From: eFiling@ferc.gov
To: Amber Nealy; efilingacceptance@ferc.gov
Subject: FERC Acceptance for Filing in P-2149-000
Date: Wednesday, May 15, 2024 2:31:34 PM

Acceptance for Filing

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-Accession No.: 202405155189
-Docket(s) No.: P-2149-000
-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 Aquatic Settlement Agreement Annual Report re the Wells Hydroelectric Project under P-2149.
-Submission Date/Time: 5/15/2024 4:41:05 PM
-Filed Date: 5/15/2024 4:41:05 PM

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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 15, 2024

Honorable Kimberly D. Bose
Secretary
Federal Energy Regulatory Commission
888 1st Street N.E.
Washington, D.C. 20426

Subject: **Wells Hydroelectric Project – FERC Project No. 2149**
Consolidated 2023 Aquatic Settlement Agreement Annual Report

Dear Secretary Bose:

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 2023 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 2023.

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, at the request of the parties to the ASA and following a request filed on behalf of the parties by Douglas PUD, the FERC approved the ASA party's request to modify the water temperature reporting deadline from April 30th to May 31st each year in order to be 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 2023 Annual Water Temperature Report

and 2023 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 and all six of the management plan reports. During the 45-day review period only the Confederated Tribes of the Colville Reservation (CTCR) provided suggested edits or revisions. Douglas PUD either accepted the edits received or worked with the CTCR to resolve all of the remaining comments and edits. These edits were discussed and accepted during the May 8, 2024 Aquatic Settlement Workgroup conference call and Teams meeting. In addition, small minor edits were made during the May 8, 2024 meeting at the advice of the Confederated Tribes and Bands of the Yakama Nation's technical lead. The revised versions of these reports were approved by all of the ASA parties during the conference call and by the CTCR in advance of the call. The pre-filing consultation record documenting the review and May 8, 2024 approval of the revised ASA Annual Report and including all six Annual Management Plan Reports 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 Annual Report and Management Plan 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 andrewg@dcpud.org.

Sincerely,

Andrew Gingerich
Natural Resources Supervisor

Exhibit A. Annual Report Calendar Year 2023 Activities under the Aquatic Settlement Agreement for the Wells Hydroelectric Project

Exhibit B. Pre-filing Consultation Record supporting the approval of the 2023 Aquatic Settlement Agreement Annual Report, 2023 Aquatic Settlement Agreement Management Plan Reports, and 2023 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 2023 ACTIVITIES UNDER THE AQUATIC SETTLEMENT AGREEMENT FOR THE WELLS HYDROELECTRIC PROJECT

May 2024
Wells Hydroelectric Project FERC License No. 2149

ANCHOR QEA

Annual Report Calendar Year 2023 Activities Under the Aquatic Settlement Agreement

Prepared for Public Utility District No. 1 of Douglas County

May 2024
Wells Hydroelectric Project FERC License No. 2149

Annual Report Calendar Year 2023 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: 210280-01.01
\\fuji\anchor\Projects\Douglas PUD\Aquatic SWG\Annual Report\2023\2024_05_17 Anchor QEA - Final 2023 ASA Annual Report.docx

FINAL

Executive Summary

This *Annual Report Calendar Year 2023 Activities Under the Aquatic Settlement Agreement* (2023 ASA Annual Report) summarizes activities completed from January 1 to December 31, 2023, 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 2023, 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) 2022 larval-origin yearling White Sturgeon into the Wells Reservoir completed the first year of the Phase II Wells Project White Sturgeon Supplementation Program. The release of 328 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 2022 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). In June and July, approximately 7,000 BY 2023 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 2024, as well as rearing 2,000 fish for Chelan PUD per an interlocal agreement between the two Districts. Survival of BY 2023 fish in hatchery was suboptimal initially but improved by fall 2023. It is expected that the stocking target for the Douglas PUD program goal will be achieved in 2024. Douglas PUD and the Aquatic SWG finalized a report summarizing the first of five adult reproductive assessments to occur over the term of Douglas PUD's FERC license. Douglas PUD and the Aquatic SWG began discussing evaluation of adult passage, per Section 4.4 of the WSMP (Objective 5),

which culminated in the final *Statement of Agreement Regarding Evaluation and Implementation of White Sturgeon Adult Passage Measures (WSMP Objective 5; Section 4.4)* (Appendix L). Douglas PUD continued implementing SAP screening and release protocols for the Wells Reservoir. Douglas PUD continued hosting annual public outreach events by inviting students from Bridgeport High School to assist Douglas PUD with releasing BY 2022 yearling White Sturgeon into the Wells Reservoir.

In 2023, 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 26 study fish to the evaluation. 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 review and are expected to be finalized in early 2024. In May 2023, Douglas PUD conducted an opportunistic Bull Trout stranding survey while the Wells Reservoir was drawn down below elevation 773 feet above sea level (MSL) to facilitate scouring of fine sediments in the lower 1 mile of the Methow River. No Bull Trout were encountered during this drawdown event. The memorandum, *Wells Hydroelectric Project No. 2149, Low Pool Elevation Bull Trout Survey – License Article 402* (Appendix M) was distributed to the Aquatic SWG on June 12, 2023. Douglas PUD also continued to be available to participate in regional and technical meetings specific to Bull Trout recovery.

In 2023, 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 *2023 Total Dissolved Gas Abatement Plan* (and appended *Wells Bypass Operating Plan*; Appendix O) 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 the water forecast for the Wells Project and 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 Washington State Department of Ecology (Ecology) and the Aquatic SWG for review in November 2023. Douglas PUD and Ecology will work jointly to further develop the draft report, and a final report is expected in 2024.

In 2023, 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 approved the SOA *To Translocate Adult Pacific Lamprey from Priest Rapids Dam to Areas Within or Upstream of the Wells Project 2023–2024* (Appendix P). This 2-year translocation program allows time to review and discuss the results of the *Wells Dam 2022 Adult Lamprey Approach and Passage Study* (2022 Adult Pacific

Lamprey Approach and Passage Study) before starting discussions of the next study design and extended the efforts of the previous translocation SOA. Results of the 2022 Adult Pacific Lamprey Approach and Passage Study are expected in early 2024. Douglas PUD continued to summarize detections of tagged adult Pacific Lamprey that were translocated upstream of Wells Dam as part of the 4-year translocation program implemented from 2018 through 2021. Douglas PUD, in coordination with the Wells HCP Coordinating Committee, deployed and operated lamprey traps in the east fishway at Wells Dam to evaluate how the traps performed during a high run year and to understand whether the traps can be used to collect study fish for future Aquatic SWG studies of adult Pacific Lamprey passage. The traps will be tested again in both the east and west fishways in 2024. Douglas PUD and the Aquatic SWG began discussing a path forward for juvenile Pacific Lamprey studies in the Upper Columbia River, including participating in a joint meeting of the Priest Rapids Fish Forum (PRFF) and Rocky Reach Fish Forum (RRFF) Pacific Lamprey Subgroups to discuss models and assumptions of models used to estimate juvenile survival and behavior. 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. Douglas PUD continued repairing plating in the Wells Dam fishways to reduce gaps in both ladders and hosted a tour of the east fishway and collection gallery 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 2023, Douglas PUD continued aquatic nuisance species monitoring in the Wells Reservoir. Douglas PUD continued annual surveillance for non-native Northern Crayfish (*Orconectes virilis*); non-native Zebra Mussel (*Dreissena polymorpha*) and Quagga Mussel (*D. bugensis*), collectively called Dreissenid Mussels; and non-native Eurasian Watermilfoil (*Myriophyllum spicatum*) throughout the Wells Project. Douglas PUD implemented the sixth year of an eDNA monitoring program for Northern Pike in the Wells Project and executed the fourth 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 (*Esox lucius*) monitoring and suppression efforts in the Columbia River Basin and maintained the *Aquatic Nuisance Species Management Plan Contact List* of parties to notify in case Douglas PUD detects new aquatic nuisance species in the Wells Project.

In 2023, 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 2022 has captured and removed approximately 360,000 Northern Pikeminnow from the Wells Reservoir and tailrace through removal efforts sponsored by Douglas PUD. Douglas PUD will distribute a draft Resident Fish Assemblage Study Plan in early 2024.

In 2023, Douglas PUD and 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. This included collaborative development and approval of the *2023 Total Dissolved Gas Abatement Plan* (and appended *Wells Bypass Operating Plan*), as revised (Appendix O), communication of Northern Pikeminnow research and removal efforts at the Wells Project in 2022, and approval of lamprey trap operations in the east fishway in 2023 and activities described in the final memorandum, "Wells Dam Lamprey Trapping and Fishway Modifications 2024," (Appendix Q). In 2023, Douglas PUD resumed hosting annual tours at Wells Dam.

TABLE OF CONTENTS

TABLES

APPENDICES

ABBREVIATIONS

[Year] ASA Annual Report	Annual Report Calendar Year [YEAR] Activities Under the Aquatic Settlement Agreement
2021–2022 Bull Trout Radio Telemetry Study Plan	Bull Trout Passage and Take Monitoring at Wells Dam and Twisp River Weir Study
2022–2023 Bull Trout Study Report	*Bull Trout Movement and Life History Investigation 2022–2023*
2022 Adult Pacific Lamprey Approach and Passage Study	*Wells Dam 2022 Adult Lamprey Approach and Passage Study*
2022 Bull Trout PIT Study Plan	Bull Trout Movement and Life History Investigation *2022*
2023 GAP/BOP	*2023 Total Dissolved Gas Abatement Plan* and appended *Wells Bypass Operating Plan*
Agreement	Aquatic Settlement Agreement
ANSMP	Aquatic Nuisance Species Management Plan
Aquatic SWG	Aquatic Settlement Work Group
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
FERC	Federal Energy Regulatory Commission
g	gram
GBT	gas bubble trauma
HCP	Habitat Conservation Plan
JBS	Juvenile Bypass System
M&E	monitoring and evaluation
MSL	mean sea level
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
PRFF	Priest Rapids Fish Forum
PUD	Public Utility District
qPCR	quantitative polymerase chain reaction
RFMP	Resident Fish Management Plan
RRFF	Rocky Reach Fish Forum
RMU	regional management unit
SAP	spontaneous autopolyploid
SOA	statement of agreement
TBD	to be determined
TDG	total dissolved gas
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
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 2023 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 15th annual report to be developed for activities accomplished under the Agreement, covering the period from January 1 to December 31, 2023. This report is due annually to FERC by May 31 of each year (License Article 406). Accordingly, on May 10, 2023, the Aquatic SWG approved the *Annual Report Calendar Year 2022 Activities Under the Aquatic Settlement Agreement* (2022 ASA Annual Report; Anchor QEA 2023), and Douglas PUD filed the report with FERC on May 16, 2023. This 2023 ASA Annual Report will be reviewed and approved by the Aquatic SWG and subsequently filed with FERC on or prior to the May 31, 2024, 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 2023, all six 2022 aquatic resource management plan annual reports were due to FERC by May 31. Accordingly, on May 10, 2023, the *2022 Annual Report White Sturgeon Management Plan, 2022 Bull Trout Management Plan and Incidental Take Annual Report, 2022 Annual Report Water Quality Management Plan, Pacific Lamprey Management Plan 2022 Annual Report, Aquatic Nuisance Species Management Plan 2022 Annual Report,* and *Resident Fish Management Plan 2022 Annual Report* were approved by the Aquatic SWG, and Douglas PUD filed the reports with FERC as appended to the 2022 ASA Annual Report on May 16, 2023 (Anchor QEA 2023).

The 2023 aquatic resource management plan annual reports (Appendices C, D, E, F, G, and H) were updated in early 2024 in consultation with the Aquatic SWG and will be filed with FERC as appended to this 2023 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 2023 in accordance with the Agreement and aquatic resource management plans, which are also required in the 2012 Wells Project License Order.

2.1 2023 Aquatic Settlement Agreement Decisions, Agreements, and Milestones

In 2023, 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 *2023 Aquatic Settlement Agreement and Workgroup Action Plan*, as revised (Appendix I), which was approved by the Aquatic SWG on March 8, 2023.

