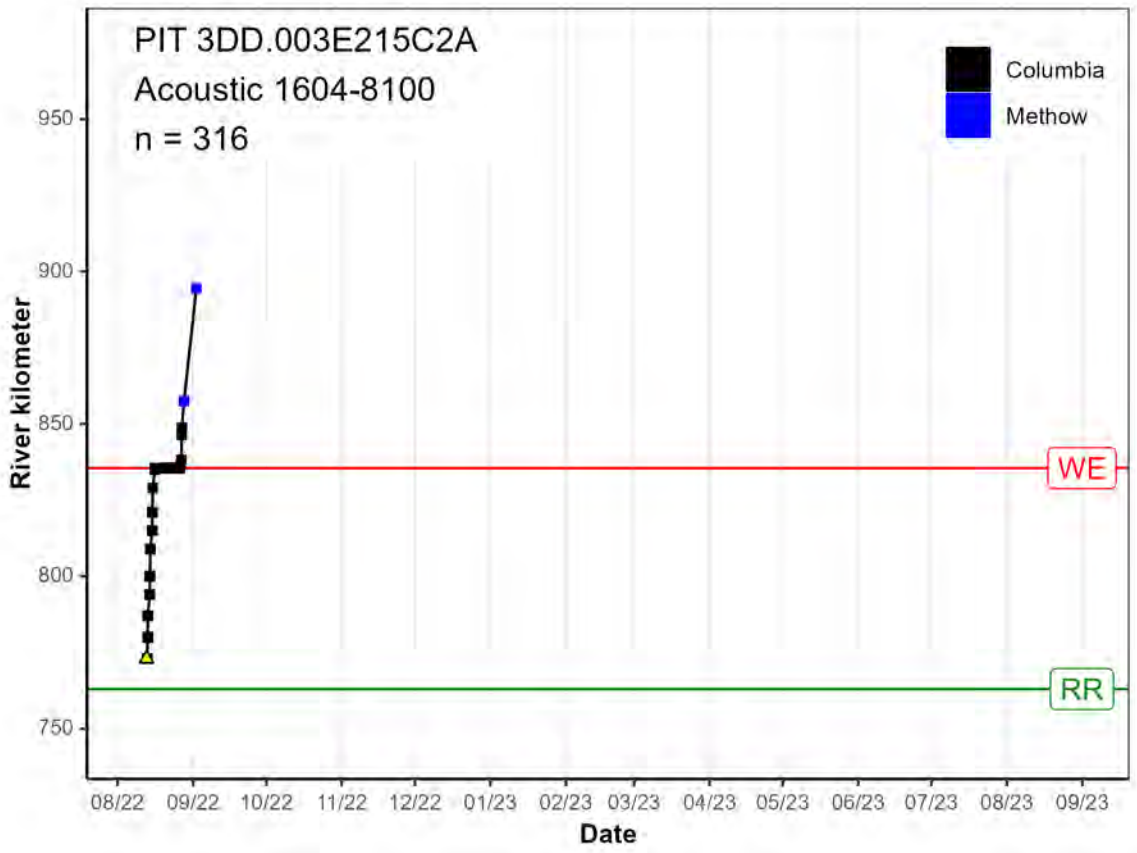

PIT 3DD.003E215C71
Acoustic 1604-8095
n = 5
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

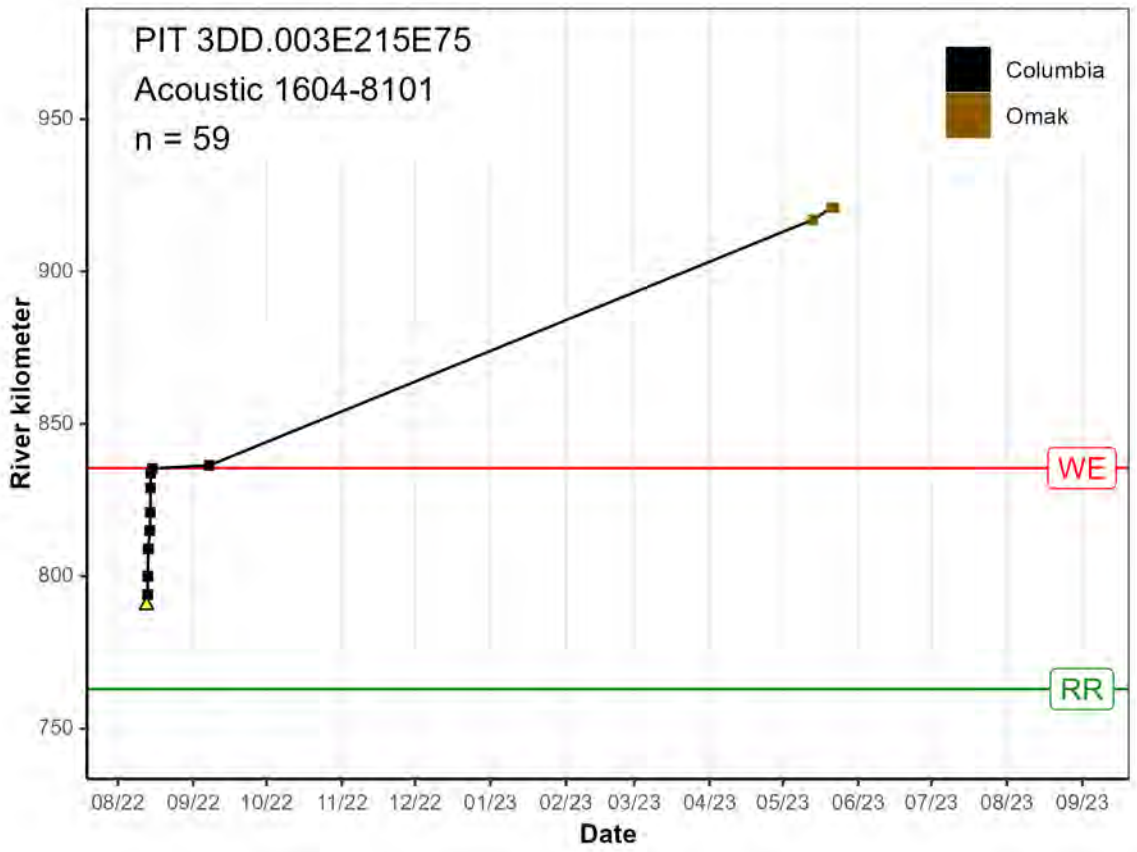

PIT 3DD.003E215C1F
Acoustic 1604-8096
n = 571
Columbia
Entiat
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

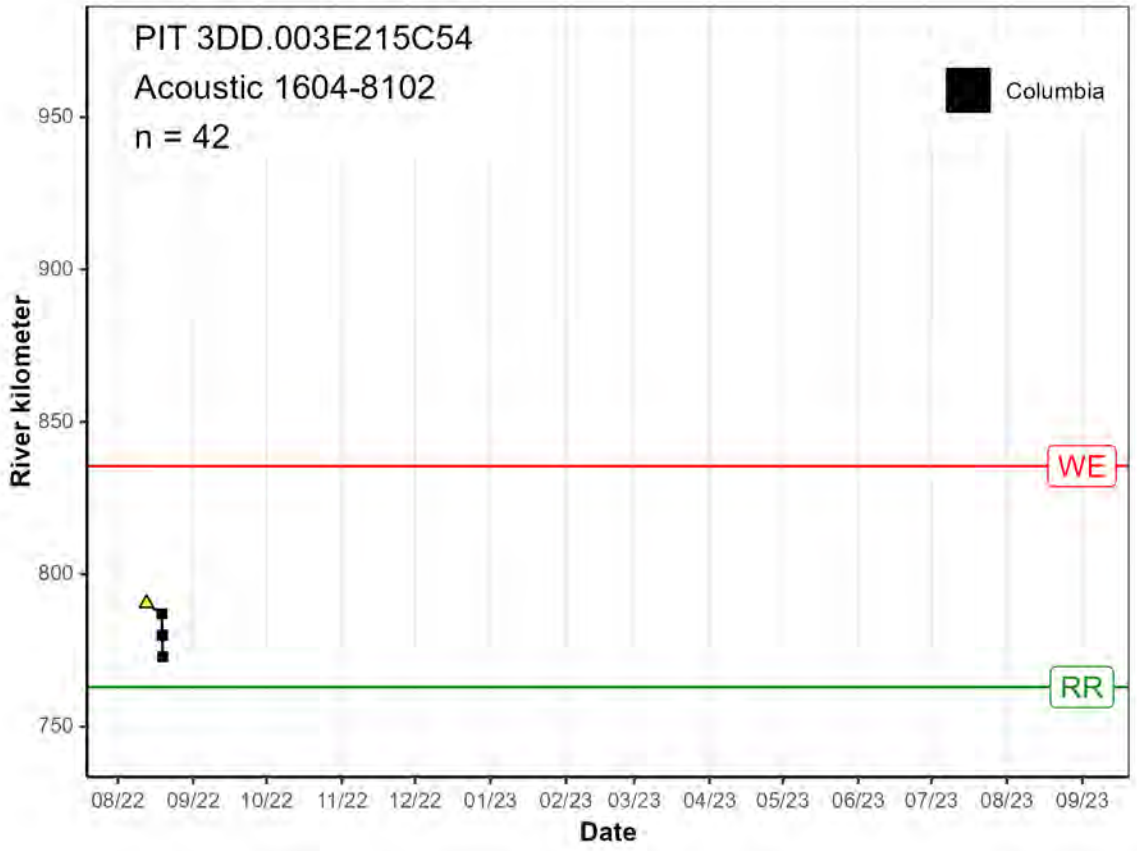

PIT 3DD.003E215C5F
Acoustic 1604-8097
n = 2854
Columbia
Entiat
WE
RR
River kilometer
950
900
850
800
750
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

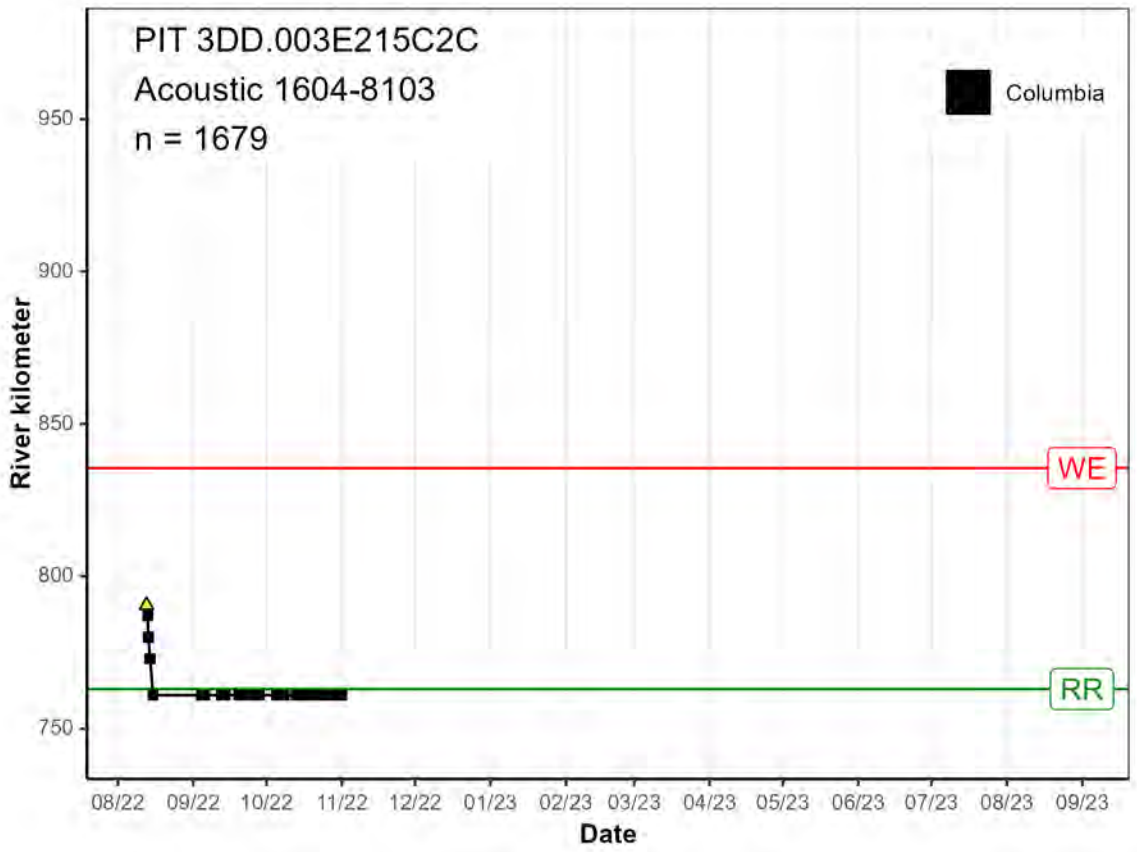

PIT 3DD.003E215FD0
Acoustic 1604-8098
n = 302
Columbia
Methow
WE
RR
River kilometer
950
900
850
800
750
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

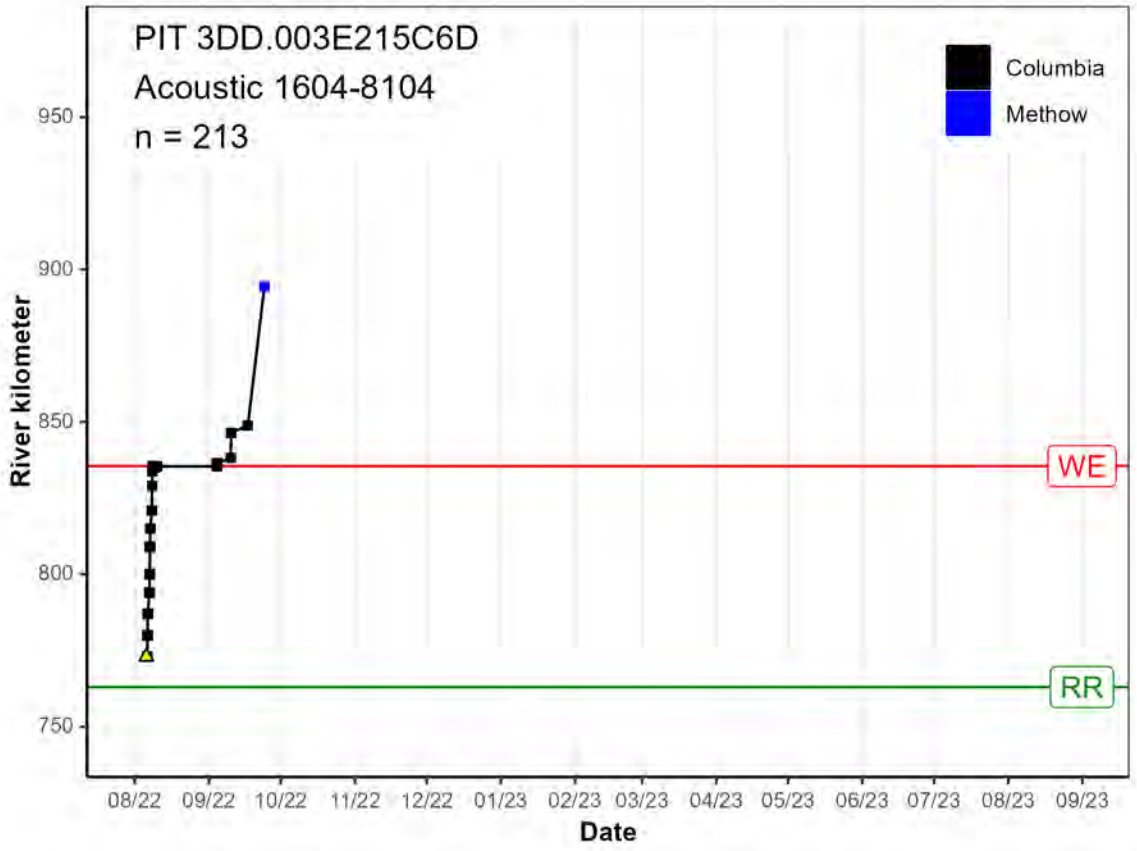

PIT 3DD.003E215FA4
Acoustic 1604-8099
n = 78
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

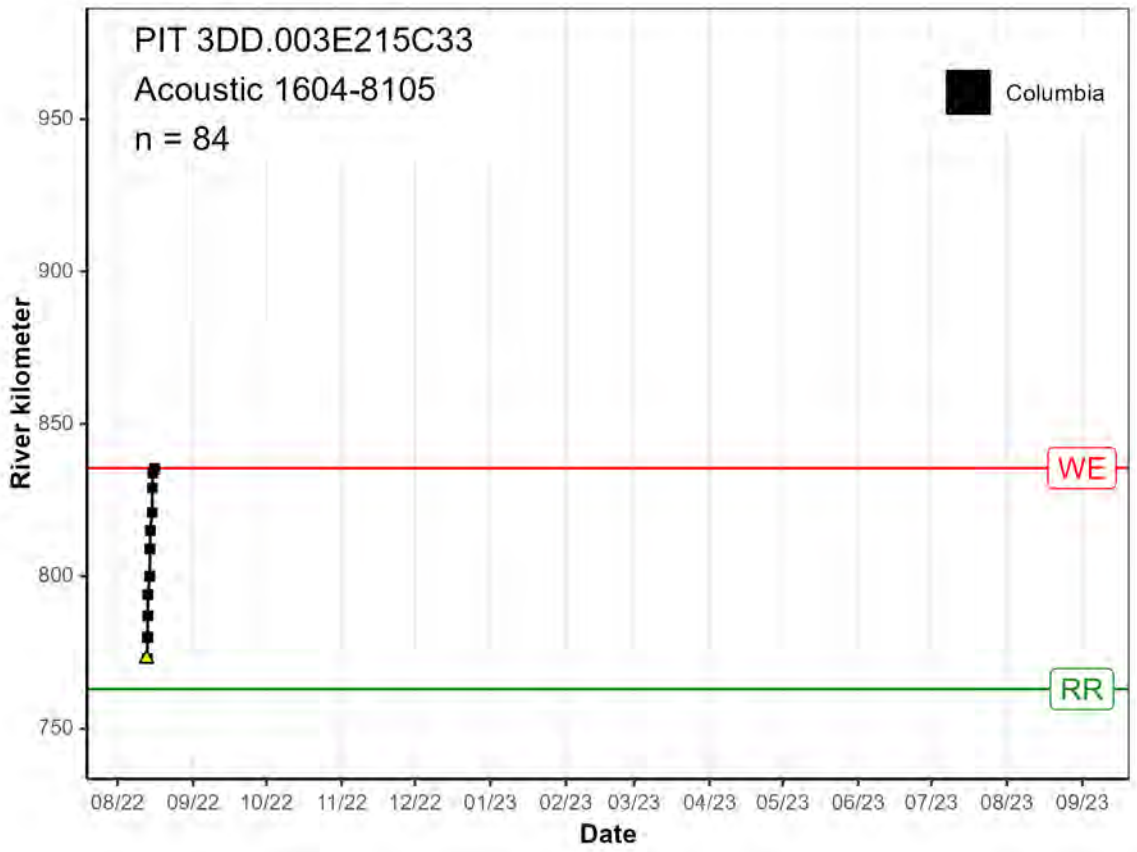

PIT 3DD.003E215C2A
Acoustic 1604-8100
n = 316
Columbia
Methow
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

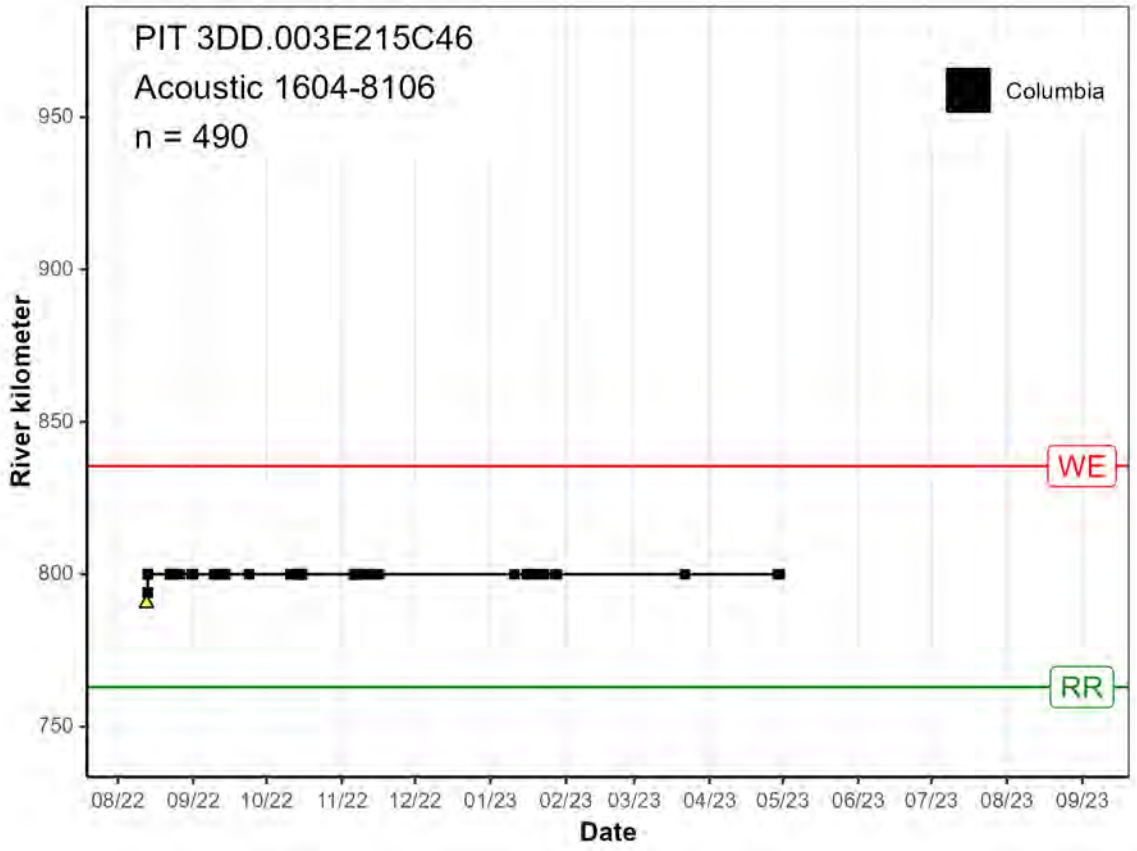

PIT 3DD.003E215E75
Acoustic 1604-8101
n = 59
Columbia
Omak
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