Decisions, agreements, and milestones reached by the Aquatic SWG during 2023 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
2023 Summary of Aquatic Settlement Work Group Decisions, Agreements, and Milestones

Aquatic SWG Decisions, Agreements, and Milestones	Date
Approved the report *2022 Annual Report Total Dissolved Gas Abatement Plan* (USFWS approved via email on February 9, 2023).	February 8, 2023
Approved the *Wells Hydroelectric Project 2023 Total Dissolved Gas Abatement Plan* and appended *Wells Bypass Operating Plan* (USFWS approved via email on February 9, 2023).	February 8, 2023
Approved the *2023 Aquatic Settlement Agreement and Workgroup Action Plan*, as revised (the CTCR approved via email on March 8, 2023).	March 8, 2023
Agreed to postpone and possibly forgo White Sturgeon SAP screening related to the 328 BY 2022 White Sturgeon slated for the Douglas PUD mitigation program, contingent on the following: 1) the high injury and mortality associated with the blood-draw process is not resolved; 2) detection of abnormal ploidy BY 2022 White Sturgeon for other programs remains low; and 3) CTCR and Ecology agree to postpone or forgo screening after Douglas PUD shares with the CTCR and Ecology the discussion and this Agreement about White Sturgeon SAP screening of Douglas PUD Program BY 2022 White Sturgeon (the CTCR suggested postponing SAP screening until screening of Chelan PUD fish is complete in April or early May 2023, as distributed on March 10, 2023).	March 8, 2023

Aquatic SWG Decisions, Agreements, and Milestones	Date
Agreed to proceed with White Sturgeon SAP screening of the 328 BY 2022 White Sturgeon slated for the Douglas PUD mitigation program, understanding the following: 1) there is a slight risk of mortality associated with the blood-draw process; 2) should fish losses reduce the in-hatchery population below the target stocking number stipulated in the current SOA, the CTCR agree to make up the shortfall with surplus BY 2022 White Sturgeon from the CTCR Resident Fish Hatchery; 3) transferred fish would be screened by the CTCR prior to transfer; and 4) if surplus BY 2022 White Sturgeon from the CTCR Resident Fish Hatchery are needed to supplement the Douglas PUD program and are below the target fish size stipulated in the current SOA, the Aquatic SWG agrees Douglas PUD still meets the stocking obligation stipulated in the current SOA.	April 12, 2023
Approved the *Annual Report Calendar Year 2022 Activities Under the Aquatic Settlement Agreement*, as revised, and appended *2022 Annual Report White Sturgeon Management Plan*, as revised; *2022 Bull Trout Management Plan and Incidental Take Annual Report*, as revised; *2022 Annual Report Water Quality Management Plan* and appended *2022 Water Temperature Annual Report*, *Pacific Lamprey Management Plan 2022 Annual Report,* as revised; *Aquatic Nuisance Species Management Plan 2022 Annual Report*, as revised; and *Resident Fish Management Plan 2022 Annual Report*, as revised.	May 10, 2023
Approved the SOA, *To Translocate Adult Pacific Lamprey from Priest Rapids Dam to Areas Within or Upstream of the Wells Project 2023–2024*, as revised.	June 14, 2023
Approved the *White Sturgeon Supplementation and Management Plan Implementation in the Wells Reservoir, 2022*, as revised.	July 12, 2023
Approved the *Wells Reservoir, 2022 White Sturgeon Reproduction Assessment*, as revised.	July 12, 2023
Approved the *Statement of Agreement Regarding Evaluation and Implementation of White Sturgeon Adult Passage Measures (WSMP Objective 5; Section 4.4)*, as revised.	November 8, 2023
Agreed to install perforated plates below the orifices of the weirs where lamprey traps are installed in the east and west fish ladders at Wells Dam.	November 8, 2023

2.1.1 White Sturgeon

In 2023, 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 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 (Section 2.1.1.8). In August 2022, the *Statement of Agreement Regarding Wells Reservoir White Sturgeon Supplementation 2023–2026* (as appended to the 2022 ASA Annual Report)

[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).
[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).

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 2023, Douglas PUD, in coordination with the Aquatic SWG, stocked 328 fish (Brood Year [BY] 2022 larval-origin White Sturgeon) in the Wells Reservoir, which was the first year of the 2023 to 2026, Phase II releases. Prior to release, blood sampling for SAP was completed per the August 2022 SOA guidelines. Following the sampling there were no mortalities or injuries, and all results were negative for SAP. In 2023, Douglas PUD, in coordination with the Aquatic SWG, also collected BY 2023 fish for the second Phase II release in 2024. This included rearing additional BY 2023 fish toward meeting a 2,000-fish target for the Chelan PUD White Sturgeon Supplementation Program, per an interlocal agreement between the two Districts (Section 2.1.1.4). Survival in the hatchery of BY 2023 fish was suboptimal initially but improved by November 2023 (Section 2.1.1.5.4). It is expected that the stocking target of 325 fish for the Douglas PUD program in 2024 will be achieved.

2.1.1.2.1 Brood Years 2022 to 2025

On May 31, 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 grams each, with only two fish below the 350-gram target size.

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 2023, there were no shortfalls in the BY 2022 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

[7] White Sturgeon are normally evolutionary octoploids and have eight copies of each chromosome (8N).

smaller fish were stocked in 2018 and 2019 (under the current SOA), even though it had not been memorialized as a formal agreement.

In 2023, the 328 BY 2022 White Sturgeon released included two fish below the 350-gram target size (Section 2.1.1.2.1). Most fish for release exceeded the target size, and the two 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 Fish 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.

Although surplusing wild-caught larvae to the CTCR Resident Fish Hatchery occurred in 2022, no surplus BY 2023 fish were available by December 2023, and therefore no transfers took place during the calendar year.

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 Fish Hatchery to rear yearling White Sturgeon for the Chelan PUD White Sturgeon Supplementation Program. The number of larvae delivered to Wells Fish 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 2023, the target stocking number for Douglas PUD's BY 2022 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 2022 White Sturgeon Supplementation Program was 2,000 fish, based on an SOA approved by the Rocky Reach Fish Forum (RRFF). In February 2023, after scute-marking and PIT-tagging of BY 2022 White Sturgeon to meet Douglas PUD program goals, the balance, or approximately 2,140 fish, were used to support Chelan PUD stocking goals.

In July 2023, the CTCR delivered approximately 7,500 BY 2023 White Sturgeon larvae to Wells Fish Hatchery to meet both Douglas PUD and Chelan PUD program goals. Survival in hatchery early on was suboptimal but improved by November 2023 (Section 2.1.1.5.4). By December 2023, between fish on station at Wells Hatchery plus surplus fish available from CTCR Resident Fish Hatchery, numbers were on track to meet the goals for both Douglas PUD and Chelan PUD programs.

2.1.1.5 Fish Health

2.1.1.5.1 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 WSIV information in future years, as needed.

In 2023, all fish were given pretransfer checks by, Dr. Betsy Bamberger (Douglas PUD Fish Health and Evaluation Specialist) in coordination with WDFW and were approved for release.

2.1.1.5.2 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 2023, White Sturgeon rearing practices at Wells Hatchery were performed consistent with recommendations outlined in this plan.

2.1.1.5.3 Brood Year 2022

In 2023, the overall condition of BY 2022 White Sturgeon while on station at Wells Hatchery was optimal, and mortalities were as expected and negligible.

2.1.1.5.4 Brood Year 2023

In 2023, survival of BY 2023 White Sturgeon in hatchery early on was suboptimal. Dr. Bamberger found nothing pathologically wrong with these fish, which was confirmed by the Washington Animal Disease Diagnostic Laboratory, and by November 2023, mortalities decreased. As of December 2023, approximately 2,224 BY 2023 White Sturgeon remained on station at Wells Hatchery, toward meeting the 325 fish needed for the Wells program (Section 2.1.1.2) and 2,000 fish for the Chelan PUD program[8] (Section 2.1.1.4). These fish were in good condition, and fish growth was on track to tag and mark fish in early 2024.

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). The final report, *White Sturgeon Supplementation and Management Plan Implementation in the Wells Reservoir, 2022* (Appendix J), which describes the 2022 White Sturgeon M&E sampling effort, was approved as revised by the Aquatic SWG on July 12, 2023.

Consistent with the White Sturgeon M&E Plan and Section 4.2.2 of the WSMP, Douglas PUD has 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). The final report, *Wells Reservoir, 2022 White Sturgeon Reproduction Assessment* (Appendix K), which describes the first of five assessments required by the WSMP, was approved as revised by the Aquatic SWG on July 12, 2023.

[8] As of December 2023, plans were underway to use surplus fish from Sherman Creek Hatchery to account for any shortfall in the Chelan PUD program.

The results of the Phase I Wells Project White Sturgeon M&E Program will inform implementation activities during the Phase II Wells Project White Sturgeon M&E Program, which will be discussed in 2024.

2.1.1.7 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.[9]

Throughout 2023, Douglas PUD and the Aquatic SWG discussed how to meet the requirements of Objective 5 of the WSMP, including how to research these questions in a reasonable way. There was general agreement to capture in an SOA what can be discussed now and what will be addressed in the next couple of years so that the Aquatic SWG can be thorough and thoughtful about how to address this objective. Douglas PUD and the Aquatic SWG identified the following five actions to meet this Year 11 requirement: 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. These main actions, along with additional details, were captured in the final *Statement of Agreement Regarding Evaluation and Implementation of White Sturgeon Adult Passage Measures (WSMP Objective 5; Section 4.4)* (Appendix L), which was approved as revised by the Aquatic SWG on November 8, 2023.

2.1.1.8 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

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

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. (Section 2.1.1.2).

In early 2023, there was a higher-than-usual mortality associated with the CTCR's and Chelan PUD's blood-drawing for SAP screening of BY 2022 White Sturgeon being reared at Well Hatchery for the Chelan PUD White Sturgeon Supplementation Program (Section 2.1.1.4). The Aquatic SWG discussed possible causes for the mortalities, but ultimately, this was unknown, except that it was associated with the blood-drawing for SAP screening. Sample results to date indicated that SAP prevalence was low. Douglas PUD was concerned that mortalities related to the blood-draw process might result in missing White Sturgeon mitigation targets for the Douglas PUD program. Considering these three things, on March 8, 2023, the Aquatic SWG agreed to postpone and possibly forgo White Sturgeon SAP screening related to the 328 BY 2022 White Sturgeon slated for the Douglas PUD White Sturgeon Supplementation Program, contingent on the following: 1) the high injury and mortality associated with the blood-draw process is not resolved; 2) detection of abnormal ploidy in BY 2022 White Sturgeon for other programs remains low; and 3) the CTCR and Ecology agree to postpone or forgo screening (representatives were not present for these discussions). Ultimately, the CTCR suggested postponing SAP screening until screening of Chelan PUD fish was complete in April or early May 2023.

On April 12, 2023, the Aquatic SWG continued discussing whether to proceed with SAP screening of Douglas PUD fish. It was determined that losses to date were attributed to sampling smaller sized fish and inexperienced trainees. Douglas PUD was still concerned about meeting program requirements under the current SOA, in terms of fish quantity and size. Therefore, the Aquatic SWG agreed to proceed with White Sturgeon SAP screening of the 328 BY 2022 White Sturgeon slated for the Douglas PUD program, understanding the following: 1) there is a slight risk of mortality associated with the blood-draw process; 2) should fish losses reduce the in-hatchery population below the target stocking number stipulated in the current SOA, the CTCR agree to make up the shortfall with surplus BY 2022 White Sturgeon from the CTCR Resident Fish Hatchery; 3) transferred fish would be screened by the CTCR prior to transfer; and 4) if surplus BY 2022 White Sturgeon from the CTCR Resident Fish Hatchery are needed to supplement the Douglas PUD program and are below the target fish size stipulated in the current SOA, the Aquatic SWG agrees Douglas PUD still meets the stocking obligation stipulated in the current SOA.

On May 8, 2023, blood sampling for SAP for Douglas PUD fish was completed. Following the blood sampling, there were no mortalities or injuries. All ploidy test results were negative.

As of December 2023, the CTCR and Douglas PUD planned to push back SAP sampling of BY 2023 White Sturgeon on station at Wells Hatchery to March (instead of January) to draw blood from larger

fish and hopefully avoid issues with mortalities observed in previous sampling conducted by CTCR and Chelan PUD.

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 31, 2023, students from Bridgeport High School assisted Douglas PUD with releasing 328 BY 2022 yearling White Sturgeon into the Wells Reservoir.

2.1.1.10 Planned Monitoring, Studies, and Activities in 2024

In 2024, 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, beginning the Phase II M&E Program, continuing the evaluation of adult passage (Objective 5), and continuing public outreach events. The *2023 Annual Report White Sturgeon Management Plan* (Appendix C), which summarizes White Sturgeon activities and results from 2023, will be reviewed by the Aquatic SWG in early 2024 and submitted to FERC as appended to this 2023 ASA Annual Report by the May 31, 2024, deadline.

2.1.2 Bull Trout

In 2023, 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 2023, removal of the Twisp Weir was completed as scheduled with no observed impacts on Bull Trout. Nonlethal incidental take at the weir was below the terms and conditions of

Douglas PUD's Biological Opinion for Bull Trout. Bull Trout interactions with the weir are summarized in the *2023 Bull Trout Management Plan and Incidental Take Annual Report* (Appendix D).

2.1.2.2 2022 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).

Per license requirements, in September 2020, Douglas PUD and the Aquatic SWG began discussing implementation of another 1-year radio telemetry Bull Trout survival and passage success study in 2021 to 2022 (Year-10 study). After multiple revisions, in February 2021, the final plan, *Bull Trout Passage and Take Monitoring at Wells Dam and Twisp River Weir Study*, as revised (2021–2022 Bull Trout Radio Telemetry Study Plan; as appended to the 2021 ASA Annual Report), was approved by the Aquatic SWG. Following Aquatic SWG approval of the 2021–2022 Bull Trout Radio Telemetry Study Plan, based on the status of local populations, USFWS expressed concern about potential effects on Bull Trout undergoing surgeries (to insert a radio tag) and instead recommended moving forward with a less intrusive study using PIT tags. In May 2021, after several iterations based on Aquatic SWG member feedback, the final *Statement of Agreement Regarding the Suspension of the Year-10 Bull Trout Passage and Survival Radio Telemetry Study at Wells Dam and the Twisp Weir*, as revised (as appended to the 2021 ASA Annual Report) was approved by the Aquatic SWG. The intent of this SOA was to clearly state that the Year-10 study is being suspended based on the status of local populations, per guidance from USFWS, and without radio telemetry there is no effective way to evaluate passage and survival as defined under Douglas PUD's FERC license and other governing documents. The SOA does not preclude conducting a radio telemetry study before the next 10-year interval in 2030, should the local populations support such a study, and states that the Aquatic SWG plans to monitor adult Bull Trout at Wells Dam and the Twisp River using PIT-tag technology in the absence of the radio telemetry study.