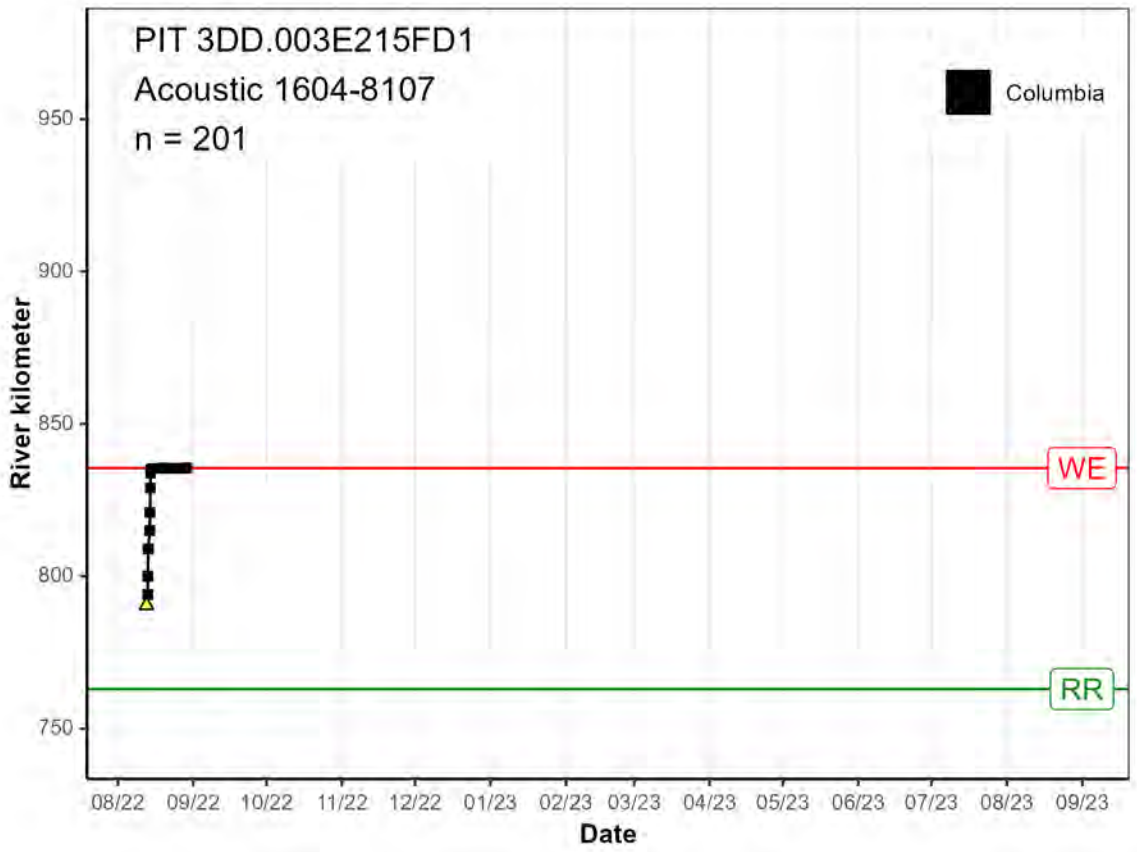

PIT 3DD.003E215C54
Acoustic 1604-8102
n = 42
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

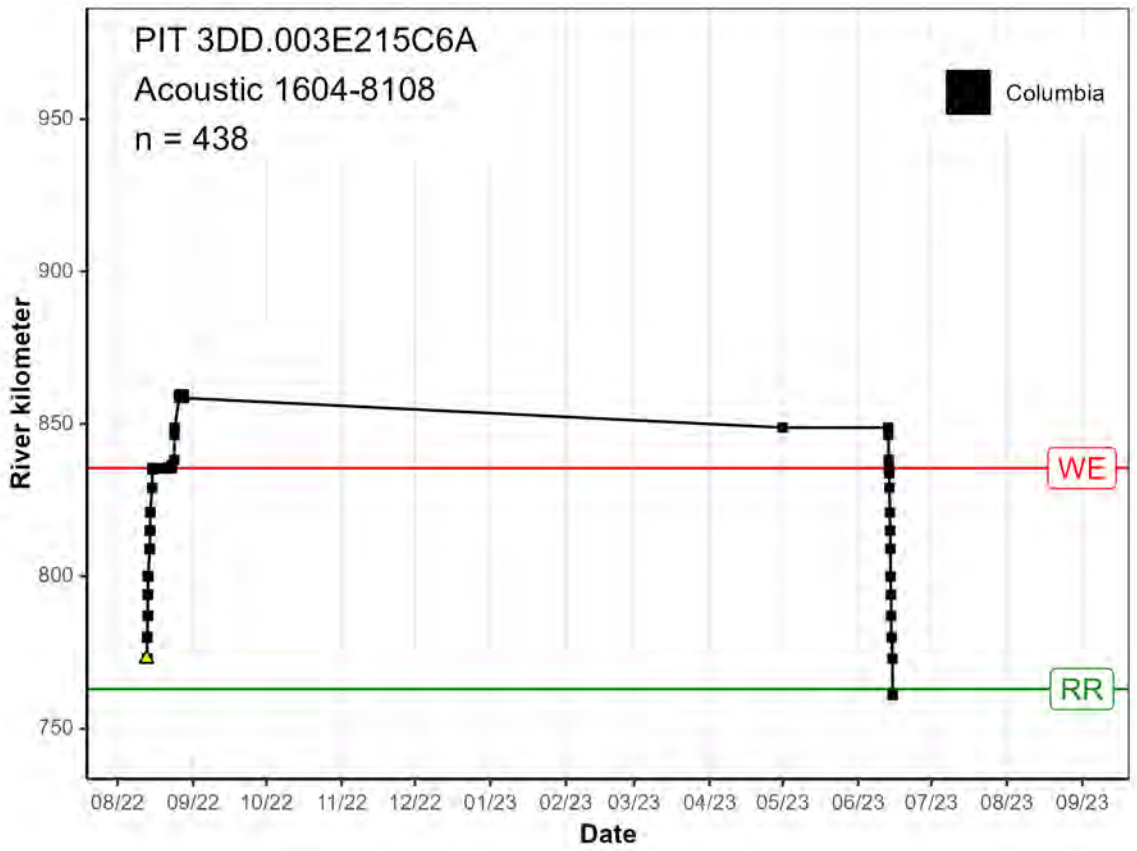

PIT 3DD.003E215C2C
Acoustic 1604-8103
n = 1679
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

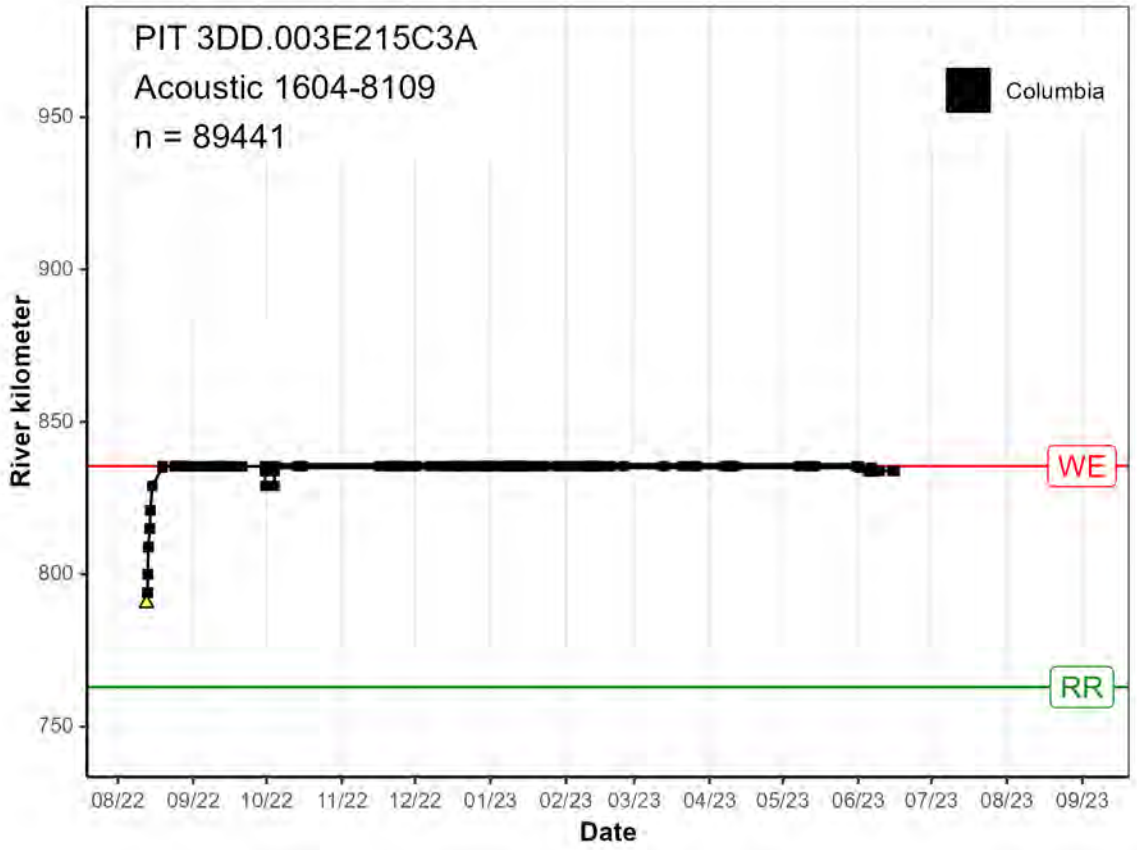

PIT 3DD.003E215C6D
Acoustic 1604-8104
n = 213
Columbia
Methow
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

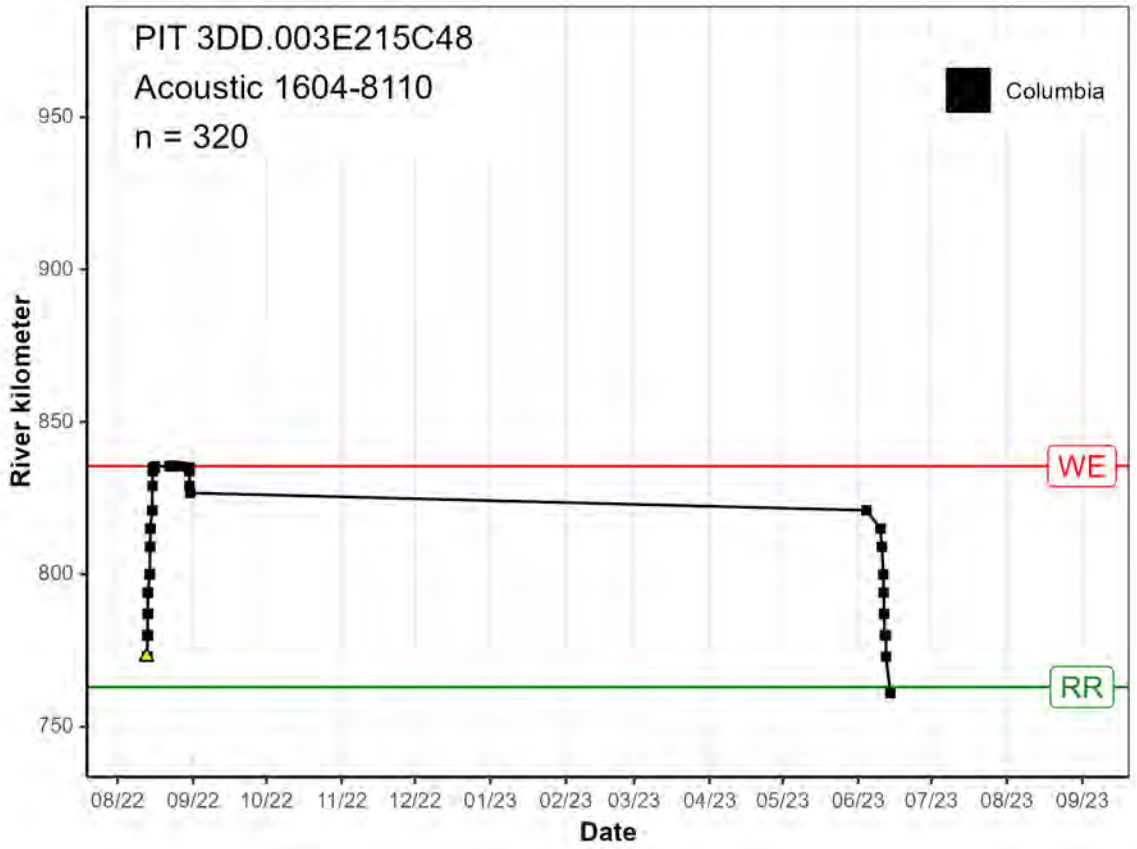

PIT 3DD.003E215C33
Acoustic 1604-8105
n = 84
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

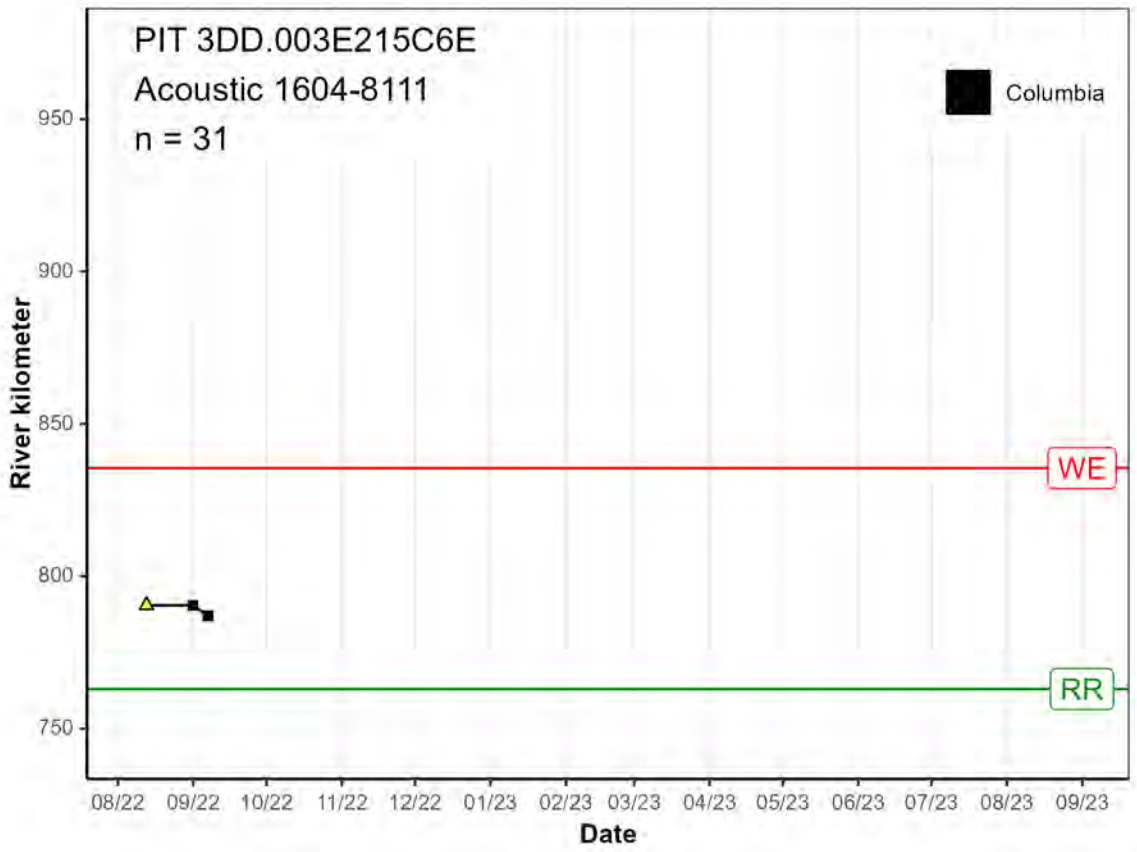

PIT 3DD.003E215C46
Acoustic 1604-8106
n = 490
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

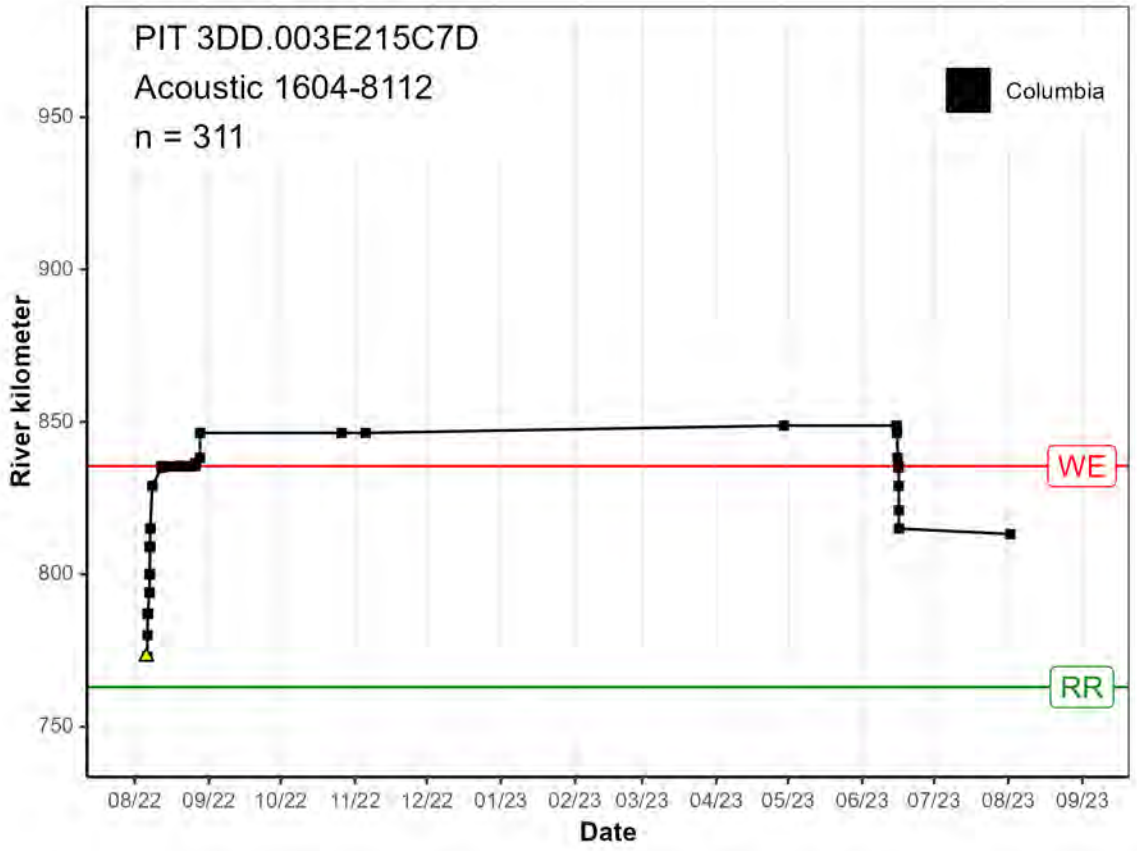

PIT 3DD.003E215FD1
Acoustic 1604-8107
n = 201
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

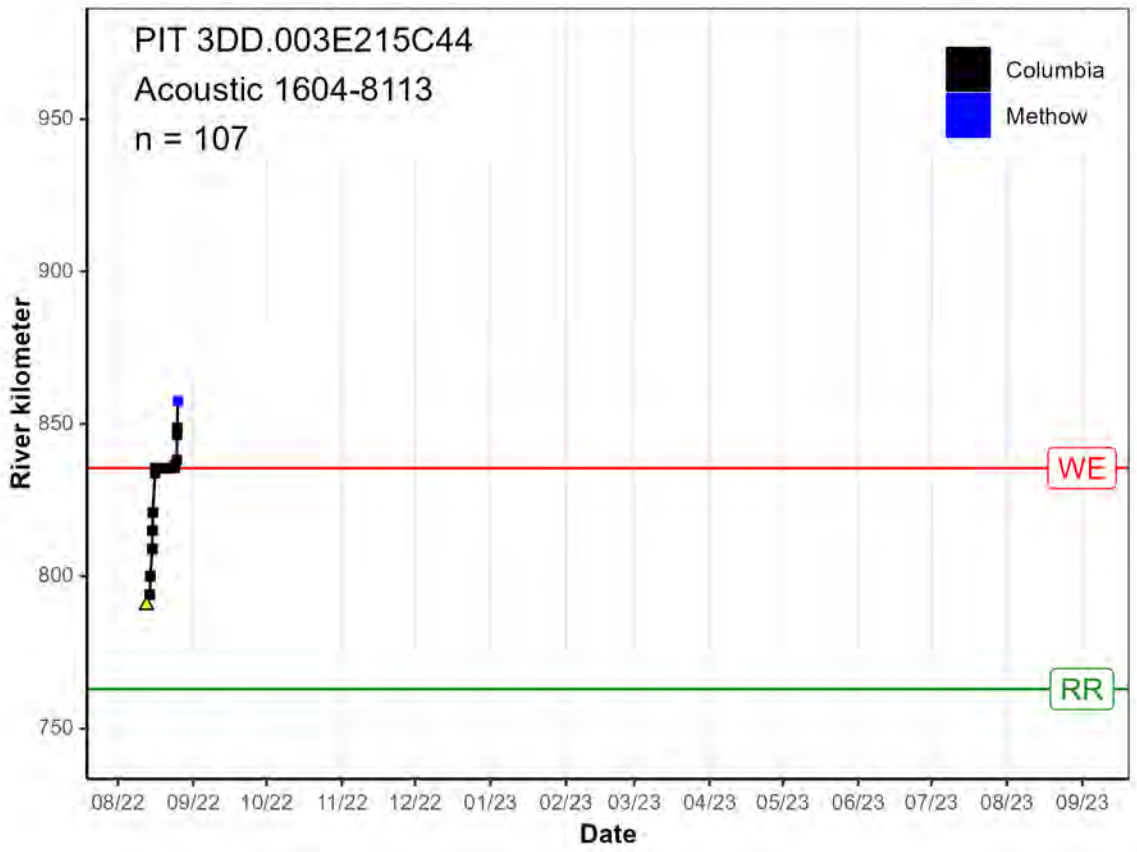

PIT 3DD.003E215C6A
Acoustic 1604-8108
n = 438
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