Immediately following Aquatic SWG approval of the SOA, Douglas PUD and the Aquatic SWG started discussing ways to clearly define study objectives for a PIT-based study. This included discussing the utility of the data; reviewing available PIT-tag data, including current PIT-tag array configurations in the vicinity of Wells Dam and the Twisp Weir; and reviewing a PIT-based study conducted by Chelan PUD. These discussions continued into July 2021, when the Bull Trout migration past Wells Dam was nearly over for the year; therefore, the Aquatic SWG agreed to continue considering possible objectives for a Bull Trout PIT-tag study for implementation in 2022. In December 2021, the draft plan, *Bull Trout Movement and Life History Investigation 2022* (2022 Bull Trout PIT Study Plan) was distributed for review. This study proposes to monitor the movements and interactions of 60 PIT-tagged adult Bull Trout within the Wells Dam fishways and at the Twisp Weir. Tissue samples

will also be collected from study fish to be used in future genetic analyses. After multiple revisions, in January 2022, the final 2022 Bull Trout PIT Study Plan (as appended to the 2022 ASA Annual Report) was approved by the Aquatic SWG for implementation in 2022.

Throughout 2022, a total of 10 fish received PIT tags for inclusion in the 2022 Bull Trout PIT Study, including fish captured at Wells Dam and incidental captures during WDFW steelhead brood collection in the Methow River. Additionally, one fish captured and PIT-tagged in the Methow River in 2021 that was subsequently detected in 2022 was included in the study, for a total of 11 fish included in the 2022 Bull Trout PIT Study.

In early 2023, Douglas PUD and the Aquatic SWG discussed next steps for completing this study. While the requirement in the BTMP is for a 1-year study (i.e., tag fish in spring 2022 and monitor fish through the subsequent spring 2023), the Aquatic SWG expressed interest in continuing PIT-tagging of any Bull Trout that are incidentally handled through spring 2023 and continuing tracking through fall 2023. Considering the small sample size to date and in the spirit of supporting ongoing monitoring, Douglas PUD agreed to continue the study through fall 2023. Throughout 2023, an additional 26 fish received PIT tags for inclusion in the 2022 Bull Trout PIT Study, including fish captured at Wells Dam and incidental captures during WDFW steelhead brood collection in the Methow River. Further, spring Chinook Salmon brood collection to meet Douglas PUD's mitigation obligation typically occurs at Wells Dam; however, this effort was extended to the Twisp Weir, presenting an opportunity to incidentally encounter Bull Trout at the weir. An additional five Bull Trout encountered at the Twisp Weir received PIT tags for inclusion in the 2022 Bull Trout PIT Study. In total, 42 PIT-tagged Bull Trout were included in the 2022 Bull Trout PIT Study. Of these, 29 tissue samples were sent to the lab for genetic analysis. On December 13, 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 more of a qualitative investigation about seasonal movement patterns of Bull Trout at the Wells Project and Twisp Weir. The report is expected to be finalized in early 2024 and will be appended to the 2024 ASA Annual Report.

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 Bull Trout Stranding Survey

Per the Wells Project FERC license and BTMP, Douglas PUD, in coordination with USFWS and the Aquatic SWG, developed a Bull Trout Stranding, Entrapment, and Take Study Plan (submitted to FERC in 2013). This plan required Douglas PUD to conduct stranding surveys within the first 5 years of the FERC license whenever the Wells Project is drawn down below 773 feet above sea level (mean sea level [MSL]). Douglas PUD completed these surveys, as summarized in past ASA annual reports. During these surveys, no Bull Trout were encountered.

On May 15, 2023, the Wells Reservoir was lowered to 772 feet above MSL to facilitate scouring of fine sediments in the lower 1 mile of the Methow River. Removing fine sediment in this area provides flood control for the City of Pateros. There was no requirement to conduct a Bull Trout stranding survey, but Douglas PUD felt it was prudent to do so. On May 16, 2023, Douglas PUD conducted a Bull Trout stranding survey, and no Bull Trout were encountered. The locations surveyed and effort utilized, as well as the history of why the reservoir has been drawn down, are described in the memorandum "Wells Hydroelectric Project No. 2149, Low Pool Elevation Bull Trout Survey – License Article 402" (Appendix M), which was distributed to the Aquatic SWG on June 12, 2023.

While discussing this Bull Trout stranding survey, Douglas PUD, the YN, and the Aquatic SWG also discussed ramp down rates and potential impacts to lamprey. Information was shared on this topic, and although there are no stranding pools near the mouth of the Methow River (ideal larval lamprey habitat), Douglas PUD and the YN agreed to stay as coordinated as possible before future drawdowns.

2.1.2.4 Recovery Planning and Regional Coordination

In 2023, 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. On January 26, 2023, Douglas PUD attended a Bull Trout status review check-in led by Erin Britton Kuttel (USFWS). The purpose of this meeting was to accomplish the following: 1) provide a status update and review of the Species Status Assessment and timelines; 2) review last year's Threats Assessment results and update as needed; and 3) review demographic data and update with new information (additional meetings are expected to take place in 2024). On May 15 and May 16, 2023, Douglas PUD participated in a U.S. Army Corps of Engineers (USACE) Regional Bull Trout Workshop at McNary Dam, where Douglas PUD shared a presentation on Bull Trout in the Wells Reservoir.

2.1.2.5 Planned Monitoring, Studies, and Activities in 2024

In 2024, 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

finalizing the 2022–2023 Bull Trout Study Report, 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 *2023 Bull Trout Management Plan and Incidental Take Annual Report* (Appendix D), which summarizes Bull Trout activities and results from 2023, will be reviewed by the Aquatic SWG in early 2024 and submitted to FERC as appended to this 2023 ASA Annual Report by the May 31, 2024, deadline.

2.1.3 Water Quality

In 2023, 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 2022 Annual Report Total Dissolved Gas Abatement Plan

On February 8, 2023, the report, *2022 Annual Report Total Dissolved Gas Abatement Plan* (Appendix N) was approved as revised by Ecology and the Aquatic SWG (USFWS approved via email on February 9, 2023). This report summarized total dissolved gas (TDG) performance during the 2022 fish and non-fish bypass season at Wells Dam, including gas bubble trauma (GBT) monitoring throughout 2022 (as described in the 2022 ASA Annual Report). The report was filed with FERC on February 16, 2023.

2.1.3.2 2023 Total Dissolved Gas Abatement Plan and Wells Bypass Operating Plan

On February 8, 2023, the *2023 Total Dissolved Gas Abatement Plan* and appended *Wells Bypass Operating Plan* (2023 GAP/BOP; Appendix O) was approved as revised by Ecology and the Aquatic SWG (USFWS approved via email on February 9, 2023). A 30-day review period was also provided to the Wells HCP Coordinating Committee (Section 3.2.1). 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 2023 spill season were outlined in the *Wells Hydroelectric Project Spill Playbook* (Appendix 1 to the 2023 GAP). This plan was filed with FERC on February 16, 2023.

In 2023, the *Wells Hydroelectric Project Spill Playbook* returned to concentrating spill through Spillways 7, 6, and 8 (as was done from 2015 to 2021), rather than concentrating spill through Spillways 9, 8, and 10 (as occurred in 2022). Spillway 7 maintenance was completed in late 2022; therefore, the concentrated spill pattern returned to spilling at locations farther from the riverbanks to minimize overall TDG production and reduce bank attachment of highly gasified waters. Additionally, the 2023 spill playbook used an in-season estimator of passage timing for subyearling Chinook Salmon to determine when to end bypass operations. The method relied on Program Real Time to estimate when the 95th percentile of the run-of-river subyearling Chinook Salmon migration

passed Rocky Reach Dam and ended bypass operations at Wells Dam at midnight on that date (as discussed in the 2022 ASA Annual Report).

Complete results of the 2023 compliance period will be summarized in the *2023 Annual Report Total Dissolved Gas Abatement Plan*, expected in early 2024.

2.1.3.3 2023 Biological Monitoring

The 2023 GAP (Appendix O) includes a biological monitoring plan[10] 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 spring spill season. The plan requires weekly sampling of juvenile salmonids and native and resident fish, including lampreys, for GBT from April to June and additional sampling from July to August if hourly TDG levels exceed 125% in the Wells Dam tailrace. The 2023 GAP also addresses the National Marine Fisheries Service (NMFS) recommendation to sample juvenile salmonids for GBT when hourly tailrace TDG levels exceed 125% saturation (NMFS 2000).

From April 4 to June 26, 2023, per the biological monitoring plan, weekly GBT monitoring was performed 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.

On May 7, 2023, there were two exceedances of the 126%, 2-hour consecutive mean TDG standard in the Wells Dam tailrace. Per the NMFS recommendation, on May 8, 2023, GBT monitoring was performed in juvenile salmonids sampled at the Rocky Reach JBS. No GBT was observed in any juvenile salmonids examined.

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, fewer than 50 anadromous fish were examined in 8 of 14 sample events. More than 50 resident fish were examined via electrofishing in the Wells Dam tailrace in all 13 sample events.

Complete results of biological monitoring for GBT in 2023 will be summarized in the *2023 Annual Report Total Dissolved Gas Abatement Plan*, expected in early 2024.

2.1.3.4 2023 Wells Project Water Forecast

In 2023, Douglas PUD continued providing the Aquatic SWG with updates on the water forecast for the Wells Project. Douglas PUD began providing these updates following the below-average

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

snowpack and subsequent drought conditions experienced in 2015. Most of the water in the Wells Reservoir originates from snowpack in British Columbia, Canada, and Douglas PUD and the Aquatic SWG remained interested in closely tracking water forecasts in terms of potential impacts to water quality and other aquatic resources in the Wells Reservoir.

The 2023 water year at the Wells Project was below average through April. From mid-May to mid-June, there was a remarkable increase in discharge at Wells due to a combination of inflow from Canadian snowpack, Grand Coulee Dam drum gate maintenance, and side flows from the Methow and Okanogan river basins. By July, discharge was below average through the remainder of the season. In September and October, average monthly discharge was at record lows (since 1967) in the Wells Project.

2.1.3.5 2023 Wells Project Water Quality Update

In 2023, Douglas PUD continued providing the Aquatic SWG with updates on water quality and TDG compliance for the Wells Project.

In 2023, inflow into the Wells Project dropped quickly after the peak 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, except for two exceedances of the Wells Dam tailrace 126% standard during the April to June period. For the year, this resulted in a 99% level of compliance. 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 were three exceedances of the 110% standard in the Wells Dam tailrace. There was no spill at that time, and river flow was low, and efforts to identify the cause of the exceedances did not find any specific cause. Of note, with such low flows, there was a period where the 7-day average daily maximum temperatures in the Methow River at Bridgeport, Okanogan River, and at Wells Dam were above 17.5°C.

2.1.3.6 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. In the coming months, Douglas PUD and Ecology will work jointly to further develop the draft report, including development of an

updated compliance plan and schedule. A revised plan will be provided to the Aquatic SWG for review and approval before submitting a final report to FERC and Ecology in 2024.

2.1.3.7 Planned Monitoring, Studies, and Activities in 2024

In 2024, 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 forecast and water quality updates and finalizing the Water Quality Attainment Plan 10-Year Report. The *2023 Annual Report Water Quality Management Plan* (Appendix E), which summarizes water quality activities and results from 2023, will be reviewed by the Aquatic SWG in early 2024 and submitted to FERC as appended to this 2023 ASA Annual Report by the May 31, 2024, deadline.

2.1.4 Pacific Lamprey

In 2023, 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.

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 (DIDSON Study Report)*** **(Johnson and Le 2011)** (April 2011) • 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 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.	***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 Adult Lamprey Approach and Passage Study* (2022 Adult Pacific Lamprey Approach and Passage Study) was underway (Section 2.1.4.1.4). Douglas PUD planned to download the acoustic receivers one last time in October 2023, and a draft report would not be available until late 2023, at the earliest. 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. Considering these things, 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* (Appendix P), 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. This included collecting 605 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 2 weeks of collecting 402 PIT-tagged adult Pacific Lamprey from Grant PUD at Kirby Billingsley Hydro Park for release farther upstream in the Wells Reservoir. A total of 956 fish were released in the mainstem Columbia River (below the Methow River confluence at Starr Boat Launch), and Douglas PUD provided the CTCR with 51 fish, which were released farther upstream in the Okanogan River Basin in the Similkameen River. This completed the first year of the 2-year SOA.

Table 3 summarizes adult Pacific Lamprey translocated upstream of Wells Dam, to date. 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	--	--	--	--	TBD	507
Starr Boat Launch	136	--	102	266	345	956	TBD	1,805
Brewster	131	70	--	--	--	--	TBD	201
Loup Creek	--	--	--	21	25	--	TBD	46
Salmon Creek	--	16	22	26	32	--	TBD	96
Omak Creek	--	15	26	22	31	--	TBD	94
Similkameen River	49	61	--	20	28	51	TBD	158
Total	**316**	**669**	**150**	**355**	**461**	**1,007**	TBD	**2,958**

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* (Appendix P).

--: 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 2023

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%

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.