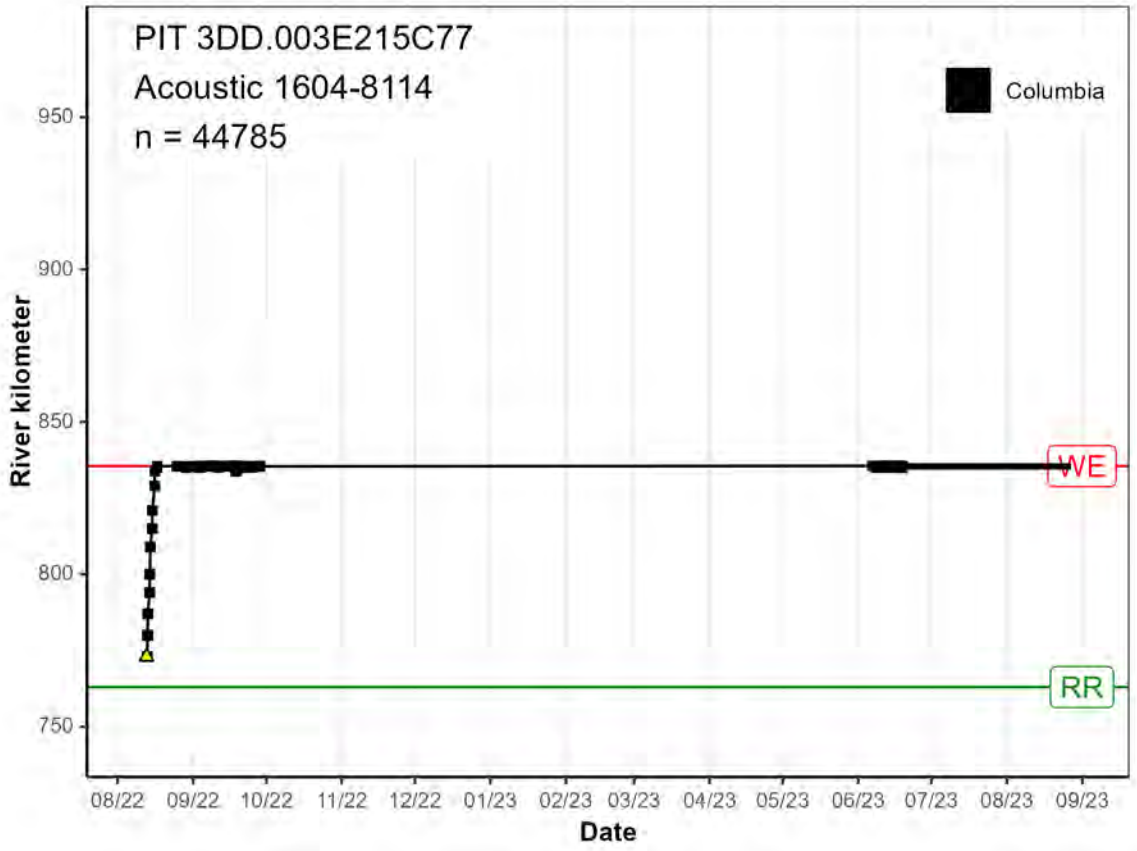

PIT 3DD.003E215C3A
Acoustic 1604-8109
n = 89441
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

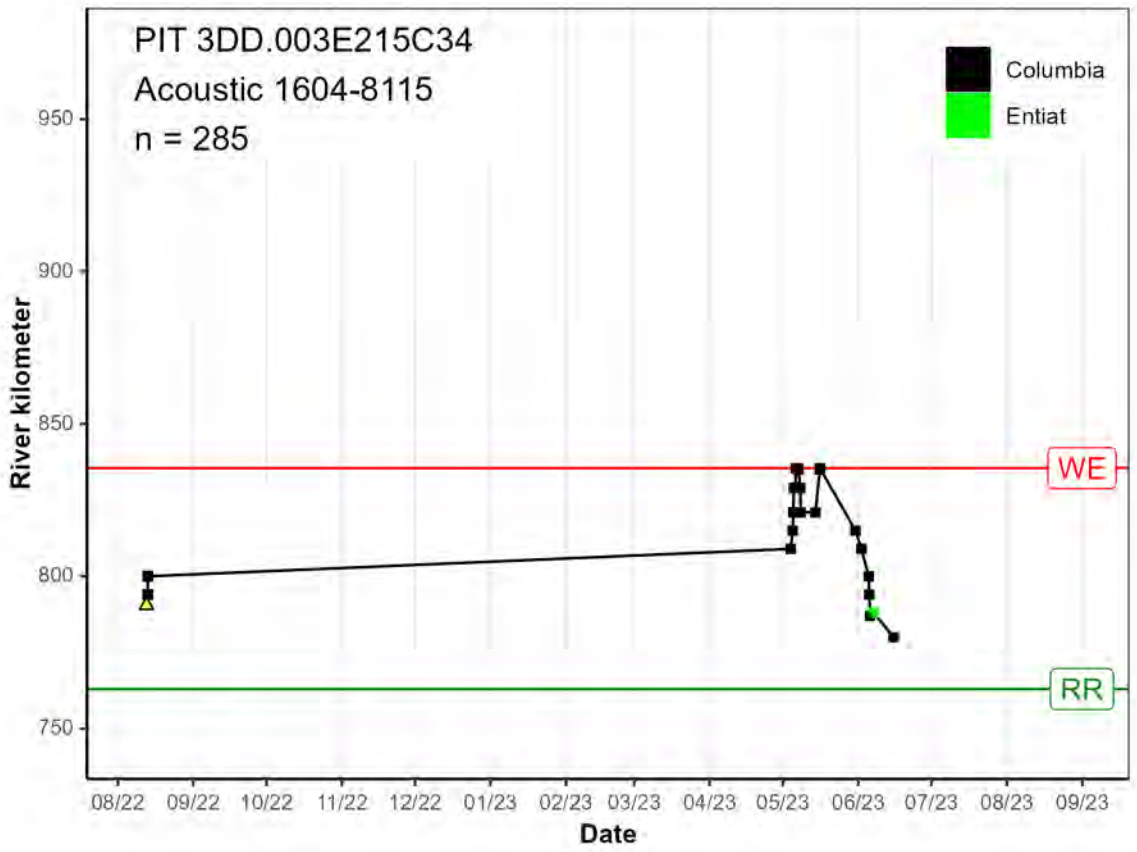

PIT 3DD.003E215C48
Acoustic 1604-8110
n = 320
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

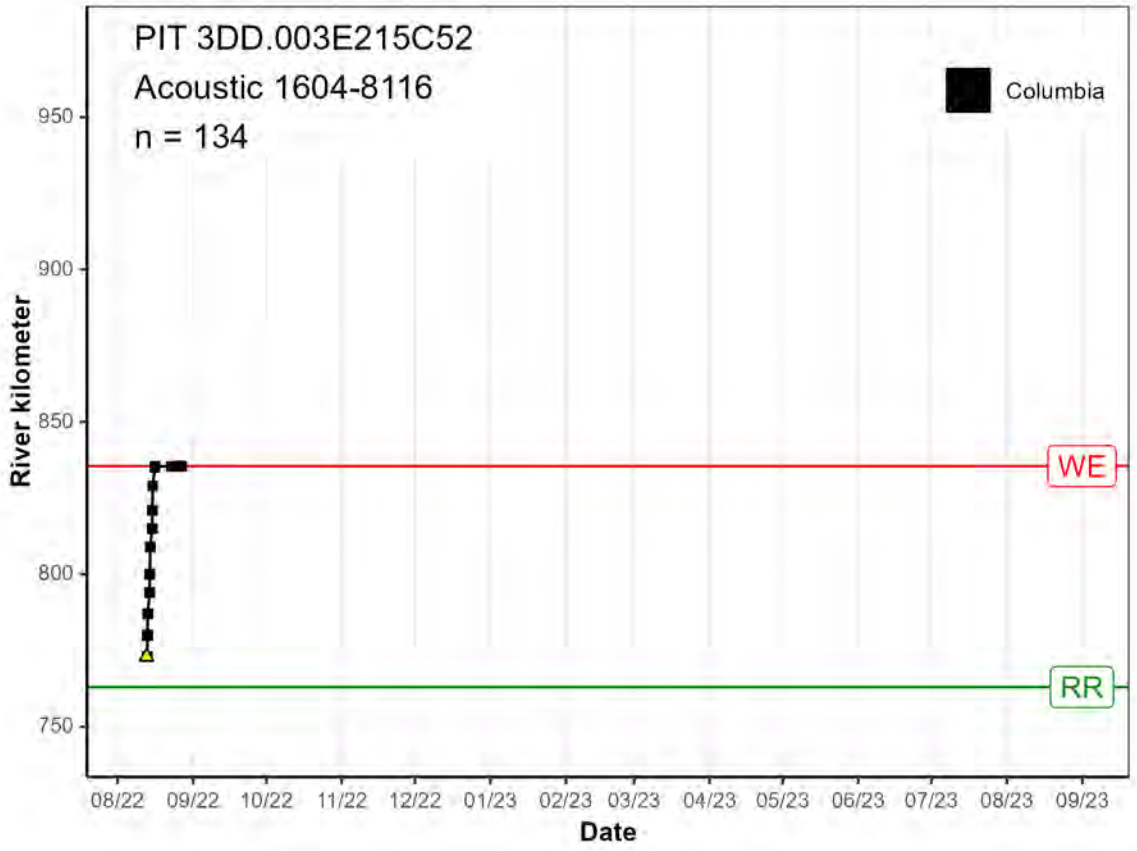

PIT 3DD.003E215C6E
Acoustic 1604-8111
n = 31
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

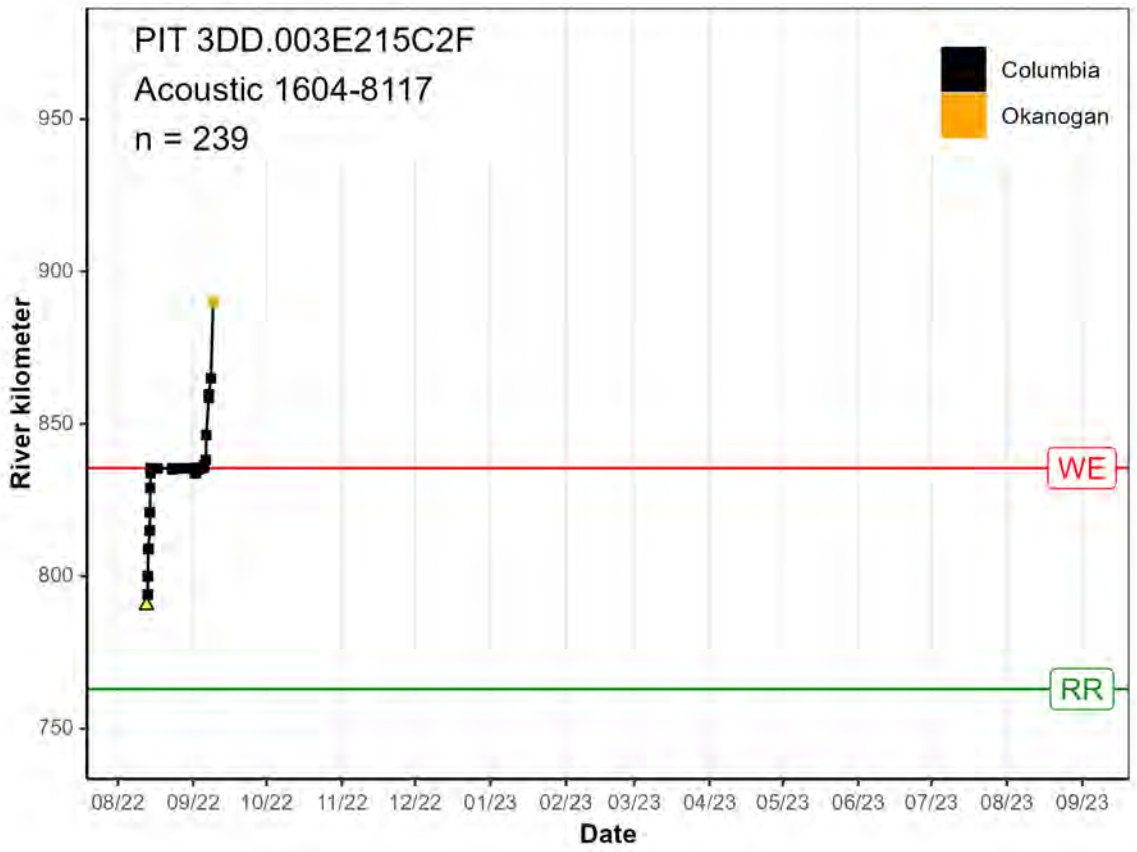

PIT 3DD.003E215C7D
Acoustic 1604-8112
n = 311
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

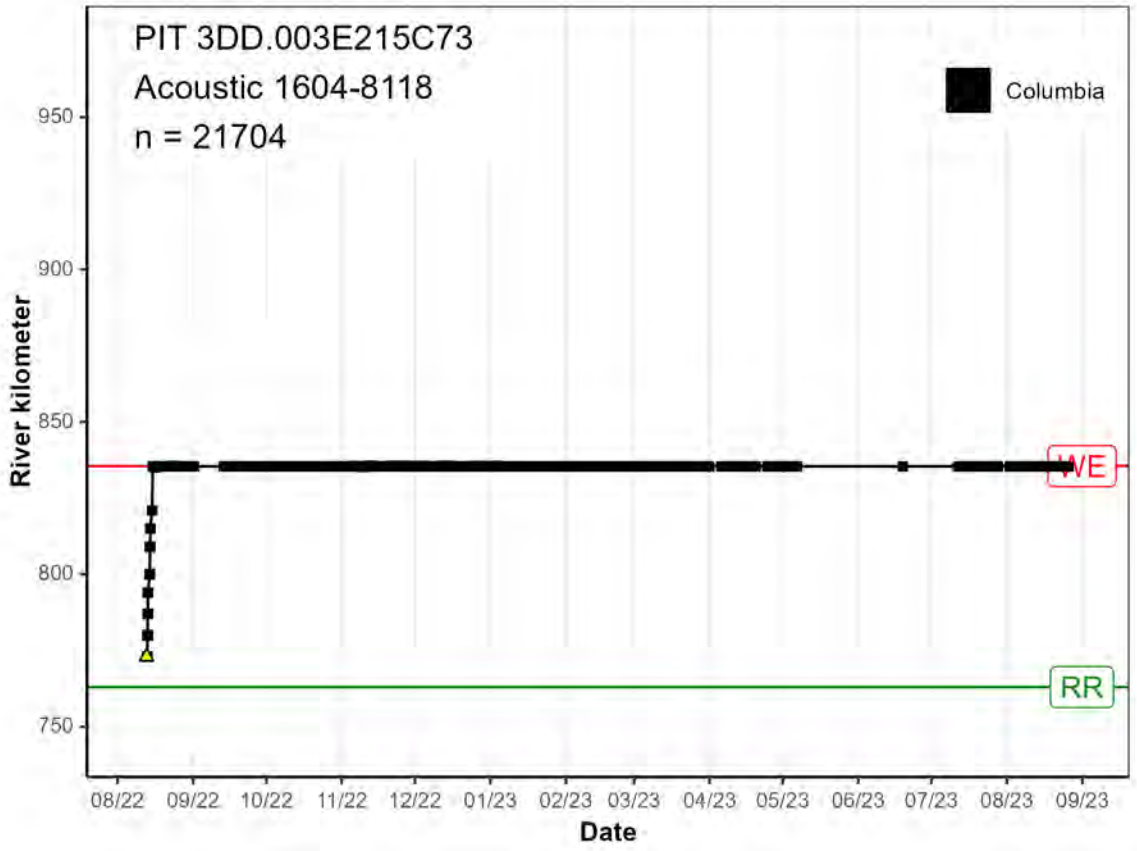

PIT 3DD.003E215C44
Acoustic 1604-8113
n = 107
Columbia
Methow
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

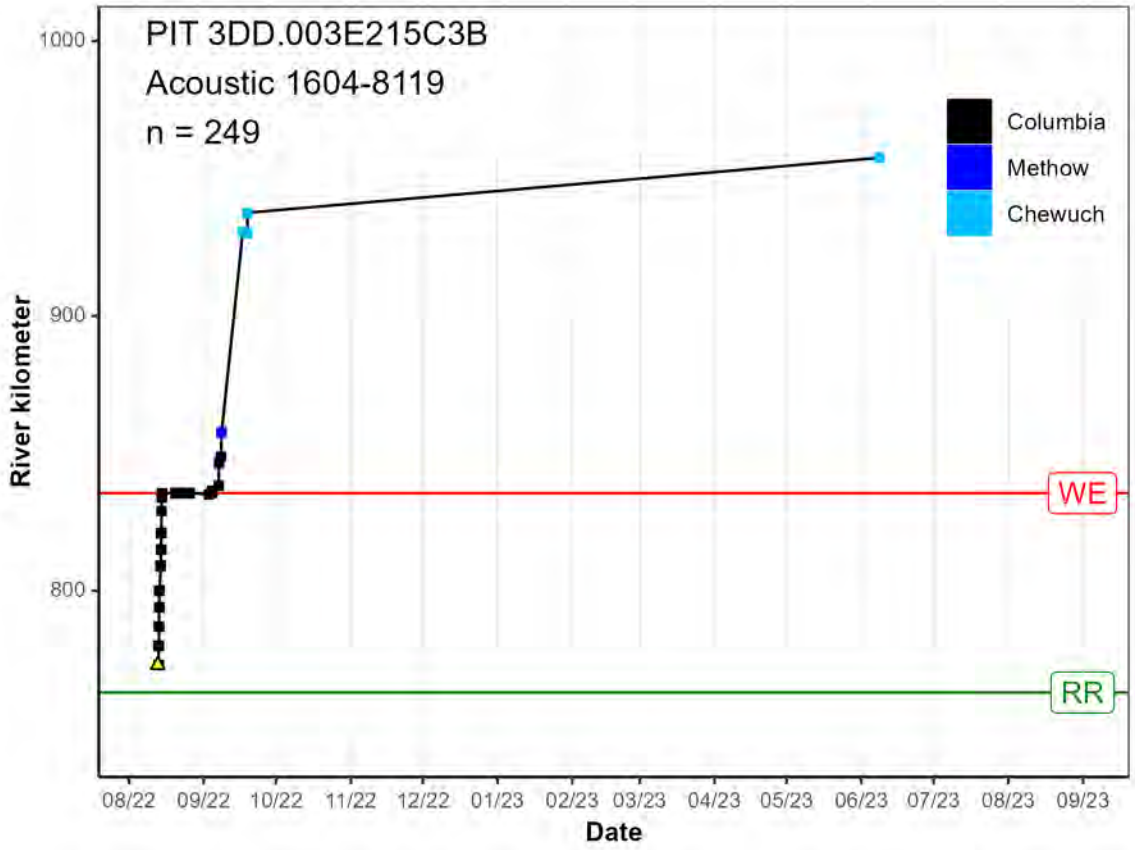

PIT 3DD.003E215C77
Acoustic 1604-8114
n = 44785
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

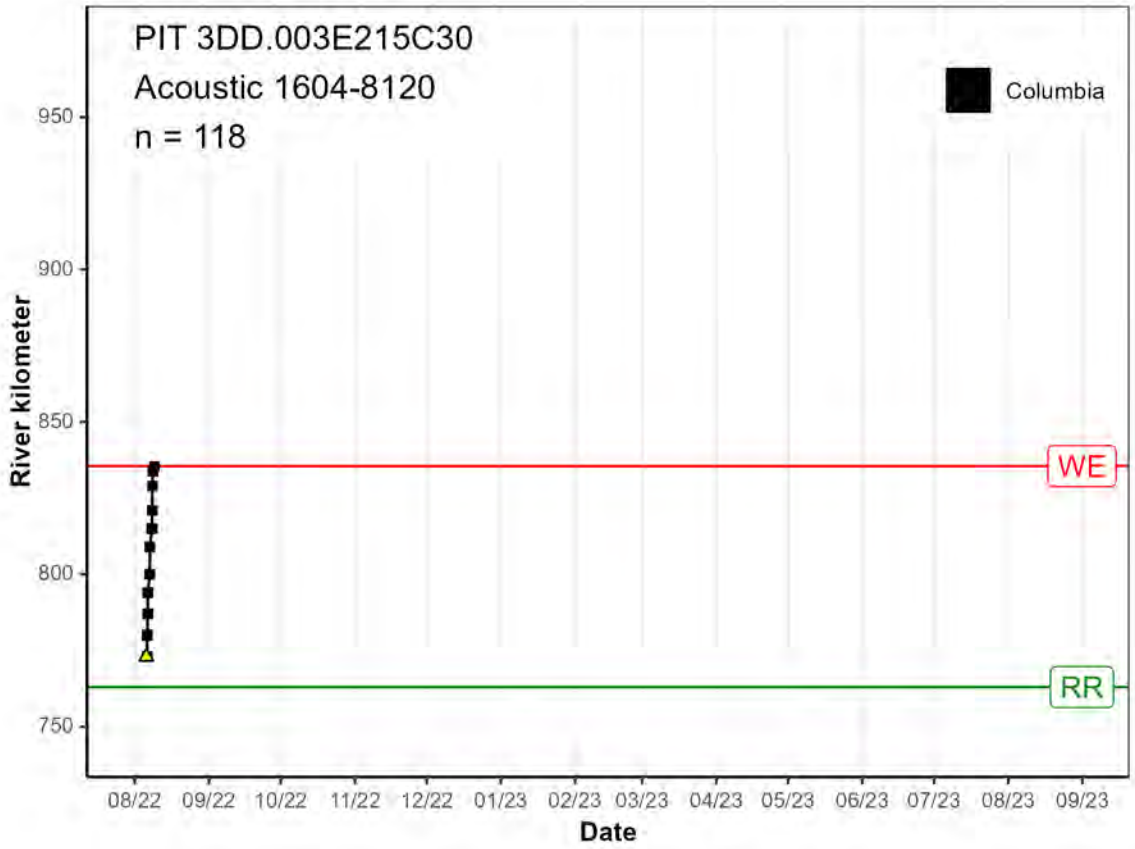

PIT 3DD.003E215C34
Acoustic 1604-8115
n = 285
Columbia
Entiat
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