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 December 22, 2023, is provided in Table 5. Fish move in both the fall and spring after translocation. The data from 2022 and previous years are not expected to change because translocated Pacific Lamprey would have completed their lives prior to the final update. All fish tagged in 2022 received PIT tags as part of the Adult Pacific Lamprey Approach and Passage Study, and 170 fish also received acoustic tags. Table 5 data for 2022 tagged fish just includes PIT-array detections and not any additional acoustic-receiver detections. Full fish-tagging results will be presented in the upcoming study report expected in 2024.

Table 5
Pacific Lamprey Translocation "Last Seen" Table

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). Dark shaded cells represent release ("Rls") locations (and

	2018 Release Location (n = 669)				*2019 Release Location (n = 150)*			*2020 Release Location (n = 355)*					*2021 Release Location (n = 460)*					*2022 Release Location (n=645)*		*2023 Release Location (n = 1007)*	
Last Detection Location	*Methow River*	*Salmon Creek*	*Omak Creek*	*Similkameen River*	*Starr Boat Launch*	*Salmon Creek*	*Omak Creek*	*Starr Boat Launch*	*Loup Loup Creek*	*Salmon Creek*	*Omak Creek*	*Similkameen River*	*Starr Boat Launch*	*Loup Loup Creek*	*Salmon Creek*	*Omak Creek*	*Similkameen River*	*Daroga*	*Rocky Reach Forebay*	*Starr Boat Launch*	*Similkameen River*
Zosel Dam (858.132)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0			1	
Rls: Similkameen River (858.119.013)	0	0	0	59	0	0	0	0	0	0	0	19	0	0	0	0	27				51
Rls: Omak Creek (858.052.018)	0	0	2	0	0	0	11	0	0	0	4	0	0	0	0	9	0				
OMAKC - Omak Creek (858.052)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0				
OMH - Omak Creek Haley Creek Road (858.052.020)	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	10	0				
OMF - Omak Creek above Mission Falls (858.052.011)	0	0	1	0	0	0	8	0	0	0	1	0	0	0	0	0	0				
OBF - Omak Creek below Mission Falls (858.052.010)	0	0	3	0	0	0	0	0	0	0	1	0	0	0	0	5	0	2			
OMK - Omak Creek Instream Array (858.052.000)	0	0	9	0	0	0	7	1	0	1	10	0	1	0	0	6	0				
Rls: Salmon Creek (858.041.021)	0	6	0	0	0	14	0	0	0	17	0	0	0	0	9	0	0				
SAD - Salmon Creek Above OID Div. (858.041.009)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0				
SA0 - Salmon Creek below OID Div. (858.041.006)	0	3	0	0	0	0	0	0	0	4	0	0	0	0	9	0	0		1		
SA1 - Salmon Creek Instream Array (858.041.002)	0	7	0	0	0	8	0	0	0	4	0	0	0	0	8	0	0	1	1		
Rls: Loup Loup Creek (858.028)	0	0	0	0	0	0	0	0	8	0	0	0	0	8	0	0	0				
LLC - Loup Loup Creek Instream Array (858.028.001)	0	0	0	0	0	0	0	0	12	0	0	0	0	10	0	0	0				
OKL - Lower Okanogan Instream Array (858.025)	0	0	0	1	3	0	0	23	1	0	0	1	18	6	1	0	1	6	5	97	
CRU - Upper Chewuch Instream Array (843.080.028)	6	0	0	0	0	0	0	2	0	0	0	0	6	0	0	0	0	6	13	56	
CMU - Chewuch River Middle Upper (843.080.008)	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	6	19	29	
CML - Chewuch River Middle Lower (843.080.007)	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	1	1	17	
CRW - Chewuch River above Winthrop (843.080.001)	80	0	0	0	4	0	0	24	0	0	0	0	25	0	0	0	0	3	1	12	
TWR - Lwr Twisp Rvr near MSRF Ponds (843.066.002)	1	0	0	0	0	0	0	2	0	0	0	0	1	0	0	0	0			2	
MRW - Methow River at Winthrop (843.085)	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	1	1	4	
LBC- Libby Creek																				1	
MRC - Methow River at Carlton (843.045)	213	0	0	0	16	0	0	76	0	0	0	0	108	0	0	0	0	11	28	54	
METTRP - Methow Smolt Trap at McFarland Creek Road Bridge (843.030)	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
LMR - Lower Methow River at Pateros (843.008)	157	0	0	1	22	0	0	38	0	0	0	0	32	0	0	0	0	9	16	113	
Rls: Methow River (843.000)	46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Rls: Brewster Boat Launch (852)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Rls: Starr Boat Launch (834)	0	0	0	0	53	0	0	95	0	0	0	0	136	0	0	0	0			570	
WEA - Wells Dam, DCPUD Adult Ladders (830)	0	0	0	0	0	0	0	1	0	0	0	0	3	1	0	0	0	17	47		
WEH - Wells Dam Hatchery (830)	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	7	10		
ENA - Upper Entiat River at rkm 17.1 (778.017)	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0		6		
ENL - Lower Entiat River (778.002)	2	0	0	0	4	0	0	3	0	0	1	0	1	0	1	0	0	5	23		
Rls: Between RR Forebay and Daroga																		114	278		
RRF- Rocky Reach Fishway																			3		
RRJ - Rocky Reach Dam Juvenile (763)	1	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0				
LWE- Lower Wenatchee Rover (754.003)																		1			
RIA - Rock Island Adult (730)	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1		
JDJ - John Day Dam Juvenile (347)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0				
TOTAL	**507**	**16**	**15**	**61**	**102**	**22**	**26**	**266**	**21**	**26**	**22**	**20**	**344**	**25**	**32**	**31**	**28**	**191**	**454**	**956**	**51**
Number Not Yet Detected	46	6	2	59	53	14	11	95	8	17	4	19	136	8	9	9	27	114	278	570	51
Detected Post Release (%)	91%	63%	87%	3%	48%	36%	58%	64%	62%	35%	82%	5%	60%	68%	72%	71%	4%	18%	43%	60%	100%
Overall detected by year as of Dec 22 2023 (%)					48%			60%					59%					61%		62%	

2.1.4.1.4 2022 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 are 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. Implementing the 2022 Adult Pacific Lamprey Approach and Passage Study included weekly coordination among Douglas PUD, Grant PUD, the YN, and the CTCR throughout the 2022 Pacific Lamprey migration, including weekly updates to the Aquatic SWG. In summary, a total of 645 fish were released as part of the 2022 Adult Pacific Lamprey Approach and Passage Study, including the target 170 dual-tagged fish and 340 PIT-tagged only fish, plus an additional 135 PIT-tagged only fish, split between the two release locations.

On January 11, 2023, Douglas PUD provided a high-level mid-study update, including sharing the latest Translocation Detection Summary Table (or "Last Seen" table) (Section 2.1.4.1.3). At that time, approximately 71% of the fish released had been detected at acoustic receivers in the Wells Dam tailrace. A total of 38 fish, or 25% of the total release group, were last detected upstream of Wells Dam. The passage rate to date was approximately 30%. 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, and only 3 fish entered the fishways, with the highest detection point being at Pool 19 in the fishways. No fish were detected upstream of Wells Dam, although the batteries in the acoustic tags used in the study expired prior to spring of the following year. In October 2023, Douglas PUD downloaded the acoustic receivers one last time, which was the end point of the 2022 study. A comprehensive study report is expected in early 2024.

2.1.4.1.5 Lamprey Trap Operations and Modifications

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 high run year and understand whether the traps can be used to collect study fish for future Aquatic SWG studies of adult Pacific Lamprey passage. These same traps were 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. Douglas PUD notified the Aquatic SWG about plans to deploy two traps in the east ladder of the Wells Dam from August 28 to September 15, 2023, from 2100 hours to 0700 hours each night. This timing coincided with historical peak passage timing of Pacific Lamprey at Wells Dam and is when HCP Plan Species are less likely to be transiting through the fishway. Because of the possibility for HCP Plan Species to interact with the lamprey traps, on August 22, 2023, Douglas PUD sought and received approval from the Wells HCP Coordinating Committee to operate the lamprey traps (Section 3.2.3). When installed and operating, the traps sit atop each of the two overflow weirs at Pool 41 of the ladder, are flush to the fishway wall, and occupy approximately half the width of each overflow section of each weir. Fish encountered in the trap are enumerated and released into Pool 42 at the conclusion of each trapping night.

From August 28 to September 15, 2023, 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.

In October 2023, Douglas PUD and the Aquatic SWG began discussing installing the perforated plates that had been installed in previous years. The plating would be installed over the 2023/2024 winter maintenance period and will be in place throughout 2024. The plating would not block or close the orifice; rather, it is installed below the weir orifices to encourage fish to pass over the top of the weir and into the traps. Concurrent with these discussions, Douglas PUD was also coordinating with the Wells HCP Coordinating Committee to obtain approval for installing the plates (Section 3.2.3).

On November 8, 2023, the Aquatic SWG agreed to install perforated plates below the orifices of the weirs where lamprey traps are installed in the east and west fish ladders at Wells Dam. On November 28, 2023, the Wells HCP Coordinating Committee approved installing the plating, as described in the final memorandum, "Wells Dam Lamprey Trapping and Fishway Modifications 2024" (Appendix Q).

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 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. The USACE study is scheduled to cover McNary and John Day dams in 2024 and The Dalles and Bonneville dams in 2025. 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. On September 13, 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, where Douglas PUD, Chelan PUD, and Grant PUD would contribute 200 to 300 tags to the study at each dam, resulting in a study involving 1,000- to 1,500-tagged fish. The components of this framework were discussed at length, including tag technology, fish source and number available, juvenile trap designs, project scope, which survival model to use, and what is an acceptable precision level. The Aquatic SWG discussed how the YN's framework and possible coordination with the USACE study aligns with Section 4.2.4 of Douglas PUD's PLMP. Notably, the PLMP stipulates a 1-year study using study fish from upstream of the Wells Project. On October 11, 2023, Douglas PUD presented responses to the YN's framework, including a summary of juvenile Pacific Lamprey trapped in Methow and Okanogan basins, which illustrated concern about obtaining a required sample size. The YN believes that Pacific Lamprey are one metapopulation, so using source fish from downstream locations is acceptable, but Douglas PUD's PLMP specifies that source fish must come from upstream locations. By the end of 2023, all three forums were still discussing all aspects of a possible study, and it did not seem that any Mid-Columbia PUD studies are planned for 2024. These discussions will continue in 2024.

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 2022/2023 winter maintenance outage, 12 larvae and 10 juveniles were collected from the east fishway, and 0 Pacific Lamprey were collected from the west fishway. All 22 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	Ongoing since 2018 (Section 2.1.4.4.1).
Genetic Sampling	Ongoing since 2019 (Section 2.1.4.4.2).
Information Exchanges	Ongoing since 2020 (Section 2.1.4.4.3).
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).

Notes:

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

2.1.4.4.1 Environmental DNA Monitoring

Since October 2018, at the request of the YN, Douglas PUD has agreed to collect and provide water samples taken from select locations upstream of Wells Dam to monitor Pacific Lamprey environmental DNA (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.

In April 2020, the YN shared results from the 2018 eDNA sampling effort with the Aquatic SWG. Positive detections of Pacific Lamprey eDNA rates (eDNA copies per second) were highest at Bonneville Dam, followed by McNary Dam, and then Rocky Reach Dam, and there were zero positive detections at Wells Dam. The only positive detection upstream of Wells Dam was at the mouth of the Methow River. In general, detection rates were higher at higher flows (e.g., when sampling occurred at thalwegs).

In 2021, this regional effort of collecting eDNA samples continued twice per year during both spring and fall, with the addition of monitoring for bile acids for comparison to eDNA results. Collection sites were similar to what was sampled in 2018, along with a few additional sites in the tributaries. Additionally, the eDNA sample collection may show whether there has been a change in pheromone levels in the Wells Project after years of translocation. Funding to cover the analysis of eDNA and bile acids samples was pending; however, Douglas PUD and the Aquatic SWG agreed to continue collecting samples as planned and preserve (or freeze) the samples until funding becomes available. This agreement was reached with the understanding that the Aquatic SWG may want to adjust the timing of sample collection in future years.

In 2022 and 2023,Douglas PUD elected not to fund the analysis of eDNA and bile acids given that the project fell outside the protection, mitigation, and enhancement goals as found in the PLMP. However, each year Douglas PUD provided in-kind support (labor) to collect samples in the Wells Project that can be analyzed at a later date when funding is available.

2.1.4.4.2 Genetic Sampling

During the 2019/2020 winter maintenance outage, the Aquatic SWG requested that Douglas PUD begin 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. Since 2022, Douglas PUD has

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.

2.1.4.4.3 Information Exchanges

Since 2020, the Aquatic SWG has routinely 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.

In early 2023, the Aquatic SWG received a debrief from the YN on Pacific Lamprey Conservation Initiative's Lamprey Summit V and Lamprey Information Exchange, which was held from December 13 to December 14, 2022. The updated Conservation Agreement received new signatories, and additional support for the Conservation Agreement was announced following the event. The Lamprey Summit V was oriented around discussions about and the signing of the new Conservation Agreement. The Lamprey Information Exchange was more technical in nature, focusing on what has changed in the Pacific Lamprey assessments being conducted by various groups. One change was that climate change is receiving more attention and is ranked as the highest threat now in many regional management units (RMUs). However, mainstem passage is still the highest threat in the Middle and Upper Columbia River and Snake River RMUs. Presentations included updates from each RMU on various research or restoration topics.

The seventh Annual Lamprey Information Exchange and Policy Meeting took place from December 12 through 14, 2023 and was attended by Douglas PUD staff. The Policy Meeting included a round table brainstorming session on Pacific Lamprey conservation successes and future restoration needs.

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 Wells Dam 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. In 2022 and 2023, following 4 years of translocation, Douglas PUD and the Aquatic SWG implemented the 2022 Adult Pacific Lamprey Approach and Passage Study (Section 2.1.4.1.4), which in part, intends to evaluate these in-ladder improvements. Results are expected in 2024.

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. However, Douglas PUD may re-evaluate the design and effectiveness of these structures during future Pacific Lamprey passage evaluations studies.

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, Douglas PUD and the Aquatic SWG began implementing the 2022 Adult Pacific Lamprey Approach and Passage Study (Section 2.1.4.1.4), which may inform future fishway modifications to improve Pacific Lamprey passage at Wells Dam. Results are expected in 2024.

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.

On February 8, 2023, Douglas PUD and the Aquatic SWG discussed photographs of maintenance and repairs completed in the east fishway during the 2022/2023 winter maintenance outage, toward improving Pacific Lamprey passage through the fishway. Work included closing any gaps larger than 1 inch, replacing damaged plating, and removing debris from behind diffuser panels.

On December 7, 2023, Douglas PUD hosted a tour of the Wells Dam east fishway and collection gallery, where attendees had an opportunity to view Pacific Lamprey passage improvements through the area (Section 3.3).

2.1.4.7 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 October 11, 2023, Douglas PUD presented and the Aquatic SWG reviewed publications recently added to the Juvenile and Adult Pacific Lamprey Document Libraries.

2.1.4.8 Planned Monitoring, Studies, and Activities in 2024

In 2024, 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 continuing translocation efforts under the current SOA, continued evaluation of lamprey trapping operations in the east and west fishways, finalizing the 2022 Adult Pacific Lamprey Approach and Passage Study Report and planning for the next Pacific Lamprey study, 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 2023 Annual Report* (Appendix F), which summarizes

Pacific Lamprey activities and results from 2023, will be reviewed by the Aquatic SWG in early 2024 and submitted to FERC as appended to this 2023 ASA Annual Report by the May 31, 2024, deadline.

2.1.5 Aquatic Nuisance Species

In 2023, Douglas PUD continued aquatic nuisance species 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 Northern Crayfish

Douglas PUD implements annual surveillance for non-native Northern Crayfish (*Orconectes virilis*) throughout the Wells Project. Annual crayfish monitoring occurred October 16 through 25, 2023. This monitoring effort used baited rectangular crayfish traps and resulted in the capture and removal of 121 non-native Northern Crayfish.

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. In 2023, similar to previous years, 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 2023, eDNA sample analysis continued to be employed as an additional monitoring method for Zebra and Quagga Mussels. Douglas PUD will continue to monitor for these species in 2024, in consultation with the Aquatic SWG.

2.1.5.3 Eurasian Milfoil

Douglas PUD implements annual surveillance for non-native Eurasian Watermilfoil (*Myriophyllum spicatum*) throughout the Wells Project. Between July 24 and July 28, 2023, 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 2022. This is the seventh 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.

2.1.5.4 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 2023, Douglas PUD implemented the sixth year of an eDNA monitoring program for Northern Pike in the Wells Project. Consistent with the past 5 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 fifth year in a row, results from the 2023 monitoring effort came back negative for Northern Pike.

2.1.5.4.2 Northern Pike Monitoring and Response Plan

In 2023, Douglas PUD executed the fourth 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 2023, 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 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 aquatic nuisance species 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.

In 2023, the *Aquatic Nuisance Species Management Plan Contact List* was updated by Douglas PUD.

2.1.5.6 Planned Monitoring, Studies, and Activities in 2024

In 2024, implementation of the ANSMP and aquatic nuisance species 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 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 2023 Annual Report* (Appendix G), which summarizes aquatic nuisance species activities and results from 2023, will be reviewed by the Aquatic SWG in early 2024 and submitted to FERC as appended to this 2023 ASA Annual Report by the May 31, 2024, deadline.

2.1.6 Resident Fish

In 2023, 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. Each year, the Wells HCP Coordinating Committee develops a report that summarizes the Northern Pikeminnow research and removal efforts 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 3.2.2).

The final report, *2022 Public Utility District No. 1 of Douglas County Northern Pikeminnow Removal and Research Program* (Appendix R), which summarizes Northern Pikeminnow removal efforts in the Wells Reservoir and tailrace in 2022, was approved by the Wells HCP Coordinating Committee on July 31, 2023, after no disapprovals were received prior to the 60-day review period deadline.

As of 2022, approximately 360,000 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 2023, Douglas PUD continued Northern Pikeminnow removal efforts, and a final report on these efforts is expected in spring 2024.

2.1.6.2 Resident Fish Assemblage Study

In 2020, Douglas PUD started conducting electrofishing in preparation for the upcoming Resident Fish Assemblage Study when COVID-19 restrictions were put in place. Due to the uncertainties surrounding COVID-19, a formal study plan was not developed. During the 2020 electrofishing

efforts, Douglas PUD acoustically tagged Smallmouth Bass to leverage the White Sturgeon acoustic telemetry arrays installed around the Wells Reservoir and begin collecting data on predator species movements. In 2023, Douglas PUD continued electrofishing and tagging resident fish as a pilot effort to better understand seasonal movements by predators and help develop a formal study plan. A draft study plan will be distributed for Aquatic SWG review in early 2024.

2.1.6.3 Planned Monitoring, Studies, and Activities in 2024

In 2024, 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 Plan. The *Resident Fish Management Plan 2023 Annual Report* (Appendix H), which summarizes resident fish activities and results from 2023, will be reviewed by the Aquatic SWG in early 2024 and submitted to FERC as appended to this 2023 ASA Annual Report by the May 31, 2024, deadline.

3 Agreement Administration

This section lists events of note that occurred in 2023 related to the administration of the Agreement and lists reports published and approved in 2023 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.

3.2 Habitat Conservation Plan Coordination

In 2023, 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.

3.2.1 2023 Total Dissolved Gas Abatement Plan and Wells Bypass Operating Plan

The 2023 GAP/BOP, as revised (Appendix O) was developed collaboratively by the Aquatic SWG and Wells HCP Coordinating Committee (Section 2.1.3.2). The Aquatic SWG approved the document on February 8, 2023, and the Wells HCP Coordinating Committee approved the document via email on February 13, 2023, prior to Douglas PUD filing the Plan with FERC on February 16, 2023.

3.2.2 Northern Pikeminnow Removal Program Annual Reports

In 2023, the Wells HCP Coordinating Committee approved the report summarizing the Northern Pikeminnow research and removal efforts at the Wells Project in 2022 and provided the final report to the Aquatic SWG for reference (Section 2.1.6.1).

3.2.3 Lamprey Trap Operations and Modifications

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

In summer 2023, Douglas PUD expressed a renewed interest to deploy these same lamprey traps to see how the traps perform during a higher run year and to understand whether the traps can be used for future Aquatic SWG studies of adult Pacific Lamprey passage (Section 2.1.4.1.5). Douglas PUD 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. These trapping hours 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. Douglas PUD and the Wells HCP Coordinating Committee reviewed and discussed deployment of the traps in 2007, positioning of the traps in the fishways, and routes of passage through the fishways. Douglas PUD also presented diel patterns of Pacific Lamprey and HCP Plan Species from 2014 to present. On August 22, 2023, the Wells HCP Coordinating Committee agreed to Douglas PUD's proposed Pacific Lamprey trap operations with regard to 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.

On October 24, 2023, Douglas PUD presented this post hoc analysis of PIT detections of steelhead within the east and west adult fish ladders at Wells Dam, which showed no significant difference in the mean ladder transit times in the east ladder or west ladder when the lamprey traps were deployed versus when the traps were not deployed.

On November 20, 2023, the draft memorandum "Wells Dam Lamprey Trapping and Fishway Modifications 2024" was distributed to the Wells HCP Coordinating Committee. In this memorandum, Douglas PUD proposed the following: 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. On November 28, 2023, the Wells HCP Coordinating Committee approved the activities described in the final memorandum "Wells Dam Lamprey Trapping and Fishway Modifications 2024" (Appendix Q), contingent on Douglas PUD providing weekly in-season updates on adult salmonid and steelhead passage timing through the east and west fishways at Wells Dam, including a comparison to past years and any Bull Trout observed passing the dam, and updates during the HCP Coordinating Committees meetings in August and September 2024.

3.3 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.

On December 7, 2023, 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 planned for next year (Section 2.1.4.1.5). In 2023, the tour was coupled with a tour of the White Sturgeon rearing facility, but the monthly meeting was convened the following week by conference call.

3.4 Agreement-Related Publications in Calendar Year 2023

The following documents were finalized by the Aquatic SWG in 2023:

- Anchor QEA, 2023. *Annual Report Calendar Year 2022 Activities Under the Aquatic Settlement Agreement*. May 10, 2023.
- Douglas PUD (Public Utility District No. 1 of Douglas County), 2023. *2022 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 2023.
- Douglas PUD, 2023. *2022 Annual Report Water Quality Management Plan*. Wells Hydroelectric Project, FERC Project No. 2149. May 10, 2023.
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Appendix A
Aquatic Settlement Work Group 2023 Conference Call Minutes

FINAL

Conference Call Minutes

Aquatic Settlement Work Group

To: Aquatic SWG Parties Date: February 8, 2023

From: John Ferguson, Chair, Anchor QEA, LLC

Re: Final Minutes of the January 11, 2023, Aquatic SWG Conference Call

The Aquatic Settlement Work Group (SWG) met by conference call on Wednesday, January 11, 2023, 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. Aquatic SWG members will submit edits and comments on the draft *2022 Annual Report Total Dissolved Gas Abatement Plan* (2022 TDG/GAP Annual Report) and draft *2023 Total Dissolved Gas Abatement Plan* and appended *Wells Bypass Operating Plan* (2023 GAP/BOP) as soon as possible, so revisions (if any) can be distributed before Douglas PUD requests approval of these documents during the Aquatic SWG conference call on February 8, 2023 (Item II-A and Item II-B).
2. Douglas PUD will provide updates regarding the progress of dewatering the Wells Dam east fishway for winter maintenance and accommodating an in-person tour of the dewatered east fishway, and Aquatic SWG members will notify Douglas PUD of their interest in attending the tour (Item II-C). *(Note: John Rohrback provided notification on January 16, 2023, that the Wells Dam east fishway was dewatered that day, and per coordination with Aquatic SWG members, a tour of the dewatered fishway was scheduled for January 23, 2023, at 11:00 a.m., but was later canceled due to scheduling conflicts.)*
3. The Yakama Nation (YN) will find out more information about which entities did not sign the new Pacific Lamprey Conservation Agreement (Agreement) for distribution to the Aquatic SWG (Item II-E). *(Note: Ralph Lampman provided a list of signatories and supporters to the 2022 Agreement on January 13, 2023, which was distributed to the Aquatic SWG by Kristi Geris that same day.)*
4. The YN will distribute meeting materials from the Pacific Lamprey Conservation Initiative (PLCI) Lamprey Summit V and Lamprey Information Exchange, which was held on December 13 to 14, 2022, once these materials are available (Item II-E). *(Note: Ralph Lampman provided a 2022 Lamprey Week Recap on January 13, 2023, which was distributed to the Aquatic SWG by Kristi Geris that same day.)*

5. The Confederated Tribes of the Colville Reservation will inquire with Sherman Creek Hatchery about the availability of surplus brood year (BY) 2022 White Sturgeon and will communicate this with Douglas PUD, who will coordinate with Chelan PUD regarding Chelan PUD program fish on station at Wells Fish Hatchery (Item II-F). *(Note: Jason McLellan provided an update to Chas Kyger following the Aquatic SWG conference call on January 11, 2023, which was distributed to the Aquatic SWG by Kristi Geris that same day.)*
6. The Aquatic SWG meeting on February 8, 2023, 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 2022 TDG/GAP Annual Report was distributed to the Aquatic SWG by Kristi Geris on January 9, 2023, and is available for a 30-day review with edits and comments due to John Rohrback by February 9, 2023 (Item II-A).
2. The draft 2023 GAP/BOP was distributed to the Aquatic SWG by Kristi Geris on January 11, 2023, and is available for a 30-day review with edits and comments due to John Rohrback by February 10, 2023 (Item II-B).
3. The draft *2023 Aquatic Settlement Agreement and Workgroup Action Plan* was distributed to the Aquatic SWG by Kristi Geris on February 7, 2023. Douglas PUD will request approval of the action plan during the Aquatic SWG conference call on March 8, 2023.

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). Ferguson asked for any additions or changes to the agenda. The following revisions were requested:

- Andrew Gingerich requested to strike the Draft 2022 Aquatic Settlement Agreement (ASA) Action Plan from today's agenda. Douglas PUD will distribute the draft plan by the end of this month for discussion during the Aquatic SWG conference call on February 8, 2023.
- Breean Zimmerman said she needs to drop off this call at 11:00 a.m. for another meeting.