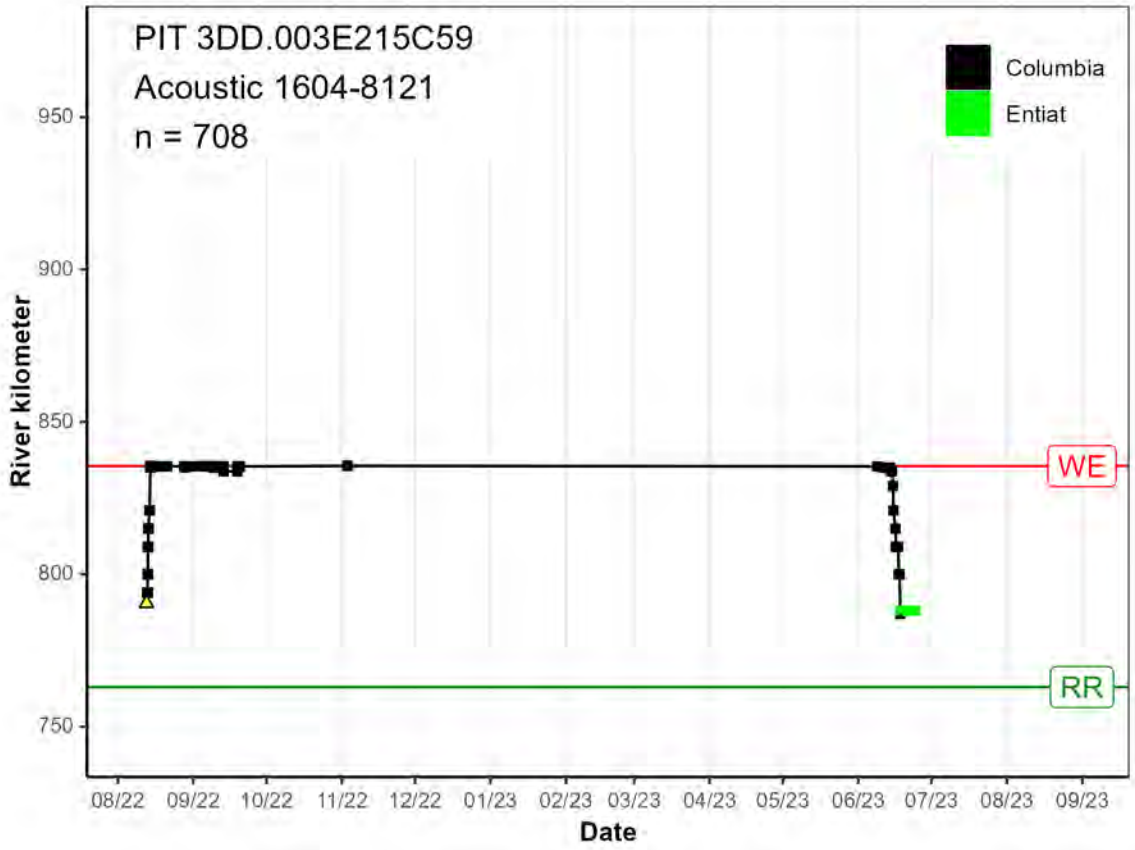

PIT 3DD.003E215C52
Acoustic 1604-8116
n = 134
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

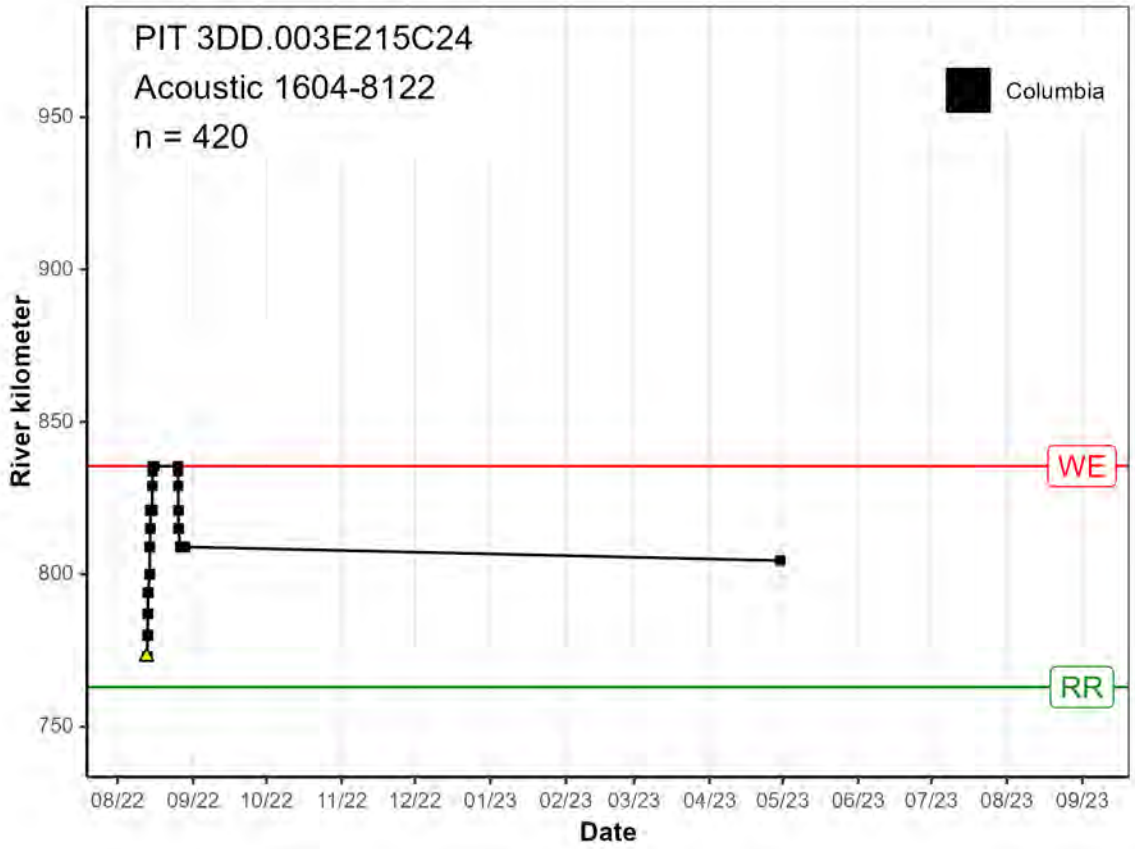

PIT 3DD.003E215C2F
Acoustic 1604-8117
n = 239
Columbia
Okanogan
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

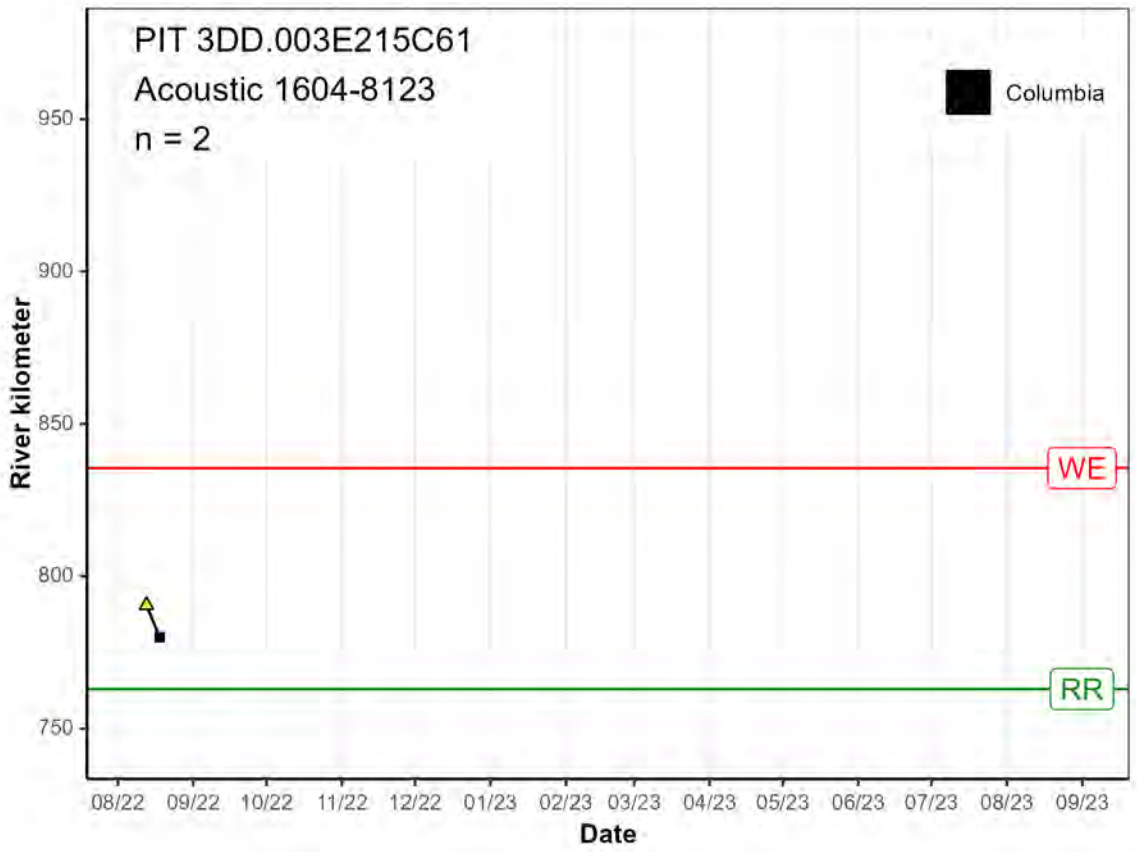

PIT 3DD.003E215C73
Acoustic 1604-8118
n = 21704
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date


PIT 3DD.003E215C3B
Acoustic 1604-8119
n = 249
Columbia
Methow
Chewuch
River kilometer
1000
900
800
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date


PIT 3DD.003E215C30
Acoustic 1604-8120
n = 118
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date


PIT 3DD.003E215C59
Acoustic 1604-8121
n = 708
Columbia
Entiat
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date


PIT 3DD.003E215C24
Acoustic 1604-8122
n = 420
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date


PIT 3DD.003E215C61
Acoustic 1604-8123
n = 2
Columbia
River kilometer
950
900
850
800
750
WE
RR
08/22
09/22
10/22
11/22
12/22
01/23
02/23
03/23
04/23
05/23
06/23
07/23
08/23
09/23
Date

Appendix N
2023 Northern Pikeminnow Removal Annual Report

2023 PUBLIC UTILITY DISTRICT NO. 1 OF DOUGLAS COUNTY NORTHERN PIKEMINNOW REMOVAL AND RESEARCH PROGRAM

WELLS HYDROELECTRIC PROJECT

FERC NO. 2149

Final Report
December 2024

Prepared by:

Tyson Jerald
Columbia Research LLC
41 Bacchus Lane.
Manson, WA 98831
(509) 679-0384

Prepared for:

Public Utility District No. 1 of Douglas County
1151 Valley Mall Parkway
East Wenatchee, WA 98802-4497

1.0 INTRODUCTION

In accordance with Section 4.3.3 of the Wells Habitat Conservation Plan (HCP), Public Utility District No. 1 of Douglas County (District) annually implements a Northern Pikeminnow (*Ptychocheilus oregonensis*) removal program around the Wells Hydroelectric Project (Wells Project). Since 1998, Columbia Research has been contracted by the District to perform Northern Pikeminnow removal in the Wells Project area. To remove fish, an incentive-based fishery is utilized (paid per fish) by a crew of experienced anglers. Anglers use setlines and hook-and-line angling to remove fish under the District's predator control measures. Yearly catch rates have ranged from approximately 6,000 to over 20,000 fish per year. This report summarizes the results of the District's 2023 Northern Pikeminnow removal efforts.

2.0 MATERIALS AND METHODS

A one-vessel crew consisting of three crew members participated in the setline portion of the removal program. Additionally, four anglers participated in hook and line fishing efforts near the confluence of the Methow and Columbia rivers. Setline efforts were initiated on April 25, 2023, and were completed on November 15, 2023.

Northern Pikeminnow removal efforts were conducted throughout the Wells Project; from below the boat restricted zone (BRZ) tailrace of Chief Joseph Dam downstream to the 2-mile tailrace area of Wells Dam. A scientific collection permit was obtained from the Washington Department of Fish and Wildlife allowing crews to place setlines throughout the Wells Project study area including the lower 1-mile section of the Methow River, the mouth of the Wells Hatchery outfall channel and immediately below the BRZ of Wells Dam.

Typically, 12 to 18 setlines were baited with crickets (*Acheta domesticus*) and set each day (Figure 1). Each line contained approximately 120 hooks. Setline gear was fished on the bottom of the riverbed. Each setline consisted of a main line anchored on either end, with a buoy line connected to the bottom of the setline that trailed at the water surface. Hooks were spaced evenly along the main line between the end weights. The hooks were attached via leaders of 2.72 kg-test monofilament approximately 0.6 meters in length. Setline gear was checked once daily, allowing crews to remove and euthanize Northern Pikeminnow and release all non-target fish back into the river unharmed. Catch per unit effort (CPUE) was calculated by the sum of hours spent to retrieve, check, and reset lines as well as travel and preparation time (tying hooks, assembling lines, etc.). Hook-time fished was calculated as the number of hooks fished each day multiplied by total days fished multiplied by 24 hours.

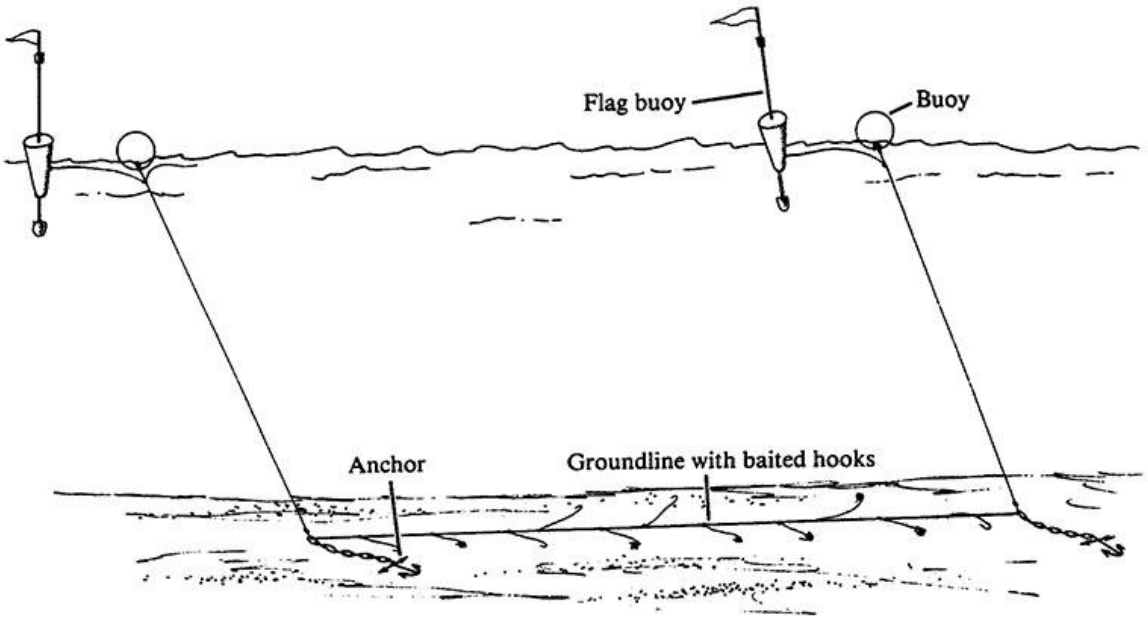


Figure 1. Schematic of a typical bottom-fishing setline (Sea Grant California 2022).

3.0 RESULTS

A total of 8,329 Northern Pikeminnow were captured during the 2023 season, slightly less than the average of 9,391 fish per year (Figure 2). Of these fish, 8,234 were over 229 mm and 95 were under 229 mm. These fish were captured during 3,040 hours of total effort resulting in a cumulative CPUE of 2.7 fish per hour (Figure 3). A total of 2,681 Norther Pikeminnow were captured on set lines during 1,184 hours of effort resulting in a CPUE of 2.3 fish per hour. A total of 5,648 Northern Pikeminnow were captured on hook and line during 1,856 hours of angling effort resulting in a CPUE of 3.0 fish per hour. All Northern Pikeminnow were captured in the Wells Project Reservoir.

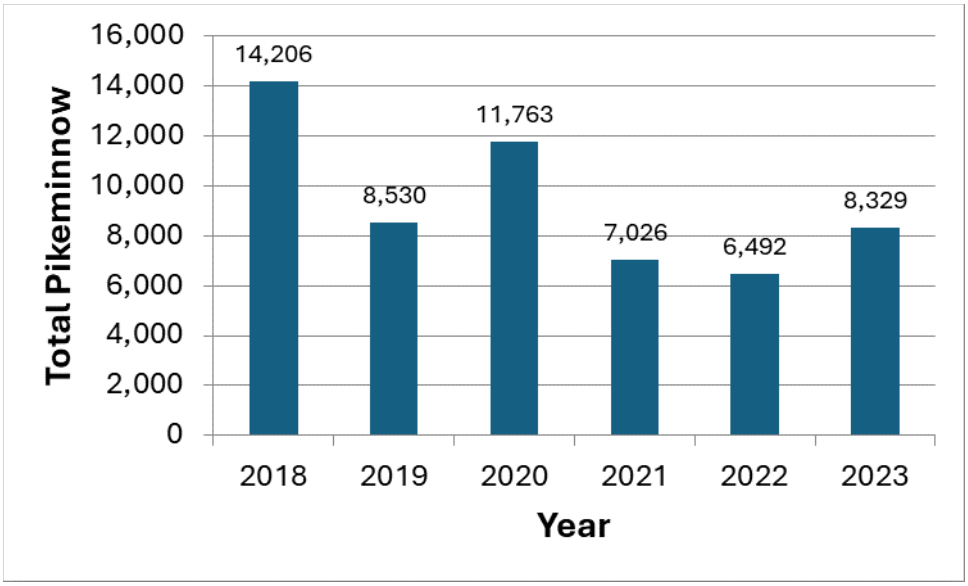


Figure 2. **Total Northern Pikeminnow removed annually.**

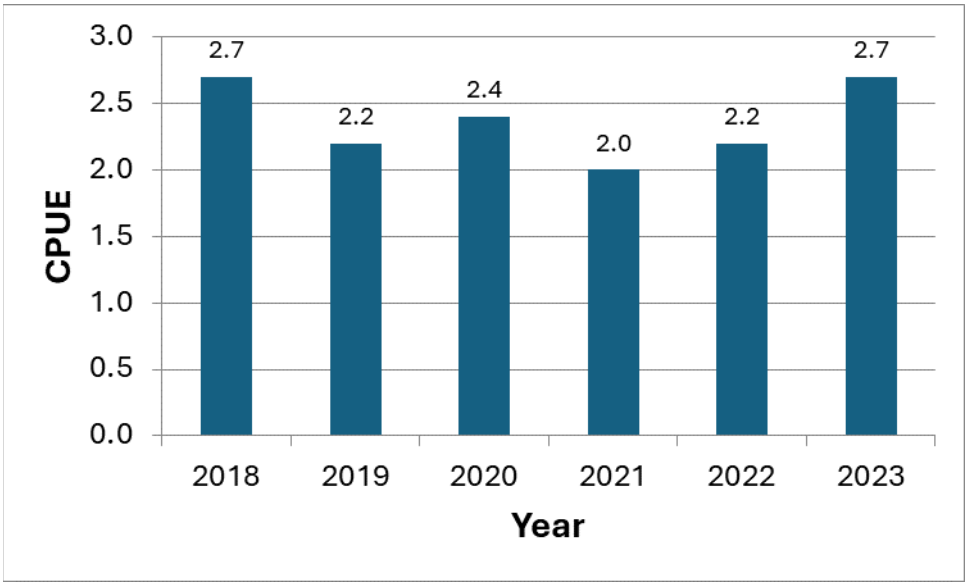


Figure 3. **Catch per unit effort (CPUE) for Northern Pikeminnow for both methods (set lines and hook-and-line).**

Northern Pikeminnow were captured in four main locations (Figures 4 and 5). Location A is directly where the Methow River drops into the Columbia River. Location B is upstream of the confluence area within the Methow River. All Northern Pikeminnow in Location B were captured on hook and line gear. Location C is located approximately 4 miles upstream from Wells Dam near Starr Boat Launch. Another productive location, Location D, is in the immediate Wells Project Forebay.