B. Meeting Minutes Approval (John Ferguson)

The revised draft December 9, 2022, conference call minutes were reviewed. Kristi Geris said all comments and revisions received from members of the Aquatic SWG were minor, and clarifying edits were incorporated into the revised minutes. She added distribution of the draft 2022 TDG/GAP Annual Report under *Review Items*. The YN submitted one additional minor edit under *Review of Action Items* (edited "what date the tags turn on again" to "what date the tags *will* turn on again"). The Aquatic SWG members present approved the December 9, 2022, conference call minutes, as revised. *(Note: Ralph Lampman provided YN approval of the minutes, as revised, after he joined the conference call during Item II-A.)*

C. Review of Action Items (John Ferguson)

Action items from the Aquatic SWG conference call on December 9, 2022, are as follows *(Note: The following italicized item numbers correspond to agenda items from the December 9, 2022, meeting)*:

1. *Douglas PUD will inquire internally about accommodating an in-person tour of the dewatered Wells Dam east fishway following the Aquatic SWG meeting on January 11, 2023, and Aquatic SWG members will notify Douglas PUD of their interest in attending the tour (Item I-C).* This action item will be discussed during today's conference call.
2. *Douglas PUD will redistribute release numbers of passive integrated transponder (PIT)-only fish and dual-tagged fish (acoustic and PIT) for the* Wells Dam 2022 Adult Lamprey Approach and Passage Study *(2022 Adult Pacific Lamprey Study) (Item II-D).*
   John Rohrback redistributed these numbers following the Aquatic SWG conference call on December 9, 2022, as discussed.
3. *The YN will distribute the weblinks to participate remotely in the PLCI Lamprey Summit and Lamprey Information Exchange Meeting starting on December 13, 2022, and Aquatic SWG members will notify the YN of their interest in attending the event remotely (Item II-G).*
   Ralph Lampman provided the weblink to attend the Lamprey Information Exchange Meeting on December 14, 2022, prior to the meeting that day; however, the webinar occurred before the link could be distributed to the Aquatic SWG.

II. Summary of Discussions

A. Draft 2022 TDG/GAP Annual Report (John Rohrback)

John Rohrback said the draft 2022 TDG/GAP Annual Report was distributed to the Aquatic SWG by Kristi Geris on January 9, 2023. Douglas PUD is hoping to obtain Aquatic SWG approval of the draft report during the Aquatic SWG conference call on February 8, 2023, and he asked that members submit questions and comments on the report ahead of the meeting.

Rohrback recalled reviewing the contents of this report during the Aquatic SWG conference call on December 9, 2022, during the Water Quality Update. To note, there was one additional Wells Dam tailrace 110% violation on November 8, 2022, which was not covered during the last meeting because that Water Quality Update was only through October 30, 2022. This report also includes biological monitoring data where fish were examined for gas bubble trauma (GBT). There were two instances of minor GBT observed in the fins of Largescale Suckers. These observations occurred at the end of June 2022, as discussed during the Aquatic SWG conference call on July 13, 2022. During that meeting, photographs of the observed GBT were shared, which are also included in this report. Also of note, no Pacific Lamprey were encountered during GBT monitoring. There were several sampling events where fewer than 50 smolts were examined including early April due to low passage rates at the Rocky Reach Juvenile Bypass System and July, when monitoring was extended due to high river flows. Typically, biological monitoring is conducted every week from April to June; however, monitoring was extended due to TDG exceedances in the Wells Dam tailrace in July 2022. Per the Biological Monitoring Plan, these exceedances triggered an extension of monitoring. There were no observations of GBT during the July monitoring.

Ralph Lampman joined the conference call.

John Ferguson said last year was interesting. It was an average year in terms of total flow, but irregular in how the flow came off.

Ferguson said Douglas PUD has mentioned shifting the end-of-spill date for Wells Dam bypass operations. There is a proposal currently under review within the Wells Habitat Conservation Plan (HCP) Coordinating Committee to shift from a date that is set preseason to a date based on in-season data available through the Columbia River Data Access in Real Time database (Program Real Time, or DART). Does Douglas PUD want to provide an update on these HCP discussions to the Aquatic SWG?

Rohrback explained that the Wells Dam juvenile bypass system operates from April 9 to August 9, with the goal of encompassing at least 95% of outmigrating spring and summer smolts. Formerly, the bypass operated from April 9 to August 19; however, several years of data indicated that ending bypass operations on August 9 would still provide a non-turbine passage route for greater than or equal to 95% of the outmigration. Each year, Columbia Basin Research completes a retrospective analysis to determine passage dates. In 2022, this analysis estimated that Wells Dam bypass operations from April 9 to August 9 provided coverage for 93.8% of the subyearling Chinook Salmon, and in order to meet 95% coverage the bypass needed to operate through August 11. Douglas PUD wanted to prevent this from occurring again. Therefore, rather than setting fixed dates Douglas PUD is proposing to use current, real-time data to estimate when 95% of the outmigration has reached Rocky Reach Dam and will use that date to end bypass spill at Wells Dam.

Andrew Gingerich said Rohrback provided an excellent summary. Gingerich further explained that the reason salmonids are being discussed here is, unlike the TDG/GAP report, the GAP/BOP package is vetted with the Wells HCP Coordinating Committee and Aquatic SWG, per requirements in Douglas PUD's 401 Water Quality Certification and Federal Energy Regulatory Commission license. This is because there are TDG concerns with bypass operations and also salmonid survival concerns through non-turbine passage routes. Instead of guiding operations with fixed dates, Douglas PUD is proposing to use a method that can adapt to environmental conditions. Every year, the salmon run timing is different. This proposed method will allow changes on the fly, versus relying on a fixed date where performance is unknown until after the run is complete. While this fixed date method has been successful in past years, except for last year, Douglas PUD is trying to be proactive to better match the way smolts are outmigrating.

Ferguson said a draft Statement of Agreement is with the Wells HCP Coordinating Committee for review. The proposed operations have been discussed with the Committee, which he suspects will be approved. These operations are discussed in the draft 2022 TDG/GAP Annual Report and will be a change in the draft 2023 GAP/BOP, which is why he wanted to flag this for Aquatic SWG members, He applauded Douglas PUD for being proactive. Rather than just saying 2022 was an anomaly, Douglas PUD is implementing a more conservative method by ending Wells Dam bypass operations based on fish counts at Rocky Reach Dam.

Aquatic SWG members will submit edits and comments on the draft 2022 TDG/GAP Annual Report as soon as possible, so revisions (if any) can be distributed before Douglas PUD requests approval of this report during the Aquatic SWG conference call on February 8, 2023.

B. Draft 2023 GAP/BOP (John Rohrback)

John Rohrback said he hopes to distribute the draft 2023 GAP/BOP by the end of today. Of note, there is a change in the *Wells Hydroelectric Project Spill Playbook* (Spill Playbook; Appendix 1 of the 2023 GAP/BOP). In 2023, the Spill Playbook will return to concentrating spill through Spillways 7, 6, and 8[1] (as was done from 2015 to 2021), rather than concentrating spill through Spillways 9, 8, and 10[2] (as occurred in 2022). Spillway 7 maintenance was completed in late 2022; therefore, the concentrated spill pattern will return to spilling at locations farther from the riverbanks to minimize overall TDG production and reduce bank attachment of highly gasified waters.

The draft 2023 GAP/BOP was distributed to the Aquatic SWG by Kristi Geris following the Aquatic SWG conference call on January 11, 2023, and is available for a 30-day review with edits and comments due to Rohrback by February 10, 2023.

[1] Listed in priority order.
[2] Listed in priority order.

Aquatic SWG members will submit edits and comments on the draft 2023 GAP/BOP as soon as possible, so revisions (if any) can be distributed before Douglas PUD requests approval of this plan during the Aquatic SWG conference call on February 8, 2023.

C. 2022/2023 Wells Dam Winter Maintenance Update (Chas Kyger)

Chas Kyger said there is a problem with achieving a seal in the east fishway bulkhead, which Douglas PUD hopes to remedy this week. Divers will be out today or tomorrow to investigate what is blocking the bulkhead. Until this is figured out, the fishway cannot be fully dewatered. Crews are in a holding pattern to conduct a fish salvage, and then a tour can occur after. To date, only Ralph Lampman has expressed interest in a tour. Once the bulkhead is fixed, a fish salvage can be scheduled, and hopefully a tour can be scheduled that same week. Douglas PUD hopes this can occur next week, but this depends on fixing the bulkhead. The upper fishway is dewatered, and a fish salvage has already been performed. Douglas PUD will provide updates regarding the progress of dewatering the Wells Dam east fishway for winter maintenance and accommodating an in-person tour of the dewatered east fishway, and Aquatic SWG members will notify Douglas PUD of their interest in attending the tour. *(Note: John Rohrback provided notification on January 16, 2023, that the Wells Dam east fishway was dewatered that day, and per coordination with Aquatic SWG members, a tour of the dewatered fishway was scheduled for January 23, 2023, at 11:00 a.m., but was later canceled due to scheduling conflicts.)*

D. PLCI Lamprey Summit V and Lamprey Information Exchange Recap (Ralph Lampman)

Ralph Lampman said there were two events last month: the Lamprey Summit V was on December 13, 2022, and the Lamprey Information Exchange was the next day on December 14, 2022. Both were held at the World Forestry Center in Portland, Oregon. Both were well attended, with approximately 100 people at each event. The updated Conservation Agreement (Agreement) received new signatories, and additional support for the Agreement was announced following the event. The Lamprey Summit V was oriented around discussions about and the signing of the new Agreement. The Lamprey Information Exchange was more technical in nature. Part of the presentations were about what has changed in the Pacific Lamprey Assessment, which should be finalized soon, possibly this spring 2023. One change was that climate change is receiving more attention and is ranked as the highest threat now in many Regional Management Units (RMUs). However, mainstem passage is still the highest threat in the Middle and Upper Columbia River and Snake River RMUs. Presentations included updates from each RMU on various research or restoration topics of their choice. A lot of good information was shared from each region.

Lampman said the YN and other Columbia River Inter-Tribal Fish Commission tribes did not sign the new Agreement. The tribes submitted edits that were not incorporated into the final version, some of

which the tribes felt strongly about, including abundance goals, urgency, and legal power to impact changes on the ground. In some sense, the new Agreement is just a "feel good" agreement with no strong requirements for funding or action on the ground. This was noted by some of the tribes as a reason they did not sign. Some tribes also felt there was a lack of communication between the tribes and U.S. Fish and Wildlife Service in resolving edits and updates. These and other reasons for not signing were outlined in letters submitted by each tribe.

Lampman acknowledged that he was a big proponent for getting more entities to sign the new Agreement, and he does not want to seem like an oxymoron. There were a lot of new discussions that came up towards the end of this process. John Ferguson asked, which tribes did not sign? Lampman said he will find out more information about which entities did not sign the new Agreement for distribution to the Aquatic SWG. *(Note: Lampman provided a list of signatories and supporters to the 2022 Agreement on January 13, 2023, which was distributed to the Aquatic SWG by Kristi Geris that same day.)*

Lampman said he will also distribute meeting materials from the PLCI Lamprey Summit V and Lamprey Information Exchange once they are available. *(Note: Lampman provided a 2022 Lamprey Week Recap on January 13, 2023, which was distributed to the Aquatic SWG by Geris that same day.)*

E. 2022 Adult Pacific Lamprey Study Update (John Rohrback)

John Rohrback said an updated Pacific Lamprey translocation Last Seen table (Attachment B) and a 2022 Adult Pacific Lamprey Mid-Study Update table (Attachment C) were distributed to the Aquatic SWG by Kristi Geris on December 30, 2022. The Last Seen table (Attachment B) is a comprehensive update on the 4-year Douglas PUD Pacific Lamprey Translocation Program for fish translocated upstream of Wells Dam at Starr Boat Launch, in the Methow River, or the Okanagan River. The mid-study update table (Attachment C) is a mid-study look at where the 2022 Adult Pacific Lamprey Study fish have been detected or last seen according to acoustic detections of the 170 fish released at Daroga State Park or the Rocky Reach Dam forebay.

Rohrback provided a high-level overview of the mid-study update table (Attachment C). To date, approximately 71% of the fish released have been detected at acoustic receivers in the Wells Dam tailrace. A total of 38 fish, or 25% of the total release group, were last detected upstream of Wells Dam. The passage rate to date is approximately 30%. Again, this study is not complete, but it is interesting to see these data after the first pulse of movement after release. Soon there will be another bout of movement in early spring and summer this year. 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 and only 3 fish entered the fishways, with the highest detection point at Pool 19. No fish were detected upstream of Wells Dam, although the batteries in the acoustic tags used in the study

expired prior to spring the following year. Another interesting note, looking at Pacific Lamprey counts at the Rocky Reach Dam count windows over the past decade, approximately 1%, plus or minus a few percentage points, of the total number were also counted at Wells Dam. In 2022, this value was 15.4%, which is a major outlier year. It is interesting that last year was a big return year, and also more fish passed Wells Dam compared to past years. Since 2010, the highest counts at Wells Dam occurred last year with 1,684 fish and in 2017 with 287 fish.

Ralph Lampman asked what might explain the increase to 15.4% from Rocky Reach Dam to Wells Dam in 2022. Rohrback said answering this would be speculative. One obvious difference is that in 2022, study fish were collected at Priest Rapids Dam and were released directly in the Rocky Reach Dam forebay. This is in contrast with previous studies where study fish typically needed to migrate and pass over Wanapum, Rock Island, and Rocky Reach dams. Chas Kyger noted that some fish counted at Rocky Reach Dam may be from a previous migration year, i.e., numbers may be inflated. Rohrback said this is a good point, and he did not parse out these details. In 2022, a total of 10,949 Pacific Lamprey passed Rocky Reach Dam and approximately 300 fewer fish passed Rock Island Dam.