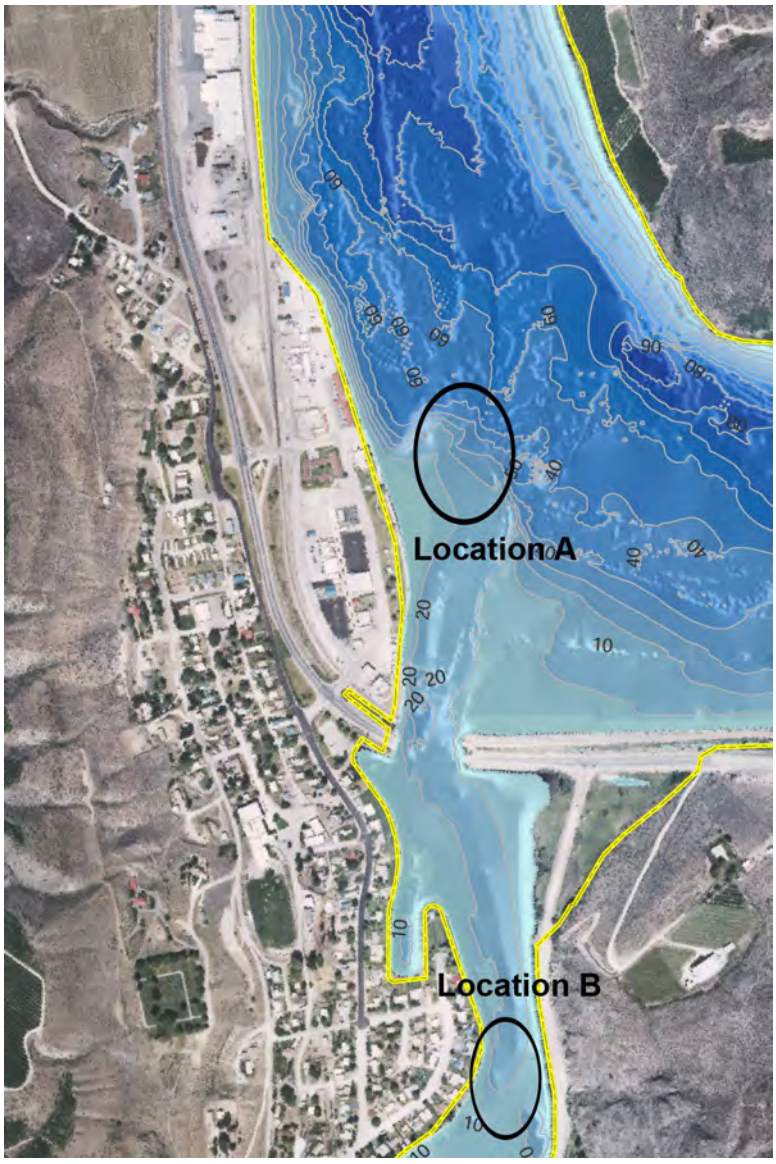


Figure 4. **Capture locations of Northern Pikeminnow at the Columbia River / Methow River confluence area.**

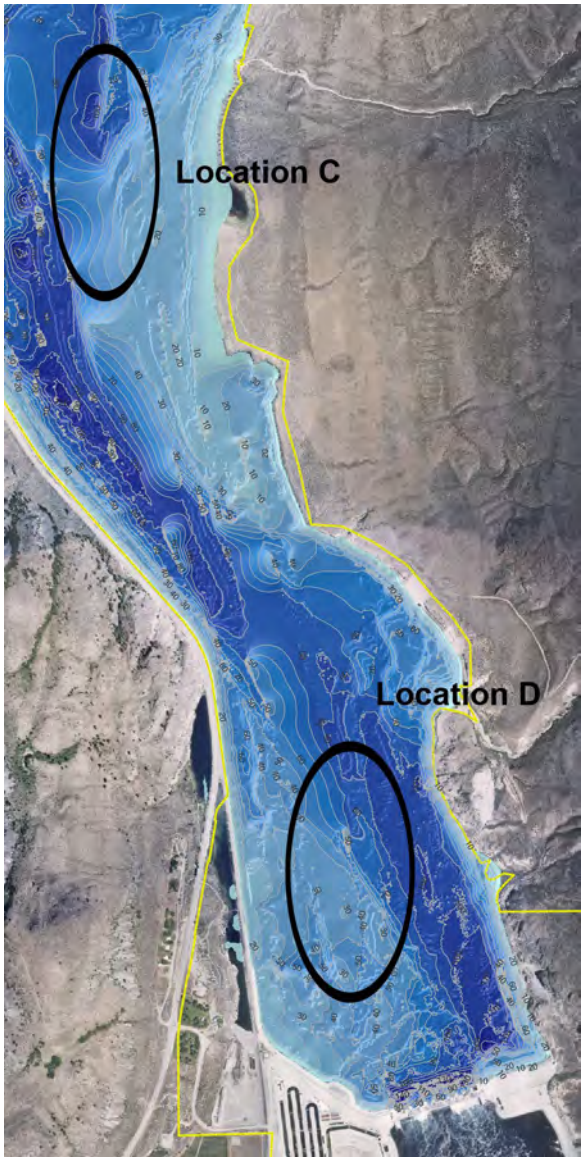


Figure 5. Catch locations of Northern Pikeminnow upstream of the Wells Project and in the Wells Dam Forebay.

No ESA-listed species or HCP Plan Species were encountered during the Northern Pikeminnow fishery. A total of 1,625 non-target fish were captured and released. Incidental encounters consisted of nine taxa: 702 Chiselmouth (*Acrocheilus alutaceus*), 699 Peamouth (*Mylocheilus caurinus*), 113 suckers (*Catostomus* spp.), 36 Burbot (*Lota lota),* 23 sculpin (*Cottus* spp.), 22 Redside Shiner (*Richardsonius balteatus*), 22 Northern Pikeminnow / Chiselmouth hybrids, 6 White Sturgeon (*Acipenser transmontanus*), and 2 Brown Bullhead (*Ameiurus nebulosus*). All non-target fish were released alive.

4.0 DISCUSSION

The 8,329 Northern Pikeminnow captured in 2023 bring the cumulative total catch over the span of the program to approximately 372,000 Northern Pikeminnow. Low catch and CPUE levels have been documented in recent years with the fishery from 2021 to 2023 marking the lowest catch levels to date. Nevertheless, the Northen Pikeminnow removal program has been successful at removing Northern Pikeminnow, with minimal bycatch of non-target species.

Of the incidental species captured during the project, only White Sturgeon are included within the District's management plan. Six White Sturgeon were encountered in the Wells Reservoir. These encounters are attributed to the release of juvenile sturgeon by the District in the Wells Reservoir as part of their White Sturgeon supplementation program. All six incidentally captured White Sturgeon were determined by scute-mark identification from these releases.

For the last two decades, the Northern Pikeminnow removal program has been successful at reducing the abundance of Northern Pikeminnow in the Wells Project while minimally impacting other native fish populations. The continuation of this program should reduce Northern Pikeminnow predation on juvenile salmonids.

5.0 REFERENCES

Sea Grant California. 2022. Fishing Gear and Methods. Available Online at https://caseagrant.ucsd.edu/california-commercial-fisheries/fishing-gear-and-methods.

Appendix O
2024 Resident Fish Assemblage Study Plan

2024 RESIDENT FISH ASSEMBLAGE STUDY PLAN
WELLS HYDROELECTRIC PROJECT

FERC PROJECT NO. 2149

March 2024

Prepared by:
Public Utility District No. 1 of Douglas County
East Wenatchee, Washington

© Copyright 2024. Public Utility District No. 1 of Douglas County. All Rights Reserved.

1.0 INTRODUCTION

In November 2012, the Federal Energy Regulatory Commission (FERC) issued a new Operating License (License) for the Wells Hydroelectric Project (Wells Project). To ensure active stakeholder participation and support during the relicensing process, the Public Utility District No. 1 of Douglas County (Douglas PUD) developed six Aquatic Resource Management Plans in close coordination with agency and tribal natural resource managers (Aquatic Settlement Work Group or Aquatic SWG) as part of an Aquatic Settlement Agreement (Agreement). During the development of these plans, the Aquatic SWG focused on developing management priorities for resources potentially impacted by Wells Dam (Wells Project) operations. Entities invited to participate in the Aquatic SWG include the U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), Bureau of Land Management (BLM), Bureau of Indian Affairs (BIA), Washington Department of Ecology (Ecology), Washington State Department of Fish and Wildlife (WDFW), the Confederated Tribes of the Colville Reservation (Colville), the Confederated Tribes and Bands of the Yakama Nation (Yakama), and Douglas PUD.

The Resident Fish Management Plan (RFMP) is one of the six Aquatic Resource Management Plans required to be implemented under the Project FERC license. Douglas PUD, in consultation with the Aquatic SWG will direct implementation of measures identified within the RFMP to protect and enhance native resident fish populations in the Wells Reservoir. Objective 2 of the RFMP requires Douglas PUD to conduct a study to determine the relative abundance of resident fish species found in the Wells Reservoir in year 2 and every 10 years thereafter during the new license term.

To satisfy the ten-year requirement this study plan was developed in consultation with the Aquatic SWG. The study objectives will focus on (1) identifying whether there have been major shifts in the resident fish populations resulting from the implementation of the White Sturgeon, Bull Trout, Pacific Lamprey, and Aquatic Nuisance Species (ANS) Management Plans, and (2) collecting information on resident predator fish populations found within the Wells Reservoir. Methodology for monitoring species composition shall remain consistent with the methods described in Beak (1999), allowing for comparisons between previous and future resident fish species assemblage studies. Information collected from these monitoring activities may be used to inform the implementation activities of the other Wells Aquatic Resource Management Plans and the Wells Anadromous Fish Agreement and Habitat Conservation Plan (HCP) predator control activities (Douglas PUD 2002).

2.0 STUDY GOALS AND OBJECTIVES

Consistent with Section 4.2 of the RFMP, the primary goal of the 2024 Resident Fish Assemblage Study will be to determine the relative abundance of the various resident fish species found within the Wells Reservoir. Specific objectives of the study include:

1. Collect resident fish abundance data using previously established methods and make comparisons to results of past studies.
2. Collect baseline resident fish abundance data using alternative sampling methods, with focus on species ineffectively sampled by previously established methods.

3. Compare the effectiveness of previously established and alternative sampling methods for individual resident fish species and develop relationships for comparing results among sampling methods.
4. Use established and alternative sampling methods to determine the abundance and distribution of non-native predator species (Walleye [*Sander vitreus*], Smallmouth Bass [*Micropterus dolomieu*], and Largemouth Bass [*Micropterus salmoides*], Northern Pike [Esox lucius], and native predators (Northern Pikeminnow [*Ptychocheilus oregonensis*] and Burbot [*Lota lota*]).

3.0 BACKGROUND

3.1 Resident Fish Species

The resident fish assemblage present in the Wells Reservoir is composed of a diverse community of native and introduced, warm and cold-water, and sport and non-sport fish species. Since the construction of Wells Dam several studies have either directly (McGee 1979; Beak 1999; Kyger 2015) or indirectly (Dell et al. 1975; Burley and Poe 1994) addressed the resident fish assemblage in the Wells Reservoir.

3.1.1 Wells Project Resident Fish Assessments

Many previous studies in the upper and middle Columbia River have commented either directly or indirectly on resident fish assemblage. For example, during a study assessing the occurrence of gas bubble disease in fish in the mid-Columbia River reservoirs, Dell et al. (1975) observed that the most abundant resident fish species in the Wells Reservoir were suckers (*Catostomus* spp.), Northern Pikeminnow, and Redside Shiners *(Richardsonius balteatus).* These researchers also determined that Bluegill (*Lepomis macrochirus)* and Pumpkinseed (*Lepomis gibbosus*) were the most abundant resident sport fish, although these two species accounted for less than two percent of the total 32,289 fish sampled in the study area, which encompassed the area from Priest Rapids Dam upstream to Chief Joseph Dam. Overall, 27 species of resident fish were identified in the study area (Table 1).

Table 1 **Native and non-native resident fish species that have been documented in the Wells Reservoir from past resident fish assessments, monitoring efforts, and miscellaneous studies (Dell et al. 1975; McGee 1979; Burley and Poe 1994; Beak 1999; NMFS 2002; BioAnalyst, Inc. 2004).**

Native Species	Non-Native Species
White Sturgeon - *Acipenser transmontanus*[*]	Carp - *Cyprinus carpio*
Chiselmouth - *Acrocheilus alutaceus*	Black Bullhead - *Ictalurus melas*
Longnose Sucker - *Catostomus catostomus*	Brown Bullhead - *Ictalurus nebulosus*
Bridgelip Sucker - *Catostomus columbianus*	Pumpkinseed - *Lepomis gibbosus*
Largescale Sucker - *Catostomus macrocheilus*	Bluegill - *Lepomis macrochirus*
Prickly Sculpin - *Cottus asper*	Smallmouth Bass - *Micropterus dolomieu*
Threespine Stickleback - *Gasterosteus aculeatus*	Largemouth Bass - *Micropterus salmoides*
Burbot - *Lota lota*	Yellow Perch - *Perca flavescens*
Peamouth - *Mylocheilus caurinus*	Black Crappie - *Pomoxis nigromaculatus*
Rainbow Trout - *Oncorhynchus mykiss*	Walleye - *Sander vitreus*
Mountain Whitefish - *Prosopium williamsoni*	Tench - *Tinca tinca*
Northern Pikeminnow - *Ptychocheilus oregonensis*	Lake Whitefish - *Coregonus clupeaformis*
Redside Shiner - *Richardsonius balteatus*	
Dace - *Rhinichthys spp.*	
Bull Trout - *Salvelinus confluentus*[*]	

[*] Individual management plans for both White Sturgeon and Bull Trout have been developed and as such, they are not addressed in this Resident Fish Management Plan.

McGee (1979) noted that Chiselmouth (*Acrocheilus alutaceus*), Redside Shiners, and Largescale Suckers (*Catostomus macrocheilus*) were the most abundant non-sport fish captured during Wells Reservoir surveys while Pumpkinseed were the most abundant sport fish caught. Similar sampling methods to the 1974 study (Dell et al. 1975) were employed to ensure that results of the study were comparable with past observations. In total, 2,480 fish were collected during the study using live traps, beach seines and angling. Twenty of the 27 known species previously trapped in other mid-Columbia reservoirs (Dell et al. 1975) were captured in the Wells Reservoir during the study.

In 1998, Douglas PUD conducted an updated Wells Reservoir resident fish assessment (Beak 1999). Again, an effort was made to implement a sampling design similar to the two previous studies (1974 and 1979) thereby allowing comparisons with past results. In total, 22 species of fish were identified with 5,657 fish captured using beach seines and 716 fish observed via diving transects. Beak (1999) reported suckers as the most abundant resident fish captured in beach seining sampling in the Wells Project study area. These species represented 41% of the beach seining catch and 46% of the underwater diver survey count. Other abundant species in the beach seine catch were Bluegill (32%), Northern Pikeminnow (10%), Peamouth (*Mylocheilus caurinus*, 6%), and Carp (*Cyprinus carpio*, 5%). Fifteen other species represented the remaining 7% of the total catch of 3,783 fish.

In 2014, Douglas PUD conducted the 2014 Resident Fish Assemblage Study (Kyger 2015). The study utilized beach seine and snorkel sampling methods that were comparable to previous resident fish studies in the Wells Reservoir in addition to boat electrofishing and baited setline sampling methods. Another objective of the study was to estimate the abundance of Smallmouth Bass, in the Okanogan River from the mouth upstream to the Wells Project boundary, and Burbot in the deeper areas of the reservoir. Twenty-two different species of resident fish were observed during the study and nearly 13,000 individual fish were captured or observed (Table 2). Threespine Stickleback (*Gasterosteus aculeatus)* and Redside Shiner (*Richardsonius balteatus)* were the most abundant fish species observed in the Wells Reservoir wide. Similar to the results from past studies, sucker species and Northern Pikeminnow were some of the most abundant species. Northern pikeminnow were the most abundant predator species, followed by Smallmouth Bass. These results were similar to what has been observed in previous resident fish studies conducted in the Wells Reservoir.

Table 2. Resident fish species observed during previous resident fish assessments in the Wells Reservoir.

	Resident Fish Assessment Year			
Species	1974	1979	1999	2015
Black Crappie		X	X	
Bluegill	X	X	X	X
Bridgelip Sucker	X	X	X	X
Brown Bullhead	X	X	X	X
Bull Trout	X			
Burbot				X
Carp	X	X	X	X
Chiselmouth	X	X	X	X
Lake Whitefish			X	
Largemouth Bass	X	X	X	X
Largescale Sucker	X	X	X	X
Longnose Sucker			X	
Mountain Whitefish	X	X	X	X
Northern Pikeminnow	X	X	X	X
Peamouth	X	X	X	X
Prickly Sculpin	X	X	X	X
Pumpkinseed	X	X	X	X
Rainbow Trout		X	X	X
Redside Shiner	X	X	X	X
Smallmouth Bass	X	X	X	X
Speckled Dace	X	X	X	X
Tench	X	X		X
Threespine Stickleback		X		X
Walleye	X		X	X
White Sturgeon*				
Yellow Bullhead	X		X	X
Yellow Perch	X	X	X	X

*White Sturgeon have been documented in the Wells Reservoir but have not been captured during previous resident fish assessments.

3.1.2 Sport Fish Species

A number of species of fish with recreational value are either known to exist in the project or are suspected to be present in low numbers. These species are of particular interest given their recreational value. Many of these species are native, while others are considered non-native originating from above Wells Dam or at one time stocked into the Wells Project waters. These recreational fish species are summarized below.

Burbot

Burbot (*Lota lota*) are the only freshwater member of the cod family. They are native to Washington State and are found in several lakes in the Columbia River Basin and have also colonized the reservoirs of the Columbia River as dams were constructed. Burbot typically inhabit deep water and are most active at night. Burbot are predatory, feeding on invertebrates as juveniles with fish becoming an increasingly important part of their diet as they reach larger sizes. Spawning occurs during late winter and early spring in shallow bays of lakes and rivers over sand or gravel bottom (Wydoski and Whitney 2003). Burbot are classified as a Washington sport fish with recreational harvest occurring in some waters.

Kokanee

Landlocked Sockeye (*Oncorhynchus nerka*), known as Kokanee are a native fish which occur in several lakes in the mid and upper Columbia basins including Lake Wenatchee, Lake Chelan, Lake Osoyoos, and Lake Roosevelt. Although previous resident fish assessments have not detected the presence of this fish species in the Wells Project, anecdotal information exists indicating that low numbers of Kokanee may be present in the Project. These fish likely originate from Lake Roosevelt, above Grand Coulee Dam, and during periods of high spring flow are displaced downstream through Grand Coulee and Chief Joseph dams and into the Wells Reservoir.

Largemouth Bass

Largemouth Bass (*Micropterus salmoides*) were widely introduced in Washington State in the late 1800s (Wydoski and Whitney 2003). They are listed as a priority species in Washington State because of their vulnerability to habitat loss or degradation and their recreational importance (WDFW 2002). Largemouth Bass prefer clear water habitat with mud and sand substrates, which is best suited for aquatic vegetation production (Wydoski and Whitney 2003). Largemouth Bass are known to inhabit the lower 10 miles of the Okanogan River and the Columbia River immediately adjacent to the mouth of the Okanogan River. Little is known about the behavior of largemouth bass in the Wells Reservoir as they were infrequently captured during past resident fish studies (Kyger 2015; Beak 1999; Duke 2001; Burley and Poe 1994).

Mountain Whitefish

Mountain Whitefish (*Prosopium williamsoni)* are assumed to occur in all small-order tributaries to the Methow, Okanogan, Wenatchee and Entiat rivers, and in larger lakes throughout the Columbia River Basin. They are also believed to occur in the mainstem reservoirs, although

their behavior patterns are not known. They mostly inhabit riffles in summer and large pools in winter (Wydoski and Whitney 2003). Spawning typically occurs from October through December, generally in riffles, but also on gravel shoals of lake shores. Mountain Whitefish feed primarily on instar forms of benthic aquatic insects, although they also occasionally eat crayfish, freshwater shrimp, leeches, fish eggs and small fish. In lakes, they feed extensively on zooplankton, particularly cladocerans. There is evidence that Mountain Whitefish still spawn in the lower reaches of some tributaries (NMFS 2002). Mountain Whitefish appear to use the Wells Reservoir principally as a migration route between spawning areas in the Methow River and the Wells Dam Tailrace (Zook 1983).

Northern Pikeminnow

Northern Pikeminnow are a slow-growing, long-lived predator native to the Columbia River Basin. In summer, adult Northern Pikeminnow prefer shallow, low velocity areas in cool lakes or rivers. During the winter, they use deeper water and pools (Scott and Crossman 1973). Spawning occurs during the summer, in shallow water areas with gravel substrate. Northern Pikeminnow tend to concentrate in tailrace areas downstream of mainstem dams during the juvenile salmonid migration period, holding in relatively slow-moving water areas (less than about 3 feet per second) near passage routes (NMFS 2002). Due to their large numbers and distribution throughout the Columbia River Basin, Northern Pikeminnow are considered to pose the greatest predation threat to migrating juvenile anadromous salmonids (NMFS 2002). Since 1995, Douglas PUD has implemented a Northern Pikeminnow removal program. Since 2004, this program has been a requirement of the Wells HCP. Removal efforts have taken approximately 380,000 from Wells Dam Tailrace during the past 20 years of implementation (Jerald 2022).

Redband Rainbow Trout

Redband Rainbow Trout (*Oncorhynchus mykiss gairdneri*) are native interior Rainbow Trout. The resident form remains in freshwater its entire life and the anadromous form migrates to the ocean and is referred to as a steelhead. The life history of Rainbow Trout appears to be plastic, with some resident forms becoming anadromous, and some offspring of anadromous fish becoming resident (Peven 1990). Resident Rainbow and juvenile Steelhead are not distinguishable from each other until the Steelhead undergo smoltification. The mid-Columbia River tributaries contain a mixture of resident Rainbow and ocean-migrating Steelhead. Resident Rainbow Trout are likely present in low numbers in the Wells Reservoir. During the 1998 resident fish assessment, Rainbow Trout consisted of 0.05% of the relative catch (Beak 1999).

Smallmouth Bass

Smallmouth Bass (*Micropterus dolomieu*) are a non-native sport fish that have inhabited the mid-Columbia River reach since at least the 1940s. Preferred habitat for this species includes rocky shoals, banks, or gravel bars. Adult Smallmouth Bass in the mid-Columbia River are most abundant around the deltas of warmer tributary rivers. In the Wells Reservoir, Smallmouth Bass are typically found in the lower Okanogan River and the confluence of the Okanogan and

Columbia rivers (Beak 1999). They are also abundant upstream of Wells Project in Lake Roosevelt and in Lake Osoyoos.

Smallmouth Bass were the second most abundant predator species captured in the mid-Columbia River during predator assessment sampling conducted in 1994. They were most frequently captured from the Wells Forebay sampling sites (Burley and Poe 1994). Similar relative abundance estimates of Smallmouth Bass were observed in recent sampling programs in other mid-Columbia River reservoirs (Beak 1999; Duke 2001). They are a significant fish predator species in the Columbia River, and are known to prey on juvenile salmonids among other forage items. In the 1994 predator assessment, fish composed 87% of the Smallmouth Bass diet, with salmonids consisting of 11% of the prey fish.

Walleye

Walleye (*Sander vitreus*) are a cool-water, piscivorous sport fish believed to have moved downstream into the mid-Columbia River reach from a population established for recreational fishing in Lake Roosevelt and Banks Lake in the late 1950s (Zook 1983). They were the least abundant predator species captured in the mid-Columbia River in 1994 (Burley and Poe 1994). They are listed as a priority species in Washington State because of their vulnerability to habitat loss or degradation and their recreational importance (WDFW 2002).

Walleye occur throughout the mainstem reservoirs but are not typically found in the tributaries. Although suitable spawning habitat appears to be plentiful in the mid-Columbia River, peak summer temperatures in this section of river are suboptimal and appear to restrict the recruitment of subyearling Walleye to the yearling age class (Zook 1983). Recruitment of Walleye into the mid-Columbia River reservoirs is suspected to result from the entrainment of young fish through Grand Coulee and Chief Joseph dams during spring run-off (Zook 1983).

3.1.3 Other Resident Non-Sport Species

Resident non-sport species make up the bulk of the fish biomass in the Wells Reservoir. Many of these species are native to the Wells Reservoir, including Chiselmouth, Peamouth Chub, Redside Shiner, Largescale Sucker, Bridgelip Sucker (*Catostomus columbianus*), Prickly Sculpin (*Cottus asper*), Threespine Stickleback, and dace species (*Rhinichthys spp.)* (See Table 1). Currently, no management actions or active fisheries for these species occur.

4.0 STUDY METHODS

A variety of sampling methods will be used to achieve the study objectives. Due to the reliance of past studies on beach seining as a primary sampling method, it will again be employed to allow for appropriate comparisons of results between study years. To address possible data gaps for individual species due to sampling gear bias or inefficiency, methods such as boat electrofishing, fyke netting, baited hoop nets, minnow traps, and gill nets will also be used. Boat electrofishing was used in 2014 but not in previous resident fish investigations on the Wells Project.

4.1 Sample Sites and Timing

4.1.1 Sampling locations

Sampling sites will be stratified into five sampling zones. (Figure 1):

1. Wells Forebay – from the face of Wells Dam upstream to the confluence of the Methow River.
2. Pateros-Brewster – from the confluence of the Methow River to the highway 173 bridge in Brewster including the Methow River to the Wells Project boundary at river mile (RM) 1.5.
3. Brewster-Bridgeport Bar – from the highway 173 bridge in Brewster to just upstream of Bridgeport bar at RM 540.
4. Okanogan River – the Okanogan River from the mouth upstream to the Wells Project boundary at RM 15.5.
5. Chief Joseph Tailrace – from RM 540 to the boat restricted zone below Chief Joseph Dam.

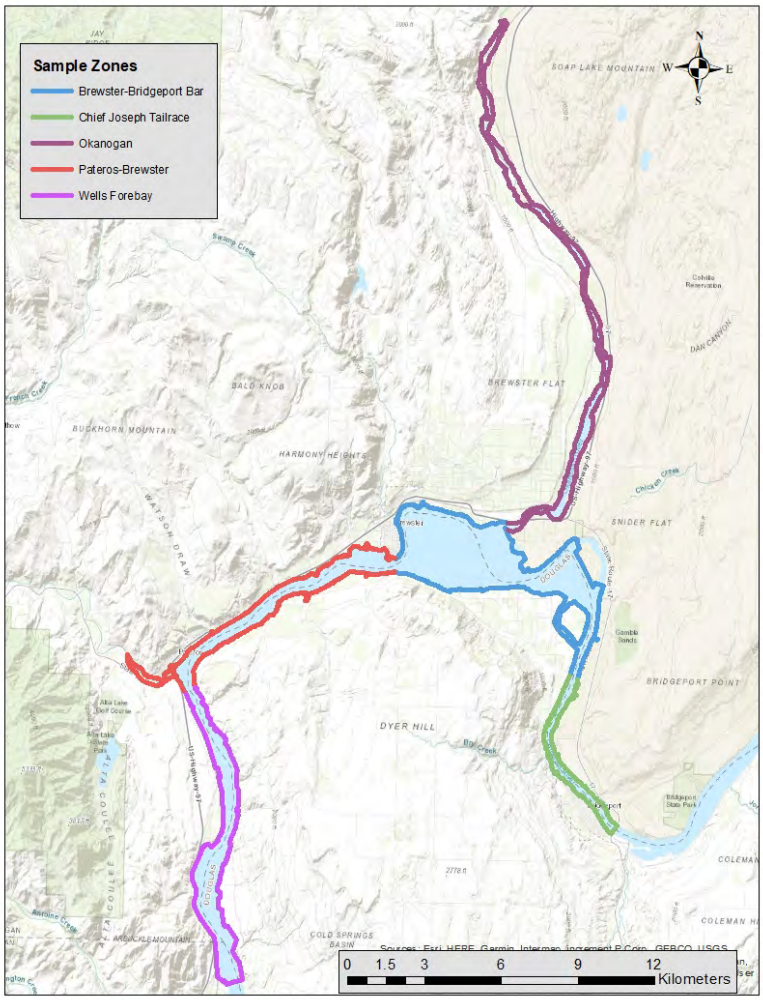


Figure 1. Map of resident fish sampling zones in the Wells Project.

The greatest sampling effort will be focused in the Brewster-Bridgeport Bar zone, where the greatest sampling effort took place in previous resident fish investigations. Specific sample sites in each zone will be in the same general locations sampled by Beak (1999). Information on sampling site characteristics will be collected at each site. The information collected will include: depth, water temperature, bottom substrate type, presence of aquatic macrophytes, and presence of woody debris.

4.1.2 Seasonal timing of sampling

Previous resident fish investigations in the Wells Project (Kyger 2015 and Beak 1999) focused sampling during the months of August and September. The 2024 study will also encompass these summer months to allow for comparisons to previous results. However, in 2024 the sampling period will be expanded to allow for observations of seasonal patterns of resident fish abundance and distribution and to provide insights into potential seasonal bias of sampling methods.

4.2 Sampling Methods

4.2.1 Beach seining

Beach seining will be the primary sampling method used during the study in order to make comparisons to results from previous investigations. The specifications of the beach seines will match those used by Beak (1999):

Length	30.5 meters
Bag Dimensions	3 meters x 3 meters x 3 meters
Panel Depth	1.8 meters
Mesh	Knotless 6.4mm stretch
Float Spacing	0.5 meters

Beach seines will be deployed from the bow of a boat with one end attached to shore. The end of the net attached to the boat will be pulled ashore and any fish captured will be quickly removed from the net bag and placed in aerated holding containers filled with fresh water. Captured fish will be identified to species and enumerated. Total length (mm) and weight (g) measurements of each fish will also be taken. For non-sport non-predator species captured in large numbers (>100 per sample; i.e. stickleback, shiners, etc.) numbers may be estimated and no length and weight measurements taken. Native fish species will be released at the location of capture. Non-native fish species will be euthanized and removed.

Sixty sites throughout the reservoir will be sampled by beach seine. At least 30 of the sites sampled by beach seines will be within sampling zone 3 (Brewster-Bridgeport Bar). Sample sites will be selected using generalized random tessellation stratified design (GRTS) to ensure a spatially balanced sample. Beach seines will not be fished in areas with high concentrations of outmigrating smolts during the peak outmigration season (May-July) to avoid impacts of those species.

4.2.2 Fyke netting

Fyke nets will be used to sample littoral areas in the Wells Project Reservoir. Sixty fyke net sites will be selected using GRTS, stratified by sampling zone. Fyke nets will consist of two 60cm x 90cm rectangular frames with two 30cm hoops leading to a single throat with an opening size 8cm and a 7.5m long center lead. All components will use 3.2mm delta mesh netting. Nets will be set perpendicular to shore and fished overnight. Upon retrieval, fish will be removed from the net and identified to species and enumerated. Total length (mm) and weight (g) measurements of each fish will also be taken. For non-sport non-predator species captured in large numbers (>100 per sample; i.e. stickleback, shiners, etc.) numbers may be estimated and no length and weight measurements taken. Fyke nets will not be fished in areas with high concentrations of outmigrating smolts during the peak outmigration season (May-July) to avoid impacts of those species. Native fish species will be released at the location of capture. Non-native fish species will be euthanized and removed.

4.2.3 Boat electrofishing

Boat electrofishing will be used to sample littoral areas in the Okanogan River zone. Ten sample sites will be selected using GRTS for sampling on a single occasion; five sites sampled April to June and five sites sampled July to September. An additional five sites selected using GRTS will be sampled during recurring visits, three times each, approximately every two weeks from July through September. Electrofishing sampling will follow the methods outlined in the Washington Department of Fish and Wildlife Standard Fish Sampling Guidelines for Washington State Ponds and Lakes (Bonar et al. 2000). Sampling sites that are selected will serve as the starting point of the electrofishing session. A boat mounted electrofishing unit with power settings standardized to water conductivity for each sampling area will be used to immobilize and collect fish. Two technicians at the bow of the boat will use long handle dip nets to collect immobilized fish and place them into an aerated live well onboard. Each boat electrofishing sampling occasion will consist of approximately 600 seconds of effort, as recorded by the electrofishing unit, beginning at the selected start point and moving upstream while thoroughly sampling the available habitat. The total sampling effort time will be recorded along with start and end locations. All fish collected will be identified to species, enumerated and have total length (mm) and weight (g) measurements taken. Fish will be checked for fin clips, and any other marks or tags. Native fish species will be released at the location of capture. Non-native fish species will be euthanized and removed, with the exception of Smallmouth Bass which will be tagged and released to support mark-recapture abundance estimation objectives.

4.2.4 Hoop nets/ traps

Baited hoop nets/ traps will be used to capture Burbot at 12 sites in the Wells Reservoir. Sites will be chosen from the list of Burbot sites developed during the 2014 Resident Fish Assemblage Study. Each site will be sampled three times approximately one week apart in the Spring and again in the Fall. Hoop nets will be 4.5 meters in length with a diameter of 0.6 meters with seven hoops tapering to an inner throat diameter of 25cm and consist of 12.7mm square knotless nylon netting. Hoop nets/traps will be baited with cut chunks of herring or Northern Pikeminnow. Traps will be fished on the river bottom attached to an anchor and will be fished

overnight. Upon retrieval, fish will be removed from the trap and identified to species and enumerated. Total length (mm) and weight (g) measurements of each fish will also be taken. Fish will be checked for fin clips, and any other marks or tags. Burbot will be implanted with a PIT tag if no existing tag is present. Native fish species will be released at the location of capture. Non-native fish species will be euthanized and removed. A descending device will be used to release Burbot at depth to mitigate impacts of barotrauma.

4.2.5 Minnow Traps

Cylindrical minnow traps will be fished in littoral areas at 40 sites selected using GRTS: 5 per month March through November. Minnow traps will be constructed of vinyl dipped 3mm steel mesh with dimensions 25cm in length and 23cm in diameter with 3 cm openings on each end. Traps will be baited with mesh sacks filled with fish feed pellets (approximately 25g). Traps will be fished overnight and retrieved the following day. Upon retrieval, fish will be removed from the trap and identified to species and enumerated. Total length (mm) and weight (g) measurements of each fish will also be taken. Native fish species will be released at the location of capture. Non-native fish species will be euthanized and removed.

4.2.6 Fall Gill Netting

During the month of November, gill nets will be fished at 20 sites selected using GRTS. Experimental monofilament gill nets measuring 1.8 m x 61m containing eight sections of increasing mesh sizes (25, 38, 51, 64, 76, 102, 127, and 152 mm) will be deployed following the Fall Walleye Index Netting (FWIN) protocol used for monitoring Walleye populations in Washington lakes based on Morgan (2002). Nets will be set overnight and retrieved the following morning. Upon retrieval, fish will be removed and identified to species and enumerated. Total length (mm) and weight (g) measurements of each fish will also be taken. Native fish species will be released at the location of capture. Non-native fish species will be euthanized and removed.

Table 3. Summary and timing of sampling methods.

Sampling Method	Number of Sites	Timing/Frequency	Total number of Samples
Beach Seine	60	10 sites per month (May-Oct)	60
Fyke Net	60	10 sites per month (Mar-May, Oct-Dec)	60
Hoop Nets/Cod Traps	12	3 times (Mar-June), 3 times (Oct-Dec)	72
Minnow Traps	40	5 sites per month (Mar-Nov)	40
Boat Electrofishing (Single Occasion)	10	5 sites (Apr-Jun), 5 sites (July-Sept)	10
Boat Electrofishing (Recurring)	5	3 times (July-Sept)	15
Fall Gill Net (FWIN)	20	20 sites (Nov)	20

4.3 Predator Species of Interest

4.3.1 Burbot

Burbot are a native cold-water predator species known to inhabit the upper Columbia River and have previously been documented in the Wells Reservoir. Targeted sampling of Burbot occurred during the 2014 Resident Fish Assemblage Study and abundance of Burbot in the Wells Reservoir was estimated between roughly 5,000 and 7,000 fish (Kyger 2015).

In an effort to better characterize the Burbot population in Wells Reservoir, baited traps will be used to target Burbot. The hoop nets/cod traps methodology described in Section 4.2.5 is specifically designed to target Burbot and will be used to capture and tag Burbot at 12 sample sites. Native fish species will be released at the location of capture. Non-native fish species will be euthanized and removed.

4.3.2 Smallmouth Bass

Smallmouth Bass populations have flourished in the lower Columbia River near John Day Dam especially with efforts dedicated to reducing Northern Pikeminnow (Carey et al. 2011). Over 1,200 Smallmouth Bass were captured during the 2014 Resident Fish Assemblage Study with the highest relative abundance observed in the Okanogan Zone. Consistent with the goals and objectives of the RFMP, Douglas PUD intends to gather more data on Smallmouth Bass distribution and relative abundance in the Wells Reservoir to monitor their abundance over the course of the new license.

Smallmouth Bass will be sampled in concurrence with the other general resident fish sampling methods, and also by recurring electrofishing sampling at a subset of 5 sites in the Okanogan River Zone and in the Columbia River near the mouth of the Okanogan River. Three sampling sessions will be conducted roughly one month apart. The same electrofishing sampling methods used to sample general resident fish sampling sites will be employed to sample additional Smallmouth Bass sampling sites. Smallmouth Bass that are captured will have total length (mm) and weight (g) measurements taken and will be marked with an individually numbered Floy® T-bar anchor tag (Floy) below the dorsal fin and have a PIT tag implanted prior to release. Recaptured Smallmouth Bass will have total length (mm) and weight (g) measurements taken and have their tag information recorded and be released.

4.3.3 Northern Pikeminnow

Northern Pikeminnow are the most abundant predator in the Wells Reservoir observed during previous resident fish assemblage studies (Kyger 2015 and Beak 1999). Ongoing Northern Pikeminnow removal efforts in the Wells Project have shown a steady decline in catch per unit effort (CPUE) for set-line caught Pikeminnow (Jerald 2022). While results of the removal program suggest a downward trend in relative abundance of Northern Pikeminnow, these efforts are not designed for estimating the distribution and abundance of the species throughout the reservoir. Beginning in 2024, setlines will be fished at up to 20 sites selected using GRTS during the typical Northern Pikeminnow removal fishing period (March-November). Data

collected during these efforts will be incorporated in this resident fish assemblage study and will also be used in future years to monitor trends in Northern Pikeminnow abundance and the effectiveness of of the removal program.

Northern Pikeminnow relative abundance will be estimated for each sampling zone using beach seining, fyke netting, and electrofishing as part of general resident fish sampling. In addition, the Northern Pikeminnow removal program will continue in the Wells Project in 2024. Total catch and CPUE from baited set-lines used in Pikeminnow removal efforts will be compared to previous year's efforts and with the other sampling techniques employed in 2024. In addition, Northern Pikeminnow captured in 2024 that exceed 250mm in length will be tagged with a Floy tag, and if data are sufficient mark-recapture abundance estimates will be produced for fish within the size class.

4.3.4 Walleye

The results of previous resident fish investigations, along with the limited number incidental encounters during sampling as part of other fisheries activities, suggest that low numbers of Walleye are present in the Wells Reservoir. Some recreational angling effort takes place for Walleye in a limited number of locations, but Walleye are not thought to be widely distributed throughout the Wells Reservoir. Previous resident fish investigations focused sampling primarily in the littoral zone. It is possible that Walleye inhabit deeper areas seasonally that were not effectively sampled with the methods utilized in past studies. Fall gill netting following the FWIN methodology will be used to target Walleye specifically during this study.

4.4 Non-target Fish Species of Concern

Endangered Species Act (ESA)-listed Steelhead, spring Chinook, and Bull Trout are known to inhabit the Wells Reservoir especially during the migration period between May and July. While it is unlikely that these species will be encountered during resident fish sampling, Douglas PUD holds the appropriate permits regarding the incidental capture or harassment of these species and will employ proper fish handling techniques if they are encountered. Any encounter with ESA-listed species during the course of the study will be documented and reported to the appropriate regulating agency in accordance with the permits.

Douglas PUD is actively monitoring the presence of White Sturgeon in the Wells Project area. Any Sturgeon captured or observed during the resident fish sampling will be examined for scute markings. If captured, PIT tag codes will be recorded and a length measurement taken. The location of each Sturgeon captured will also be recorded. Untagged fish will be given a PIT tag. A tissue sample (pectoral fin clip) will be collected from all captured Sturgeon and stored in vials of 90% ethanol for future genetic analysis in support of the objectives of the White Sturgeon Management Plan.

5.0 DATA ANALYSIS AND REPORTING

5.1 Data Analysis

5.1.1 Comparisons to previous studies

Mean CPUE of each resident fish species for each sampling method will be calculated. A two-factor ANOVA will be used to assess differences in mean CPUE among gear type and sampling season during this study. If statistically significant differences or interaction among gear type and season are observed, post-hoc tests will be conducted to determine which gear types and seasons are different. Mean CPUE for beach seine and electrofishing methods from Kyger (2015) will be compared to mean CPUE of those methods in 2024. Should the results indicate no statistically significant difference in mean CPUE among gear type or season in 2024, data from similar methods and seasons will be pooled and compared to the results of Kyger (2015).

5.1.2 Burbot, Smallmouth Bass, and Northern Pikeminnow

In addition to total catch and relative abundance, if data are sufficient, mark-recapture estimates of abundance will be calculated for Burbot, Smallmouth Bass, and Northern Pikeminnow. Length-frequency histograms will also be developed for each species.

Sampling for Burbot, Smallmouth Bass, and Northern Pikeminnow is designed to collect data to be used to estimate the abundance of each species using an open capture-recapture model such as POPAN (Schwarz and Arnason 1996). If recapture numbers are insufficient to estimate abundance using open mark-recapture models alternative methods such as N-mixture models will be used to estimate abundance of these species (Royle 2004).

5.2 Reporting

A report summarizing the results of the 2024 Resident Fish Assemblage Study will be provided to the Aquatic SWG in February 2025. The report will also include a map of resident fish species distribution and relative abundance in the Wells Project. In-season updates of the progress of the study will also be provided at the request of the Aquatic SWG.

6.0 REFERENCES

Beak Consultants, Inc. and Rensel Associates. 1999. Assessment of resident fish in Lake Pateros, Washington. Final Report. Prepared for Public Utility District No. 1 of Douglas County. Beak Consultants, Inc. in cooperation with Rensel Associates. Arlington, Washington.

BioAnalysts, Inc. 2004. Movement of Bull Trout within the mid-Columbia River and tributaries, 2001-2004. Prepared for Public Utility District No. 1 of Chelan County, Wenatchee, WA, Public Utility District No. 1 of Douglas County, East Wenatchee, WA, and Public Utility District No. 2 of Grant County, Ephrata, WA.

Bonar, S. A., B. D. Bolding, and M. Divens. 2000. Standard fish sampling guidelines for Washington State pond and lake surveys. Report No. FPT 00-28, Washington Department of Fish and Wildlife, Olympia,Washington. 24 pp.

Burley, C.C. and T.P. Poe. 1994. Significance of predation in the Columbia River from Priest Rapids dam to Chief Joseph dam, predator consumption indexing. Contract 430-486. Prepared for PUD No 1 of Chelan County, PUD No. 1 of Douglas County, and PUD No. 2 of Grant County.

Carey M.P, Sanderson B.L., Friesen T.A., Barnas K.A., and J.D. Olden. 2011. Smallmouth Bass in the Pacific Northwest: A Threat to Native Species; a Benefit for Anglers. Reviews in Fisheries Science 19(3) 305-315.