John Ferguson asked whether the increase could be due to environmental conditions. In 2022, there was a late, cool, high runoff, and he wondered if this might be better migration conditions for Pacific Lamprey. Andrew Gingerich said this would just be more speculation. Judy Neibauer said she was thinking the same thing and asked whether there were any changes in flow operations during that same period and whether the monitoring time periods were similar. Rohrback said the spillway configuration was different from 2015 to 2021; however, there is no evidence to support that this affected the Pacific Lamprey migration up to Wells Dam. Jason McLellan noted that 2022 was the biggest flow year since 1997, by far, during the month of July.

Rohrback recalled seeing the big return numbers at Bonneville Dam in 2017, then the 287 fish over Wells Dam and thinking maybe a big pulse of fish downriver pushes the migration farther upriver. This makes sense looking at 2022 data; however, not so much looking at the past decade of data.

Lampman said, perhaps it is translocation. Rohrback said he also had that thought—that translocation was working in concert with big flows and the high return year. However, he also has not seen a steadily increasing trend as translocation progressed. Lampman said this could be because juveniles are just starting to transform to head downstream, which might be an important cue. It is not just larvae now because the fish are getting bigger. The numbers may not change significantly, but the mass is getting to be so much more, which could have a cumulative impact on the pheromone cue. This would not be a gradual change but more of a sharp increase.

Ferguson said this somewhat fits the story in the Yakima and Umatilla rivers. The effects of translocation take a while, right? Lampman said yes, it takes time for adults to return. In the Umatilla River, it took 10 years. In the Yakima River, it took 4 to 5 years. He believes it is a combination of pheromones and big return years pushing fish farther upstream and river flow that is probably contributing in ways not fully understood.

Gingerich said he would like to agree with Lampman, but again, this is all speculative. There could be several factors that are driving these fish. For example, another piece of the puzzle is not just run size, but average fish size. He believes there are literature citations showing that fish of larger body size or length are more likely to go farther in a river system and go farther past dams. Perhaps a year where fish are more robust and bigger in size partly explains a stronger run. He said this is something to keep in my mind, and there may be other forces that are driving fish to go farther in a river system. Ferguson agreed, and added better ocean conditions, more food, among other things.

Lampman asked when the next salmonid acoustic telemetry study is planned at Wells Dam. Gingerich said the next 10-year confirmation survival study will occur in 2030; however, in past years, these have been PIT-tag studies. Ferguson said the use of PIT detection is driven by the Wells HCP. Gingerich said this is correct.

F. BY 2022 White Sturgeon Rearing Update (Chas Kyger)

A BY 2022 White Sturgeon Rearing Update (Attachment D) was distributed to the Aquatic SWG by Kristi Geris prior to the conference call on January 11, 2023. Chas Kyger said hatchery staff are now grading fish each week and starting to fill out the magnum tanks, which will mostly go to the Chelan PUD program. Scute marking, PIT-tagging, and blood sampling for spontaneous autopolyploidy is scheduled for the first week in February 2023. Approximately 330 fish will be sampled and marked for stocking into the Wells Reservoir. Everything is continuing to go well, and fish are growing and should be at target size for stocking.

Jason McLellan said the total number of fish on station at Wells Fish Hatchery seems below target for the combined programs, assuming the target for the Chelan PUD program is still 2,250 fish. Has Douglas PUD had any discussions with Chelan PUD about this? Currently, there are surplus fish available, but there may not be for very long. Kyger said, according to these numbers, it looks like Chelan PUD's program might be short approximately 100 fish. Douglas PUD has not discussed this with Chelan PUD, but these numbers are also not final. Once Douglas PUD's 330 fish are split out, it will be clearer how many fish are available for Chelan PUD's program. How long will the surplus fish be available? McLellan guessed no more than 2 weeks. The surplus fish are at Sherman Creek Hatchery. Mitch Combs (Sherman Creek Hatchery Manager) wanted to move all surplus fish offsite in mid-December 2022, but agencies were unable to get coordinated on scute marking. McLellan

believes the goal is to have surplus fish offsite by the end of January 2023, at the latest. He said he will inquire with Sherman Creek Hatchery about the availability of surplus BY 2022 White Sturgeon and will communicate this with Douglas PUD, who will coordinate with Chelan PUD regarding Chelan PUD program fish on station at Wells Fish Hatchery. *(Note: McLellan provided an update to Kyger following the Aquatic SWG conference call on January 11, 2023, which was distributed to the Aquatic SWG by Geris that same day.)*

III. Administration

A. Draft 2022 ASA Annual Report (John Ferguson)

John Ferguson said Anchor QEA is currently drafting the 2022 ASA Annual Report, and Douglas PUD is drafting the appended resource management plan annual reports. The draft 2022 ASA Annual Report plus the six aquatic resource management plan annual reports are due to the Aquatic SWG for a 45-day review on Friday, March 10, 2023, with comments due back on Monday April 24, 2023. Douglas PUD will request approval of the full report during the Aquatic SWG meeting in May 2023, and Douglas PUD will file the approved report with Federal Energy Regulatory Commission by May 31, 2023.

B. Upcoming Meetings (John Ferguson)

The Aquatic SWG meeting on February 8, 2023, will be held by conference call.

John Ferguson reminded the Aquatic SWG that next month, Douglas PUD will discuss the draft 2022 ASA Action Plan and request approval of the 2022 TDG/GAP Annual Report and 2023 GAP/BOP.

Other upcoming meetings include March 8 and April 12, 2023 (to be determined).

List of Attachments

Attachment A List of Attendees
Attachment B Updated Pacific Lamprey Translocation "Last Seen" Table
Attachment C 2022 Pacific Lamprey Mid-Study Update Table
Attachment D BY 2022 White Sturgeon Rearing Update

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
RD Nelle	Aquatic SWG Technical Representative	U.S. Fish and Wildlife Service
Judy Neibauer	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
Jason McLellan	Aquatic SWG Technical Representative	Confederated Tribes of the Colville Reservation
Ralph Lampman	Aquatic SWG Technical Representative	Yakama Nation

	Last Detection Location			Release Location	
	Zone Name	rkm		Daroga	RR Forebay
Upstream of Wells Dam	PIT: OKL - Lower Okanogan Instream Array	890		1	
	Okanogan River Mouth	865			2
	Brewster Community Dock	860			2
	Brewster Bridge	858			2
	PIT: CRU - Upper Chewuch Instream Array	958		1	1
	PIT: CMU - Chewuch River Middle Upper	938		1	5
	PIT: CRW - Chewuch River above Winthrop	931		0	1
	PIT: MRC - Methow River at Carlton	895		2	5
	PIT: LMR - Lower Methow River at Pateros	858		2	4
	Starr Access	846		1	7
	Wells Forebay	838			1
Rocky Reach Reservoir	PIT: WEA - Wells Dam, DCPUD Adult Ladders	836		1	
	Wells L Collection Outside	835		6	20
	Wells Tailrace (hatchery outflow)	835		12	28
	PIT: WEH - Wells Dam Hatchery	835		2	1
	MOB: Wells Tailracce	835		1	4
	Wells Tailrace (first approach)	835		3	4
	CCPUD Long Draw	829		1	
	CCPUD Ghallagher	821		4	6
	MOB: Ghallagher to Bebee	-		1	
	CCPUD Beebe Bridge	817		1	2
	MOB: Bebee to Greens Canyon	-			1
	CCPUD Greens Canyon	809			2
	CCPUD Sun Cove	800		2	5
	CCPUD Bend	794			1
	Rls: Daroga	*790*		2	
	CCPUD Entiat	787		1	3
	CCPUD Orondo	780		2	
	Rls: RR Forebay	*773*			11
	CCPUD Rocky Reach Forebay	773		1	1
	CCPUD Rocky Reach Tailrace	761		2	1

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). Dark shaded cells represent release ("Rls") locations

Last Detection Zone	Last Detection Location	2018 Release Location (n = 669)				2019 Release Location (n = 150)			2020 Release Location (n = 355)					2021 Release Location (n = 460)				
		2018	2018	2018	2018	2019	2019	2019	2020	2020	2020	2020	2020	2021	2021	2021	2021	2021
		Methow River	Salmon Creek	Omak Creek	Similkameen River	Starr Boat Launch	Salmon Creek	Omak Creek	Starr Boat Launch	Loup Loup Creek	Salmon Creek	Omak Creek	Similkameen River	Starr Boat Launch	Loup Loup Creek	Salmon Creek	Omak Creek	Similkameen River
130	Zosel Dam (858.132)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
-41	*Rls: Similkameen River (858.119.013)*	0	0	0	59	0	0	0	0	0	0	0	19	0	0	0	0	27
-31	*Rls: Omak Creek (858.052.018)*	0	0	2	0	0	0	11	0	0	0	4	0	0	0	0	9	0
118	OMAKC - Omak Creek (858.052)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
117	OMH - Omak Creek Haley Creek Road (858.052.020)	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	10	0
115	OMF - Omak Creek above Mission Falls (858.052.011)	0	0	1	0	0	0	8	0	0	0	1	0	0	0	0	0	0
114	OBF - Omak Creek below Mission Falls (858.052.010)	0	0	3	0	0	0	0	0	0	0	1	0	0	0	0	5	0
112	OMK - Omak Creek Instream Array (858.052.000)	0	0	9	0	0	0	7	1	0	1	10	0	1	0	0	6	0
-21	*Rls: Salmon Creek (858.041.021)*	0	6	0	0	0	14	0	0	0	17	0	0	0	0	9	0	0
108	SAD - Salmon Creek Above OID Div. (858.041.009)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0
106	SA0 - Salmon Creek below OID Div. (858.041.006)	0	3	0	0	0	0	0	0	0	4	0	0	0	0	9	0	0
102	SA1 - Salmon Creek Instream Array (858.041.002)	0	7	0	0	0	8	0	0	0	4	0	0	0	0	8	0	0
-51	*Rls: Loup Loup Creek (858.028)*	0	0	0	0	0	0	0	0	8	0	0	0	0	8	0	0	0
95	LLC - Loup Loup Creek Instream Array (858.028.001)	0	0	0	0	0	0	0	0	12	0	0	0	0	10	0	0	0
90	OKL - Lower Okanogan Instream Array (858.025)	0	0	0	1	3	0	0	23	1	0	0	1	18	6	1	0	1
76	CRU - Upper Chewuch Instream Array (843.080.028)	6	0	0	0	0	0	0	2	0	0	0	0	6	0	0	0	0
74	CMU - Chewuch River Middle Upper (843.080.008)	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
73	CML - Chewuch River Middle Lower (843.080.007)	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0
72	CRW - Chewuch River above Winthrop (843.080.001)	80	0	0	0	4	0	0	24	0	0	0	0	25	0	0	0	0
60	TWR - Lwr Twisp Rvr near MSRF Ponds (843.066.002)	1	0	0	0	0	0	0	2	0	0	0	0	1	0	0	0	0
58	MRW - Methow River at Winthrop (843.085)	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0
55	MRC - Methow River at Carlton (843.045)	213	0	0	0	16	0	0	76	0	0	0	0	108	0	0	0	0
52	METTRP - Methow Smolt Trap at McFarland Creek Road Bridge (843.030)	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50	LMR - Lower Methow River at Pateros (843.008)	157	0	0	1	22	0	0	38	0	0	0	0	32	0	0	0	0
-11	*Rls: Methow River (843.000)*	46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-2	*Rls: Brewster Boat Launch (852)*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-1	*Rls: Starr Boat Launch (834)*	0	0	0	0	53	0	0	95	0	0	0	0	136	0	0	0	0
40	WEA - Wells Dam, DCPUD Adult Ladders (830)	0	0	0	0	0	0	0	1	0	0	0	0	3	1	0	0	0
38	WEH - Wells Dam Hatchery (830)	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
23	ENA - Upper Entiat River at rkm 17.1 (778.017)	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
20	ENL - Lower Entiat River (778.002)	2	0	0	0	4	0	0	3	0	0	1	0	1	0	1	0	0
10	RRJ - Rocky Reach Dam Juvenile (763)	1	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0
5	RIA - Rock Island Adult (730)	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
2	JDJ - John Day Dam Juvenile (347)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
	TOTAL	**507**	**16**	**15**	**61**	**102**	**22**	**26**	**266**	**21**	**26**	**22**	**20**	**344**	**25**	**32**	**31**	**28**
	Number Not Yet Detected	46	6	2	59	53	14	11	95	8	17	4	19	136	8	9	9	27
	Detected Post Release (%)	91%	63%	87%	3%	48%	36%	58%	64%	62%	35%	82%	5%	60%	68%	72%	71%	4%
	Overall detected by year as of Dec 27 2022 (%)					48%			60%					59%				

	5-Dec		10-Jan	
Tank	Population	Grams	Population	Grams
1	223	151.3	116	181.6
2	209	75.7	217	68.8
3	--	--	90	26.7
4	106	146.5	115	174.6
5	208	36.0	219	49.9
6	--	--	198	129.7
7	246	51.0	156	30.1
8	46	10.1	54	13.9
9	216	66.8	215	98.7
10	213	60.5	--	--
11	143	27.5	135	27.9
12	231	119.5	225	49.7
Mag 1	693	189.2	797	224.8
Mag 2	--	--	--	--
Total	2,534	108.7	2,537	124.5

FINAL

Conference Call Minutes

Aquatic Settlement Work Group

To: Aquatic SWG Parties Date: March 8, 2023

From: John Ferguson, Chair, Anchor QEA, LLC

Re: Final Minutes of the February 8, 2023, Aquatic SWG Conference Call

The Aquatic Settlement Work Group (SWG) met by conference call on Wednesday, February 8, 2023, from 10:00 a.m. to 11:50 a.m. Attendees are listed in Attachment A of these conference call minutes.