Dell, M.B., Erho, M.W., and B.D. Leman. 1975. Occurrence of Gas Bubble Disease Symptoms On Fish In Mid-Columbia River Reservoirs. Public Utility District of Grant County, Ephrata, WA, Public Utility District of Douglas County, East Wenatchee, WA, Public Utility District of Chelan County, Wenatchee, WA.

Douglas PUD (Public Utility District No. 1 of Douglas County). 2002. Wells Hydroelectric Project Anadromous Fish Agreement and Habitat Conservation Plan. Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.

Duke. 2001. Rocky Reach fish presence and habitat use survey. Report prepared for the Public Utility District No. 1 of Chelan County, Wenatchee, Washington.

Jerald, T. 2022. 2021 Public Utility District No. 1 of Douglas County Northern Pikeminnow Removal and Research Program. Prepared by Columbia Research for Public Utility District No. 1 of Douglas County, 1151 Valley Mall Parkway, East Wenatchee, WA 98802-4497.

Kyger, C.D. 2015. 2014 Resident Fish Assemblage Study Report. Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.

McGee, J.A. 1979. Fisheries Survey of Wells Reservoir. Public Utility District of Douglas County, East Wenatchee, Washington.

Morgan, G. E. 2000. Manual of Instructions, fall walleye index netting (FWIN). Ontario Ministry of Natural Resources. Peterborough, Ontario (Canada).

NMFS. 2002. Anadromous Fish Agreements and Habitat Conservation Plans: Final Environmental Impact Statement for the Wells, Rocky Reach, and Rock Island Hydroelectric Projects. U.S. Department of Commerce. National Oceanic and Atmospheric Administration. National Marine Fisheries Service, Northwest Region, Portland, Oregon. December 2002.

Peven, C.M. 1990. The life history of naturally produced steelhead trout from the mid-Columbia River basin. M.S. Thesis, University of Washington, Seattle, Washington.

Royle J.A. 2004. N-mixture models for estimating population size from spatially replicated counts. Biometrics 60, 108-115.

Scott, W.B. and E.J. Crossman. 1973. Freshwater fishes of Canada. Fisheries Research Board of Canada, Ottawa, Canada.

Schwarz, C. J., & Arnason, A. N. 1996. A general methodology for the analysis of open-model capture-recapture experiments. Biometrics, 52, 860-873.

Wydoski, R.S. and R.R. Whitney. 2003. Inland Fishes of Washington. Second Edition. American Fisheries Society. University of Washington Press.

Zook, W.J. 1983. Resident fisheries of Wells Pool: A Review. Prepared for Public Utility District No. 1 of Douglas County. Fulton Fisheries Advisors. 61 pgs.

Appendix P
Wells Dam Lamprey Trapping and Fishway Modifications 2025

DEPARTMENT OF NATURAL RESOURCES
1151 VALLEY MALL PARKWAY • EAST WENATCHEE, WASHINGTON • 98802-4497 • 509.884.7191

Memorandum

TO: Wells HCP Coordinating Committee Reps
FROM: Mariah Mayfield, Douglas PUD
SUBJECT: Wells Dam Lamprey Trapping and Fishway Modifications 2025
DATE: December 12, 2024

Public Utility District No. 1 of Douglas County (Douglas PUD) is planning an adult Pacific Lamprey passage study for summer of 2025 and is proposing several changes to the Wells Dam fishways to trap Pacific Lamprey and test collection gallery head differential effects on lamprey passage.

Adult Pacific Lamprey Traps in Wells Fishway:
Douglas PUD is proposing to trap and tag at least 200 adult Pacific Lamprey obtained from the Wells Fishways using the adult lamprey traps (Figure 1). These traps were successfully tested during summer 2024. In 2024, traps were deployed from 21:00 to 8:00 Sunday night to Thursday morning. Regular updates on steelhead upstream passage through the Wells Dam fishways were provided to the HCP Coordinating Committee during the trapping period, and no adverse effects were detected. For 2025, Douglas PUD is requesting the ability to deploy the traps for twenty-four hours each day, with the traps checked daily. There are several reasons for the proposed change: 1) to have the highest likelihood of obtaining the required number of study fish, and 2) to allow staff to deploy the traps properly during normal working hours. As most salmonids pass the weir using the lower orifice and the traps do not cover the entire cross-section of the weir overflow, Douglas PUD is confident that the traps will not adversely affect salmonid migration patterns or timing. Traps will be deployed from August 1 until no later than September 30, depending on trapping efficiency.

Douglas PUD seeks approval from the Wells HCP Coordinating Committee to deploy the adult lamprey traps for in both ladders from August 1 to September 30, 2025.

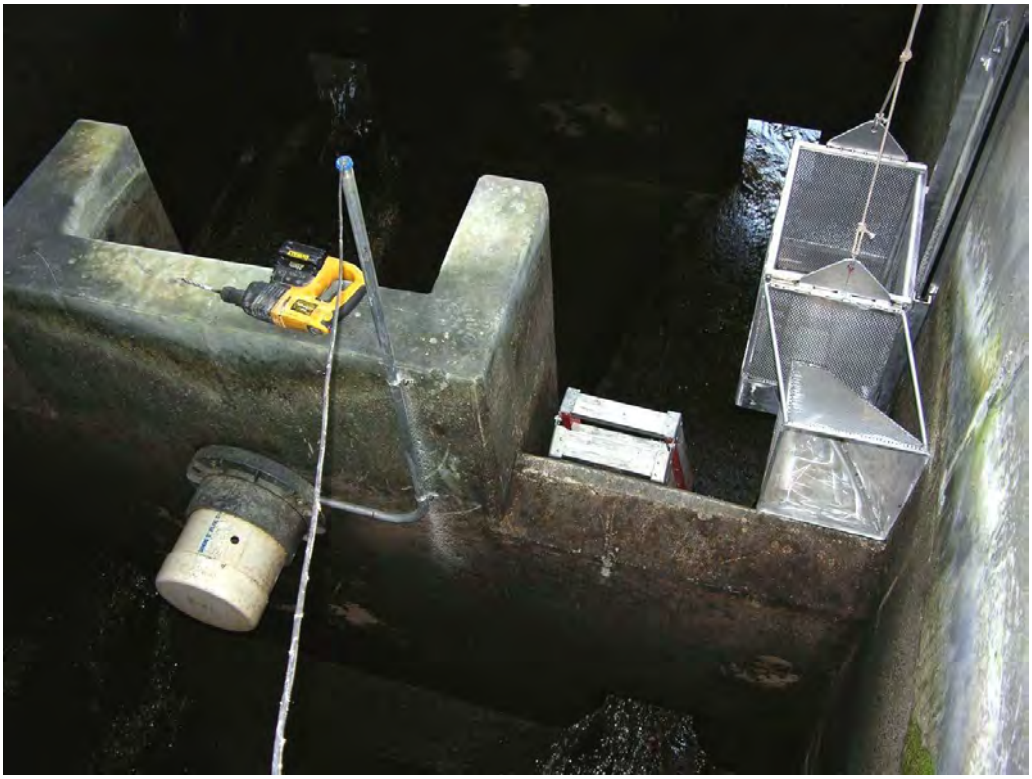


Figure 1. Overflow-weir adult-lamprey trap. Pictured during fishway maintenance while fishway is dewatered.

Testing Collection Gallery Head Differentials:
As part of the Pacific Lamprey adult passage study, Douglas PUD is proposing testing a lower nighttime head differential in the collection gallery to test if there is an effect to lamprey fishway entrance rates with a lower head differential. The current head differential is set at 1.5 ft and Douglas PUD is proposing that the head differential at one or both ladders be reduced to 0.5 ft during nighttime hours (18:00 to 6:00) in an alternating format to be determined by the Aquatic Settlement Work Group. Outside of these hours, the head differential will be maintained at 1.5 ft. This change is proposed to begin when the first group of study fish is released (likely late-July) and would continue until October 15, 2025. The change to the head differential only affects the water level within the collection gallery and does not change the discharge and water levels within the fish ladders.

Douglas PUD seeks approval from the Wells HCP Coordinating Committee to reduce the collection gallery head differential from 1.5 ft to 0.5 ft in accordance with the Pacific Lamprey passage study plan approved in the Aquatic Settlement Work Group from late-July to October 15, 2025.

EXHIBIT B

PRE-FILING CONSULTATION RECORD SUPPORTING THE APPROVAL OF THE 2024 AQUATIC SETTLEMENT AGREEMENT ANNUAL REPORT, 2024 AQUATIC SETTLEMENT AGREEMENT MANAGEMENT PLAN REPORTS, AND 2024 WATER TEMPERATURE REPORT

EMAIL NOTICE TO THE AQUATIC SETTLEMENT WORK GROUP OF THE REQUIRED REVIEW PERIOD FOR THE DRAFT 2024 AQUATIC SETTLEMENT AGREEMENT ANNUAL REPORT AND SIX AQUATIC RESOURCE MANAGEMENT PLAN ANNUAL REPORTS

From:	Kristi Geris
To:	Andrew Gingerich; Blanchard, Monica R (DFW); Chad Brown; Chas Kyger; David Blodgett, III; Fety, Stuart B (FWS); Jason McLellan; John Ferguson; John Rohrback; murk; Kristi Geris; Laura.Heironimus@dfw.wa.gov; Mariah Mayfield; Melissa Peterson; Verhey, Patrick M (DFW); Ralph Lampman (lamr@yakamafish-nsn.gov)
Cc:	Neal, William (Travis); Amber Nealy
Subject:	Aquatic SWG: Draft 2024 ASA Annual Report +MP Annual Reports for ASWG 54-day review
Date:	Wednesday, March 5, 2025 8:35:46 AM
Attachments:	image001.png

Good morning, ASWG Technical Reps!

Gifts come early! The draft 2024 Aquatic Settlement Agreement Annual Report and appended six aquatic resource management plan annual reports are now available for your 45-day (+9-day) review with edits and comments due by **Monday, April 28, 2025**.

The following DOCs can be downloaded from the Aquatic SWG Extranet site under: Documents > Reports (instructions below). Please let me know if you have Qs! –kristi

2025_03_05 Anchor QEA - Draft 2024 ASA Annual Report_for ASWG review

2025_03_05 Douglas - Draft 2024 WQMP Annual Report and appended Water Temperature Report

2025_03_05 Douglas - Draft 2024 BTMP Annual Report and ITS

2025_03_05 Douglas - Draft 2024 ANSMP Annual Report

2025_03_05 Douglas - Draft 2024 PLMP Annual Report

2025_03_05 Douglas - Draft 2024 RFMP Annual Report

2025_03_05 Douglas - Draft 2024 WSMP Annual Report

Instructions:

To gain access to the Aquatic SWG Extranet Homepage, please use the following procedure:
* Visit: https://extranet.dcpud.net/sites/nr/aswg/
* Login using “Forms Authentication” (for non-Douglas PUD employees)

You should now be at the Aquatic SWG homepage.

If you encounter problems, or need a login username and password to access the site: Please feel free to contact me, Andrew Gingerich, or Julene McGregor [jmcgregor@dcpud.org; (509) 881-2236] and we will gladly assist you with questions or issues.

Kristi Geris
M (360) 220-3988

ACTION ITEMS FOR THE AQUATIC SETTLEMENT WORK GROUP CONFERENCE CALL SHOWING REQUEST FOR REVIEW OF THE 2024 AQUATIC SETTLEMENT AGREEMENT MANAGEMENT PLANS AND ANNUAL REPORT

FINAL

Conference Call Action Items

Aquatic Settlement Work Group

To: Aquatic SWG Parties **Date:** March 12, 2025

From: John Ferguson, Chair, Anchor QEA

Re: **Final Action Items of the March 12, 2025, Aquatic SWG Conference Call**

Below is a summary of action items from the Aquatic Settlement Work Group (SWG) meeting that was held by conference call on Wednesday, March 12, 2025, from 10:00 a.m. to 12:00 p.m. Attendees are listed in Attachment A. These action items include the following:

Summary of Action Items

1. U.S. Fish and Wildlife Service (USFWS) will provide a representation designation letter to Anchor QEA for distribution to the Aquatic SWG (Item I-B).
2. The Yakama Nation (YN) will provide a draft strategy document that summarizes key questions to consider while developing a juvenile lamprey project survival study, for discussion during the Aquatic SWG conference call on May 14, 2025 (Item II-C).
3. The YN will provide the latest juvenile lamprey passage survival study reports and presentations from Pacific Northwest National Laboratory (PNNL) for studies conducted at U.S. Army Corps of Engineers (USACE) projects, including the final 2022 report, final 2023 report, and 2024 presentation, for distribution to the Aquatic SWG (Item II-C).
4. Douglas PUD will coordinate with the YN and the Confederated Tribes of the Colville Reservation (CTCR) to develop ideas for translocating adult Pacific Lamprey upstream of Wells Dam in 2025, using fish that are collected beyond what is needed to implement the 2025 Adult Pacific Lamprey Study[1] (Item II-D).
5. The Aquatic SWG meeting on April 9, 2025, will be held by Microsoft Teams conference call (Item III-B).

Summary of Decisions

1. Aquatic SWG representatives present approved the *2025 Aquatic Settlement Agreement and Workgroup Action Plan* (2025 ASA Action Plan), as revised (Item II-D).

[1] Per the *Wells Dam 2025 Adult Lamprey Approach and Passage Study Plan*, approved by the Aquatic SWG on February 12, 2025.

Agreements

1. There were no Agreements discussed during today's conference call.

Review Items

1. The draft *Annual Report Calendar Year 2024 Activities Under the Aquatic Settlement Agreement* (2024 ASA Annual Report) and appended *2024 Annual Report White Sturgeon Management Plan* (2024 WSMP Annual Report), *2024 Bull Trout Management Plan and Incidental Take Annual Report* (2024 BTMP and ITS Annual Report), *2024 Annual Report Water Quality Management Plan* (2024 WQMP Annual Report) and appended *2024 Water Temperature Annual Report*, *Pacific Lamprey Management Plan 2024 Annual Report* (2024 PLMP Annual Report), *Aquatic Nuisance Species Management Plan 2024 Annual Report* (2024 ANSMP Annual Report), and *Resident Fish Management Plan 2024 Annual Report* (2024 RFMP Annual Report) were distributed to the Aquatic SWG by Kristi Geris on March 5, and are available for a 54-day review, with edits and comments due by April 28, 2025 (Item III-A).

Documents Finalized

1. There are no documents that have been recently finalized.

Attachment A – List of Attendees

Name	Role	Organization
John Ferguson	Aquatic SWG Chair	Anchor QEA
Kristi Geris	Administration/Technical Support	Anchor QEA
Andrew Gingerich	Aquatic SWG Technical Representative	Douglas PUD
Chas Kyger	Aquatic SWG Technical Alternate	Douglas PUD
Mariah Mayfield	Aquatic SWG Technical Support	Douglas PUD
Stuart Fety	Aquatic SWG Technical Alternate	U.S. Fish and Wildlife Service
Travis Neal	Aquatic SWG Technical Support	U.S. Fish and Wildlife Service
Melissa Peterson	Aquatic SWG Technical Representative	Washington State Department of Ecology
Patrick Verhey	Aquatic SWG Technical Representative	Washington Department of Fish and Wildlife
Jason McLellan	Aquatic SWG Technical Representative	Confederated Tribes of the Colville Reservation
Ralph Lampman	Aquatic SWG Technical Representative	Yakama Nation
Steve Lewis	Observer	U.S. Bureau of Indian Affairs

From: Kristi Geris
To: Andrew Gingerich; Chas Kyger; Mariah Mayfield
Cc: John Ferguson
Subject: 2024 ASA - MP comments
Date: Wednesday, April 30, 2025 5:07:53 AM
Attachments:
2025_03_05 Douglas - Draft 2024 PLMP Annual Report_RL.docx
2025_03_05 Douglas - Draft 2024 PLMP Annual Report_sf.docx
2025_03_05 Douglas - Draft 2024 RFMP Annual Report_RL.docx
2025_03_05 Douglas - Draft 2024 WQMP Annual Report and appended Water Temperature Report_RL.docx
2025_03_05 Douglas - Draft 2024 WSMP Annual Report_CTCR.docx
2025_03_05 Douglas - Draft 2024 WSMP Annual Report_RL.docx
2025_03_05 Douglas - Draft 2024 BTMP Annual Report and ITS_CTCR.docx
2025_03_05 Douglas - Draft 2024 BTMP Annual Report and ITS_sf.docx
2025_03_05 Douglas - Draft 2024 PLMP Annual Report_CTCR.docx

Hello!

Attached are all of the comments received on the MP annual reports. Melissa emailed yesterday asking where to send Ecology comments, so those may be forthcoming. I haven't reviewed the ASA report comments (CTCR, YN, FWS, possibly ECY), but plan to spend some time on that later today or tomorrow.

The goal is to work with commenters and have final drafts for approval back to the SWG by next Wed 5/7. Thanks! -kristi

Kristi Geris
M (360) 220-3988

From: Kristi Geris
To: Andrew Gingerich; Chas Kyger; Mariah Mayfield
Cc: John Ferguson; Hazel Wright; Lucas Stonehouse
Subject: RE: 2024 ASA - report comments
Date: Monday, May 5, 2025 3:48:38 PM
Attachments: 2024_05_08 Final Aquatic SWG conf call minutes.docx

---

Thank you, Andrew!

Consistent with last year, I'll share your responses with the individual commentors and will distribute the revised ASA Annual Report with tracked changes this Wed 5/7, to review during next week's meeting.

For the MP annual reports, last year you went ahead and accepted all changes and clean versions were distributed 1 week ahead of the meeting. Then Chas and Mariah provided a high-level overview of edits during the meeting.

We then approved all reports at once (minutes attached as refresher).

We'll go with this plan unless you prefer otherwise. -kristi

Kristi Geris
M (360) 220-3988

From: Andrew Gingerich <andrew.gingerich@dcpud.org>
Sent: Monday, May 5, 2025 15:33
To: Kristi Geris <kgeris@anchorqea.com>; Chas Kyger <chas.kyger@dcpud.org>; Mariah Mayfield <mariah.mayfield@dcpud.org>
Cc: John Ferguson <jferguson@anchorqea.com>; Hazel Wright <hwright@anchorqea.com>; Lucas Stonehouse <lstonehouse@anchorqea.com>
Subject: RE: 2024 ASA - report comments

Kristi our comments are summarized below but also found in the three report versions that are zipped in the attached. Pretty straightforward in almost every case.

USFWS are easy. Accept all.

YN:
For Ralph 129 fish would have been PIT tagged and genetic clipped even when given to CTCR for transport to the Okanogan.

For eLAT edit to ELAT. Sounds great.

For Ralph last seen table updates. It's hard to get all years in one giant table. I think Mariah updated this table for the PLMP report. I think that's as far as we will go. Previous reports have

additional detail that Ralph may be after.

CTCR:
I like the change to Betsy. This was a good catch. I updated Betsy's title to be consistent with her designation.

No complaint on the WSIV acronym change. This is consistent with the updated taxonomy.

Appreciate the reviews. Feel free to distribute- or we can take this up at next weeks call. Either way I'm good with.

Andrew Gingerich
Natural Resources Supervisor
Douglas PUD
509-881-2323
DouglasPUD.org

From: Kristi Geris <kgeris@anchorqea.com>
Sent: Monday, May 5, 2025 1:35 PM
To: Andrew Gingerich <andrew.gingerich@dcpud.org>; Chas Kyger <chas.kyger@dcpud.org>; Mariah Mayfield <mariah.mayfield@dcpud.org>
Cc: John Ferguson <jferguson@anchorqea.com>; Hazel Wright <hwright@anchorqea.com>; Lucas Stonehouse <lstonehouse@anchorqea.com>
Subject: FW: 2024 ASA - report comments

Hi there!

Now that I'm back from vacay, wanted to check in on these. We would like to run a final tech edit on the ASA report before it goes out to the ASWG this Wed 5/7 (I think we can accomplish this on Wed, if needed). Please let me know if we can loop back to Stuart, Jason, or Ralph with your responses! Thanks! -kristi

Kristi Geris
M (360) 220-3988

From: Kristi Geris <kgeris@anchorqea.com>
Sent: Thursday, May 1, 2025 11:46
To: andrew.gingerich <andrew.gingerich@dcpud.org>; Chas Kyger <chask@dcpud.org>; Mariah Mayfield <mariah.mayfield@dcpud.org>
Cc: John Ferguson <jferguson@anchorqea.com>

Subject: 2024 ASA - report comments

Hello!

Attached for your review are comments received on the ASA Annual Report. A few notes—

USFWS Comments

- Stuart provided initial comments on March 28. DPUD approved on March 31.
- Stuart provided additional comments on April 28, for DPUD review/approval.

CTCR Comments

- There are two edits for DPUD review/approval.

YN Comments

- There are a number of requests/clarifications for DPUD to address.

Can you please review the attached and provide responses? Again, the goal is to work with commenters and have final drafts for approval back to the SWG by next Wed 5/7. Thanks! - kristi

Kristi Geris
M (360) 220-3988

UNITED STATES FISH AND WILDLIFE SERVICE COMMENTS AND APPROVAL ON THE DRAFT 2024 AQUATIC SETTLEMENT AGREEMENT ANNUAL REPORT AND THE 2024 BULL TROUT MANAGEMENT PLAN AND INCIDENTAL TAKE ANNUAL REPORT

From:	Kristi Geris
To:	Fety, Stuart B
Cc:	Neal, William (Travis); Lucid, Michael K; Andrew Gingerich; John Ferguson; Chas Kyger; Mariah Mayfield
Subject:	RE: Wells Project; Annual Report Review
Date:	Tuesday, May 6, 2025 12:05:29 PM
Attachments:	2025_03_05 Anchor QEA - Draft 2024 ASA Annual Report_for ASWG review_sf-kg-DPUD.docx

Hi Stuart!

Attached are responses to your edits/comments on the ASA Annual Report. Edits will be retained in tracked changes in the revised version that will be distributed to the ASWG tomorrow.

The revised management plan annual reports will also be distributed tomorrow, and Douglas will review edits during next week's meeting. Thanks! -kristi

Kristi Geris
M (360) 220-3988

From: Fety, Stuart B <stuart_fety@fws.gov>
Sent: Monday, April 28, 2025 16:59
To: Kristi Geris <kgeris@anchorqea.com>
Cc: Neal, William (Travis) <william_neal@fws.gov>; Lucid, Michael K <michael_lucid@fws.gov>
Subject: Wells Project; Annual Report Review

Hello Kristi,

Please find attached copies on ASWG annual reports with my comments. On the whole they reflect my understanding well. I only had a few minor additions to each from my previous submission.

Best,

Stuart

Stuart Fety

Fish and Wildlife Biologist

US Fish and Wildlife Service

Washington Ecological Services

215 Melody Lane, Suite 103

Wenatchee, Washington 98801

stuart_fety@fws.gov | (564) 233 - 8434

I am out of the office every other Friday

From: Kristi Geris
To: Fety, Stuart B
Cc: Neal, William (Travis); Chas Kyger; Andrew Gingerich; Mariah Mayfield; John Ferguson
Subject: RE: [EXTERNAL] RE: Annual Report and BTMP Comments
Date: Monday, March 31, 2025 9:30:49 AM

Sounds good, Stuart!

Kristi Geris
M (360) 220-3988

From: Fety, Stuart B <stuart_fety@fws.gov>
Sent: Monday, March 31, 2025 09:18
To: Kristi Geris <kgeris@anchorqea.com>
Cc: Neal, William (Travis) <william_neal@fws.gov>; chask@dcpud.org
Subject: Re: [EXTERNAL] RE: Annual Report and BTMP Comments

Hi Kristi and Chas,

Thank you for taking my comments into consideration. My intent was to suggest a few edits that would help clarify potential exposure of bull trout to project activities.
I confused the deadline for comments, overlooking the "April" part of the date in favor of the "28th". I will plan to continue to review the annual reports and will submit any revised or additional comments. Please reach out for clarification.
Best,

Stuart

Stuart Fety
Washington Ecological Services
stuart_fety@fws.gov | (564) 233 - 8434
I am out of the office every other Friday

From: Kristi Geris <kgeris@anchorqea.com>
Sent: Monday, March 31, 2025 9:05 AM
To: Fety, Stuart B <stuart_fety@fws.gov>
Cc: Neal, William (Travis) <william_neal@fws.gov>; chask@dcpud.org <chask@dcpud.org>
Subject: [EXTERNAL] RE: Annual Report and BTMP Comments

This email has been received from outside of DOI - Use caution before clicking on links, opening attachments, or responding.

Hi Stuart! Chas and I reviewed your edit and comment to the ASA Annual Report and will incorporate your changes as suggested. Chas will reach out separately if he has Qs on the BTMP Annual Report. Thanks! -kristi

Kristi Geris
M (360) 220-3988

From: Fety, Stuart B <stuart_fety@fws.gov>
Sent: Friday, March 28, 2025 17:18
To: Kristi Geris <kgeris@anchorqea.com>
Cc: Neal, William (Travis) <william_neal@fws.gov>
Subject: Annual Report and BTMP Comments

Hi Kristi,

Please find attached my comments on the Wells Annual Report and the 2024 BTMP report. I have been time limited so my review of the annual report was restricted to bull trout issues. I will continue to look for time to review the entire document prior to our meeting.
All my comments are requests for clarification.

Best,

Stuart

Stuart Fety

Fish and Wildlife Biologist

US Fish and Wildlife Service

Washington Ecological Services

215 Melody Lane, Suite 103

Wenatchee, Washington 98801

stuart_fety@fws.gov | (564) 233 - 8434

I am out of the office every other Friday

CONFEDERATED TRIBES OF THE COLVILLE RESERVATION EDITS AND COMMENTS ON THE DRAFT 2024 AQUATIC SETTLEMENT AGREEMENT ANNUAL REPORT, DRAFT 2024 BULL TROUT MANAGEMENT PLAN AND INCIDENTAL TAKE ANNUAL REPORT, AND DRAFT 2024 WHITE STURGEON MANAGEMENT PLAN

From:	Kristi Geris
To:	Jason McLellan
Cc:	Andrew Gingerich; John Ferguson; Chas Kyger; Mariah Mayfield
Subject:	RE: [REMINDER] RE: Aquatic SWG: Draft 2024 ASA Annual Report +MP Annual Reports for ASWG 54-day review
Date:	Tuesday, May 6, 2025 11:53:51 AM
Attachments:	image001.png 2025_03_05 Anchor QEA - Draft 2024 ASA Annual Report_for ASWG review_CTCR-kg-DPUD.docx

Hi Jason!

Attached are responses to your edits/comments on the ASA Annual Report. Edits will be retained in tracked changes in the revised version that will be distributed to the ASWG tomorrow.

The revised management plan annual reports will also be distributed tomorrow, and Douglas will review edits during next week's meeting. Thanks! -kristi

Kristi Geris
M (360) 220-3988

From: Jason McLellan <Jason.McLellan@colvilletribes.com>
Sent: Monday, April 28, 2025 12:41
To: Kristi Geris <kgeris@anchorqea.com>; andrew.gingerich <andrew.gingerich@dcpud.org>; John Ferguson <jferguson@anchorqea.com>; Chas Kyger <chas.kyger@dcpud.org>; Mariah Mayfield <mariah.mayfield@dcpud.org>
Subject: Re: [REMINDER] RE: Aquatic SWG: Draft 2024 ASA Annual Report +MP Annual Reports for ASWG 54-day review

Hello Everyone,

I have completed reviews of all of the reports. Not much to provide, but suggested edits are attached. No edits to the ANSMP, RFMP, and WQMP reports.

Best Regards,
Jason

On Wed, Apr 23, 2025 at 7:09 AM Kristi Geris <kgeris@anchorqea.com> wrote:

> Hi ASWG Technical Reps!
>
> Sending a friendly reminder to please submit edits and comments on the draft 2024 ASA Annual Report and appended six aquatic resource MP annual reports by this **Mon**

4/28. Thanks! -kristi

Kristi Geris
M (360) 220-3988

From: Kristi Geris <kgeris@anchorqea.com>
Sent: Wednesday, March 5, 2025 08:36
To: Andrew Gingerich (andrewg@dcpud.org) <andrewg@dcpud.org>; Blanchard, Monica R (DFW) <Monica.Blanchard@dfw.wa.gov>; Chad Brown <chbr461@ecy.wa.gov>; Chas Kyger <chask@dcpud.org>; David Blodgett, III <blod@yakamafish-nsn.gov>; Fety, Stuart B (FWS) <stuart_fety@fws.gov>; Jason McLellan <Jason.McLellan@colvilletribes.com>; John Ferguson <jferguson@anchorqea.com>; john.rohrback <john.rohrback@dcpud.org>; murk <murk@yakamafish-nsn.gov>; Kristi Geris <kgeris@anchorqea.com>; Laura.Heironimus@dfw.wa.gov; Mariah Mayfield <mariah.mayfield@dcpud.org>; Melissa Peterson <mepe461@ecy.wa.gov>; Verhey, Patrick M (DFW) <patrick.verhey@dfw.wa.gov>; Ralph Lampman (lamr@yakamafish-nsn.gov) <lamr@yakamafish-nsn.gov>
Cc: Neal, William (Travis) <william_neal@fws.gov>; amber.nealy <amber.nealy@dcpud.org>
Subject: Aquatic SWG: Draft 2024 ASA Annual Report +MP Annual Reports for ASWG 54-day review

Good morning, ASWG Technical Reps!

Gifts come early! The draft 2024 Aquatic Settlement Agreement Annual Report and appended six aquatic resource management plan annual reports are now available for your 45-day (+9-day) review with edits and comments due by **Monday, April 28, 2025**.

The following DOCs can be downloaded from the Aquatic SWG Extranet site under: Documents > Reports (instructions below). Please let me know if you have Qs! –kristi

2025_03_05 Anchor QEA - Draft 2024 ASA Annual Report_for ASWG review

2025_03_05 Douglas - Draft 2024 WQMP Annual Report and appended Water Temperature Report

2025_03_05 Douglas - Draft 2024 BTMP Annual Report and ITS

2025_03_05 Douglas - Draft 2024 ANSMP Annual Report

2025_03_05 Douglas - Draft 2024 PLMP Annual Report

2025_03_05 Douglas - Draft 2024 RFMP Annual Report

2025_03_05 Douglas - Draft 2024 WSMP Annual Report

Instructions:

To gain access to the Aquatic SWG Extranet Homepage, please use the following procedure:
* Visit: https://extranet.dcpud.net/sites/nr/aswg/
* Login using “Forms Authentication” (for non-Douglas PUD employees)

You should now be at the Aquatic SWG homepage.

If you encounter problems, or need a login username and password to access the site: Please feel free to contact me, Andrew Gingerich, or Julene McGregor [jmcgregor@dcpud.org; (509) 881-2236] and we will gladly assist you with questions or issues.

Kristi Geris
M (360) 220-3988

YAKAMA NATION EDITS ON THE DRAFT 2024 AQUATIC SETTLEMENT AGREEMENT ANNUAL REPORT, THE DRAFT 2024 PACIFIC LAMPREY MANAGEMENT PLAN, THE DRAFT 2024 RESIDENT FISH MANAGEMENT PLAN, THE DRAFT 2024 WATER QUALITY MANAGEMENT PLAN, THE DRAFT 2024 BULL TROUT MANAGMENT PLAN, AND THE DRAFT 2024 WHITE STURGEON MANAGEMENT PLAN

From: Kristi Geris
To: Ralph Lampman
Cc: John Ferguson; Andrew Gingerich; Chas Kyger; John Rohrback; Mariah Mayfield
Subject: RE: [REMINDER] RE: Aquatic SWG: Draft 2024 ASA Annual Report +MP Annual Reports for ASWG 54-day review
Date: Tuesday, May 6, 2025 11:53:21 AM
Attachments: image001.png
image002.png
2025_03_05 Anchor QEA - Draft 2024 ASA Annual Report_for ASWG review_RL-kg-DPUD.docx

---

Hi Ralph!

Attached are responses to your edits/comments on the ASA Annual Report. Edits will be retained in tracked changes in the revised version that will be distributed to the ASWG tomorrow.

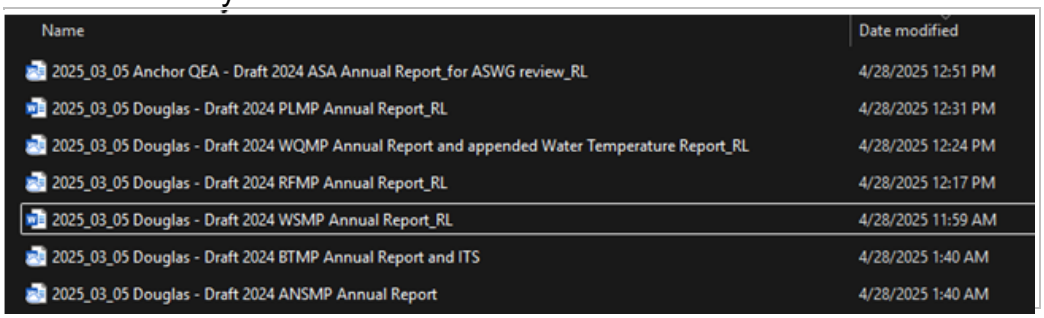
The revised management plan annual reports will also be distributed tomorrow, and Douglas will review edits during next week's meeting. Thanks! -kristi

Kristi Geris
M (360) 220-3988

From: Ralph Lampman <lamr@yakamafish-nsn.gov>
Sent: Tuesday, April 29, 2025 05:33
To: Kristi Geris <kgeris@anchorqea.com>
Cc: John Ferguson <jferguson@anchorqea.com>; Andrew Gingerich <andrewg@dcpud.org>; Chas Kyger <chask@dcpud.org>; john.rohrback <john.rohrback@dcpud.org>; Mariah Mayfield <mariah.mayfield@dcpud.org>
Subject: Re: [REMINDER] RE: Aquatic SWG: Draft 2024 ASA Annual Report +MP Annual Reports for ASWG 54-day review

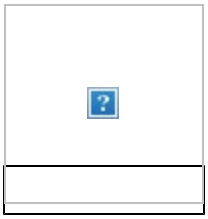
Hi Kristi and all,

My apologies - I finished this yesterday early afternoon, but with multiple back to back events and field trips, I completely forgot to hit "send" yesterday.
Attached are my comments and edits.



~Warm Regards~

Ralph Lampman
COLUMBIA RIVER| Honor. Protect. Restore
Yakama Nation FRMP, Pacific Lamprey Project, Lamprey Project Lead
lamr@yakamafish-nsn.gov
cell: 509-388-3871



On Wed, Apr 23, 2025 at 7:09 AM Kristi Geris <kgeris@anchorqea.com> wrote:

> Hi ASWG Technical Reps!
>
> Sending a friendly reminder to please submit edits and comments on the draft 2024 ASA Annual Report and appended six aquatic resource MP annual reports by this **Mon 4/28**. Thanks! -kristi
>
> **Kristi Geris**
> M (360) 220-3988
>
> ---
>
> **From:** Kristi Geris <kgeris@anchorqea.com>
> **Sent:** Wednesday, March 5, 2025 08:36
> **To:** Andrew Gingerich (andrewg@dcpud.org) <andrewg@dcpud.org>; Blanchard, Monica R (DFW) <Monica.Blanchard@dfw.wa.gov>; Chad Brown <chbr461@ecy.wa.gov>; Chas Kyger <chask@dcpud.org>; David Blodgett, III <blod@yakamafish-nsn.gov>; Fety, Stuart B (FWS) <stuart_fety@fws.gov>; Jason McLellan <Jason.McLellan@colvilletribes.com>; John Ferguson <jferguson@anchorqea.com>; john.rohrback <john.rohrback@dcpud.org>; murk <murk@yakamafish-nsn.gov>; Kristi Geris <kgeris@anchorqea.com>; Laura.Heironimus@dfw.wa.gov; Mariah Mayfield <mariah.mayfield@dcpud.org>; Melissa Peterson <mepe461@ecy.wa.gov>; Verhey, Patrick M (DFW) <patrick.verhey@dfw.wa.gov>; Ralph Lampman (lamr@yakamafish-nsn.gov) <lamr@yakamafish-nsn.gov>
> **Cc:** Neal, William (Travis) <william_neal@fws.gov>; amber.nealy <amber.nealy@dcpud.org>
> **Subject:** Aquatic SWG: Draft 2024 ASA Annual Report +MP Annual Reports for ASWG 54-day review
>
> Good morning, ASWG Technical Reps!
>
> Gifts come early! The draft 2024 Aquatic Settlement Agreement Annual Report and

appended six aquatic resource management plan annual reports are now available for your 45-day (+9-day) review with edits and comments due by **Monday, April 28, 2025**.

The following DOCs can be downloaded from the Aquatic SWG Extranet site under: Documents > Reports (instructions below). Please let me know if you have Qs! –kristi

2025_03_05 Anchor QEA - Draft 2024 ASA Annual Report_for ASWG review

2025_03_05 Douglas - Draft 2024 WQMP Annual Report and appended Water Temperature Report

2025_03_05 Douglas - Draft 2024 BTMP Annual Report and ITS

2025_03_05 Douglas - Draft 2024 ANSMP Annual Report

2025_03_05 Douglas - Draft 2024 PLMP Annual Report

2025_03_05 Douglas - Draft 2024 RFMP Annual Report

2025_03_05 Douglas - Draft 2024 WSMP Annual Report

Instructions:

To gain access to the Aquatic SWG Extranet Homepage, please use the following procedure:
* Visit: https://extranet.dcpud.net/sites/nr/aswg/
* Login using “Forms Authentication” (for non-Douglas PUD employees)

You should now be at the Aquatic SWG homepage.

If you encounter problems, or need a login username and password to access the site: Please feel free to contact me, Andrew Gingerich, or Julene McGregor [jmcgregor@dcpud.org; (509) 881-2236] and we will gladly assist you with questions or issues.

Kristi Geris
M (360) 220-3988

FINAL ACTION ITEMS FOR THE AQUATIC SETTLEMENT WORK GROUP CONFERENCE CALL SHOWING APPROVAL OF THE REVISED 2024 AQUATIC SETTLEMENT AGREEMENT MANAGEMENT PLANS AND ANNUAL REPORT

FINAL

Conference Call Action Items

Aquatic Settlement Work Group

To: Aquatic SWG Parties **Date:** May 14, 2025

From: John Ferguson, Chair, Anchor QEA

Re: **Final Action Items of the May 14, 2025, Aquatic SWG Conference Call**

Below is a summary of action items from the Aquatic Settlement Work Group (SWG) meeting that was held by conference call on Wednesday, May 14, 2025, from 10:00 a.m. to 12:00 p.m. Attendees are listed in Attachment A. These action items include the following:

Summary of Action Items

1. Douglas PUD will distribute the proposed plan for translocating adult Pacific Lamprey upstream of Wells Dam in 2025 (Item I-C).
2. Douglas PUD and the Yakama Nation (YN) will provide adult Pacific Lamprey migration run updates starting next month (Item I-C). *(Note: This was added to next month's agenda.)*
3. Douglas PUD will provide the Brood Year (BY) 2024 Wells White Sturgeon spontaneous autopolyploidy (SAP) blood sampling results from U.C. Davis, along with the fish pre-release/transfer health inspection report from Dr. Betsy Bamberger (Douglas PUD Fish Veterinarian) for distribution to the Aquatic SWG (Item II-B).
4. Douglas PUD will distribute the draft 2024 Wells White Sturgeon Monitoring and Evaluation (M&E) Report for Aquatic SWG review (Item II-B).
5. The YN will provide a revised updated Columbia Basin Lamprey Identification Guide for Aquatic SWG review, with comments due to Ralph Lampman before the Aquatic SWG conference call on June 11, 2025 (Item II-C).
6. Aquatic SWG representatives will provide comments on the YN's draft *Juvenile Pacific Lamprey Passage Behavior and Survival at Upper Columbia River Hydroelectric Dams General Study Design* and working *Upper Columbia Juvenile Lamprey Source Datasheet* for discussion during the Aquatic SWG conference call on June 11, 2025 (Item II-D).
7. Aquatic SWG representatives will develop a list of questions for Pacific Northwest National Laboratory (PNNL) to address during the upcoming joint Juvenile Lamprey Subgroup meeting, including discussing the list during the Aquatic SWG June 11 meeting and finalizing the list by the Aquatic SWG July 9 meeting, towards providing a combined (Rocky Reach Fish Forum [RRFF], Priest Rapids Fish Forum [PRFF], and Aquatic SWG) list to PNNL about 1 month in advance of the joint session scheduled on August 6, 2025 (Item II-D).

8. Aquatic SWG representatives will consider potential Aquatic SWG Chair nominations for discussion during the Aquatic SWG conference call on June 11, 2025 (Item III-A).
9. Douglas PUD and Anchor QEA will review the last Aquatic SWG Chair selection process (2015), will distribute the previous list of candidate interview questions, and will develop a draft timeline for the current process (Item III-A).
10. The Aquatic SWG meeting on June 11, 2025, will be held by Microsoft Teams conference call (Item III-B).

Summary of Decisions

1. Aquatic SWG representatives present approved the *Annual Report Calendar Year 2024 Activities Under the Aquatic Settlement Agreement* (2024 ASA Annual Report), as revised, and appended *2024 Annual Report White Sturgeon Management Plan* (2024 WSMP Annual Report), as revised, *2024 Bull Trout Management Plan and Incidental Take Annual Report* (2024 BTMP Annual Report), as revised, *2024 Annual Report Water Quality Management Plan* (2024 WQMP Annual Report) and appended *2024 Water Temperature Annual Report*, as revised, *Pacific Lamprey Management Plan 2024 Annual Report* (2024 PLMP Annual Report), as revised, *Aquatic Nuisance Species Management Plan 2024 Annual Report* (2024 ANSMP Annual Report), and *Resident Fish Management Plan 2024 Annual Report* (2024 RFMP Annual Report), as revised (Item II-A).

Agreements

1. There were no Agreements discussed during today's conference call.

Review Items

1. The YN's draft *Juvenile Pacific Lamprey Passage Behavior and Survival at Upper Columbia River Hydroelectric Dams General Study Design* and working *Upper Columbia Juvenile Lamprey Source Datasheet* were distributed to the Aquatic SWG by Kristi Geris on May 7. Edits and comments will be discussed during the Aquatic SWG conference call on June 11, 2025 (Item II-B).

Documents Finalized

1. There are no documents that have been recently finalized.

Attachment A – List of Attendees

Name	Role	Organization
John Ferguson	Aquatic SWG Chair	Anchor QEA
Kristi Geris	Administration/Technical Support	Anchor QEA
Andrew Gingerich	Aquatic SWG Technical Representative	Douglas PUD
Mariah Mayfield	Aquatic SWG Technical Support	Douglas PUD
Stuart Fety	Aquatic SWG Technical Representative	U.S. Fish and Wildlife Service
Travis Neal	Aquatic SWG Technical Alternate	U.S. Fish and Wildlife Service
Melissa Peterson	Aquatic SWG Technical Representative	Washington State Department of Ecology
Patrick Verhey	Aquatic SWG Technical Representative	Washington Department of Fish and Wildlife
Laura Heironimus†	Aquatic SWG Technical Alternate	Washington Department of Fish and Wildlife
Bret Nine	Aquatic SWG Technical Support	Confederated Tribes of the Colville Reservation
Ralph Lampman	Aquatic SWG Technical Representative	Yakama Nation
Steve Lewis*	Observer	U.S. Bureau of Indian Affairs

Notes:
† Left conference call during Item II-C.
* Left conference call during Item II-D.