Summary of Action Items

1. Anchor QEA, LLC (Anchor QEA) will request from U.S. Fish and Wildlife Service (USFWS) a vote via email on the *2022 Annual Report Total Dissolved Gas Abatement Plan* (2022 TDG/GAP Annual Report) and *2023 Total Dissolved Gas Abatement Plan* and appended *Wells Bypass Operating Plan* (2023 GAP/BOP), which were approved by Aquatic SWG members present during today's Aquatic SWG conference call (Item II-A and Item II-B). *(Note: Kristi Geris sent this request following the Aquatic SWG conference call on February 8, 2023, and USFWS approved via email on February 9, 2023.)*
2. Douglas PUD will verify that juvenile Pacific Lamprey collected and passive integrated transponder (PIT)-tagged at the Carlton rotary screw trap are released upstream of the trap to help monitor trap efficiency and estimate overall run size (Item II-C). *(Note: John Rohrback provided a response from Washington Department of Fish and Wildlife [WDFW] on February 22, 2023, which Kristi Geris distributed to the Aquatic SWG that same day.)*
3. The Yakama Nation (YN) will provide a lamprey bait flyer to Douglas PUD for posting around the Wells Project (Item II-C).
4. The YN will let The River Mile Network know that Douglas PUD is supportive of sharing crayfish monitoring data collected in the Wells Reservoir upon request (Item II-C).
5. WDFW will ask internally about the timeline and schedule for releasing the Northern Pike Rapid Response Statewide Plan (Item II-C). *(Note: Laura Heironimus provided an update indicating the plan will be complete on July 1, 2023, which Kristi Geris distributed to the Aquatic SWG on February 21, 2023.)*
6. Anchor QEA will notify USFWS that Douglas PUD plans to request approval of the *2023 Aquatic Settlement Agreement and Workgroup Action Plan* during the Aquatic SWG conference call on March 8, 2023, and to reach out to Douglas PUD with questions (Item

I-C). *(Note: Kristi Geris sent this notification following the Aquatic SWG conference call on February 8, 2023.)*

7. Douglas PUD will coordinate with Wells Dam mechanical staff to: 1) ask about the feasibility of widening the 3-inch plating around diffuser gratings with regards to hydraulics through the area; 2) request any additional photographs taken of reducing gaps in the east fishway during the 2022/2023 Wells Dam winter maintenance period; and 3) make note to recheck measurements of the areas depicted in the photographs shared during today's Aquatic SWG conference call (Attachment B; Item II-D).
8. Douglas PUD will resend or provide the location of the latest photographs taken of the Pacific Lamprey improvements installed in the Wells Dam count window areas (Item II-D). *(Note: Chas Kyger provided this location on March 8, 2023, which was distributed to the Aquatic SWG by Kristi Geris that same day.)*
9. Douglas PUD will follow up with USFWS regarding PIT-tagging of Bull Trout incidental captures in the Methow River Basin for inclusion in the *Bull Trout Movement and Life History Investigation 2022* (2022 Bull Trout PIT Study) (Item II-F).
10. The Aquatic SWG meeting on March 8, 2023, will be held by conference call (Item III-A).

Summary of Decisions

1. Aquatic SWG members present approved the 2022 TDG/GAP Annual Report (Item II-A). *(Note: USFWS approved via email on February 9, 2023.)*
2. Aquatic SWG members present approved the 2023 GAP/BOP (Item II-B). *(Note: USFWS approved via email on February 9, 2023.)*

Agreements

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

Review Items

1. The draft *2023 Aquatic Settlement Agreement and Workgroup Action Plan* was distributed to the Aquatic SWG by Kristi Geris on February 7, 2023. Douglas PUD will request approval of the action plan during the Aquatic SWG conference call on March 8, 2023 (Item II-C).

Documents Finalized

1. The final 2022 TDG/GAP Annual Report and final 2023 GAP/BOP were distributed to the Aquatic SWG by Kristi Geris on February 13, 2023 (Item II-A and Item II-B).

2. The final study plan, *Wells Reservoir White Sturgeon Reproduction Assessment*, which was approved during the Aquatic SWG conference call on May 11, 2022, was distributed to the Aquatic SWG by Kristi Geris on March 2, 2023.

I. Welcome

A. Review Agenda (John Ferguson)

John Ferguson welcomed the Aquatic SWG members (Attachment A). Ferguson asked for any additions or changes to the agenda. Breean Zimmerman said she will need to leave the call after the Decisions Items. Ferguson added a reminder about the draft 2022 Aquatic Settlement Agreement Annual Report timeline.

B. Meeting Minutes Approval (John Ferguson)

The revised draft January 11, 2023, conference call minutes were reviewed. Kristi Geris said all comments and revisions received from members of the Aquatic SWG were minor, and clarifying edits were incorporated into the revised minutes. She added distribution of the draft *2023 Aquatic Settlement Agreement and Workgroup Action Plan* under *Review Items*. The Aquatic SWG members present approved the January 11, 2023, conference call minutes, as revised.

C. Review of Action Items (John Ferguson)

Action items from the Aquatic SWG conference call on January 11, 2023, are as follows *(Note: The following italicized item numbers correspond to agenda items from the January 11, 2023, meeting)*:

1. *Aquatic SWG members will submit edits and comments on the draft 2022 TDG/GAP Annual Report and draft 2023 GAP/BOP as soon as possible, so revisions (if any) can be distributed before Douglas PUD requests approval of these documents during the Aquatic SWG conference call on February 8, 2023 (Item II-A and Item II-B).*
   John Rohrback said no comments were received on either document. This will be further discussed during today's conference call.
2. *Douglas PUD will provide updates regarding the progress of dewatering the Wells Dam east fishway for winter maintenance and accommodating an in-person tour of the dewatered east fishway, and Aquatic SWG members will notify Douglas PUD of their interest in attending the tour (Item II-C).*
   John Rohrback provided notification on January 16, 2023, that the Wells Dam east fishway was dewatered that day, and per coordination with Aquatic SWG members, a tour of the dewatered fishway was scheduled for January 23, 2023, at 11:00 a.m., but was later canceled due to scheduling conflicts.

3. *The YN will find out more information about which entities did not sign the new Pacific Lamprey Conservation Agreement (Agreement) for distribution to the Aquatic SWG (Item II-E).*
   Ralph Lampman provided a list of signatories and supporters to the 2022 Agreement on January 13, 2023, which was distributed to the Aquatic SWG by Kristi Geris that same day.
4. *The YN will distribute meeting materials from the Pacific Lamprey Conservation Initiative Lamprey Summit V and Lamprey Information Exchange, which was held on December 13 to 14, 2022, once these materials are available (Item II-E).*
   Ralph Lampman provided a 2022 Lamprey Week Recap on January 13, 2023, which was distributed to the Aquatic SWG by Kristi Geris that same day.
5. *The Confederated Tribes of the Colville Reservation (CTCR) will inquire with Sherman Creek Hatchery about the availability of surplus brood year (BY) 2022 White Sturgeon and will communicate this with Douglas PUD, who will coordinate with Chelan PUD regarding Chelan PUD program fish on station at Wells Fish Hatchery (Item II-F).*
   Jason McLellan provided an update to Chas Kyger following the Aquatic SWG conference call on January 11, 2023, which was distributed to the Aquatic SWG by Kristi Geris that same day.

II. Summary of Discussions

A. DECISION: 2022 TDG/GAP Annual Report (John Rohrback)

John Rohrback said the draft 2022 TDG/GAP Annual Report was distributed to the Aquatic SWG by Kristi Geris on January 9, 2023. Rohrback said last month, he reviewed this draft report and no comments or edits have been received.

John Ferguson asked for questions or comments from the Aquatic SWG. Breean Zimmerman said Washington State Department of Ecology appreciates Douglas PUD reviewing the details of the report before distributing it for review. No other comments were expressed.

Aquatic SWG members present approved the 2022 TDG/GAP Annual Report.

Ferguson said both USFWS representatives are out sick. Andrew Gingerich said neither of them requested an extension to vote. Technically, this report is approved by Aquatic SWG members present. However, Douglas PUD would like to give USFWS an opportunity to vote and to record their vote in the administrative record, while also being sensitive to the February 28 deadline to the Federal Energy Regulatory Commission (FERC).

Anchor QEA will request from USFWS a vote via email on the 2022 TDG/GAP Annual Report, as approved by Aquatic SWG members present during today's Aquatic SWG conference call.
(Note: Geris sent this request following the Aquatic SWG conference call on February 8, 2023, and USFWS approved the 2022 TDG/GAP Annual Report via email on February 9, 2023.)

The final 2022 TDG/GAP Annual Report was distributed to the Aquatic SWG by Geris on February 13, 2023.

B. DECISION: 2023 GAP/BOP (John Rohrback)

John Rohrback said the draft 2023 GAP/BOP was distributed to the Aquatic SWG by Kristi Geris on January 11, 2023. Rohrback said that last month, he reviewed changes to this year's plan and no comments or edits have been received.

John Ferguson noted that today is just short of the 30-day review deadline and asked if any members are not ready to approve.

Breean Zimmerman asked whether Spillway 7 was only offline for maintenance last season or offline for previous seasons as well. Her reason for asking is that the 2022 TDG/GAP Annual Report discusses how Spillway 7 produces the smallest increase to total dissolved gas (TDG).
Andrew Gingerich said that Spillway 7 has been offline for 2 years. Maintenance crews hoped to complete this maintenance during the 2021 season, but the work ultimately took until halfway through the 2022 spill season; therefore, Douglas PUD chose to finish out 2022 implementing the approved 2022 GAP/BOP. Douglas PUD conducted TDG modeling and physical studies in the early 2000s,[1,2] which found that concentrated spill is effective at Wells Dam in minimizing TDG production when not spilling near the riverbanks. Likewise, Douglas PUD tries to avoid spilling in gates 1 and 11 because that spill can interrupt fishway performance. Spreading spill at Wells is as good as concentrated spill in terms of TDG under moderate spill volumes. However, because bypass barriers are in place to facilitate salmon passage, spread spill cannot be implemented. Concentrated spill and spread spill perform similarly in terms of total TDG production, but Douglas PUD attempts to avoid "dentated spill." Dentated spill, which is when spill occurs at every other spillway across the face of the dam rather than adjacent spillways, produces about 1% to 4% more TDG compared to spreading spill or concentrated spill. As such, during the bypass season, concentrated spill gives us the best TDG performance of the spill options. He is not sure if Spillway 7 necessarily performs better than Spillway 9. Spillway 9 is likely as good as Spillway 7.

Aquatic SWG members present approved the 2023 GAP/BOP.

Anchor QEA will request from USFWS a vote via email on the 2023 GAP/BOP, as approved by Aquatic SWG members present during today's Aquatic SWG conference call. *(Note: Geris sent this*

[1] EES Consulting, 2008. *Total Dissolved Gas Production Evaluation of Spill Operations for 2007*. Bellingham, Washington.
[2] Politano, M., A. Arenas Amado, and L. Weber, 2009. *An Investigation into the Total Dissolved Gas Dynamics of the Wells Project (Total Dissolved Gas Investigation)* Wells Hydroelectric Project FERC No. 2149.

request following the Aquatic SWG conference call on February 8, 2023, and USFWS approved the 2023 GAP/BOP via email on February 9, 2023.)

The final 2023 GAP/BOP was distributed to the Aquatic SWG by Geris on February 13, 2023.

C. Draft 2023 ASA Action Plan (Andrew Gingerich)

Andrew Gingerich said the draft *2023 Aquatic Settlement Agreement and Workgroup Action Plan* was distributed to the Aquatic SWG by Kristi Geris on February 7, 2023. Gingerich said this is the same document Aquatic SWG members see each year. It is organized by aquatic resource management plan (MP), and outlines activities planned for the year. This document is not submitted to FERC but provides a good opportunity to catch any missing items and helps with planning. Most items are consistent year to year. Unique and other specific items were discussed, as follows:

<u>White Sturgeon MP</u>

2. BY 2022 Juvenile White Sturgeon Tagging/Marking – February 2023

Gingerich added "and SAP screening" to this item, which is not included in the draft distributed on February 7, 2023, but will be included in the final.

4. 2022 Reproductive Assessment Report – February 2023

Gingerich said last year during field season, Chas Kyger, John Rohrback, and others put in a big effort on egg mats and larval drift nets. This report is expected to be issued soon. Recall, this activity is required by the White Sturgeon MP.

6. Evaluation of Adult Passage Measures – June 2024

Gingerich said this item should say "June 2023." Section 4.4 of the White Sturgeon MP discusses additional adult passage measures and Douglas PUD must demonstrate efforts to meet the criteria outlined in this section. He encouraged Aquatic SWG members to review this section in preparation for forthcoming discussions.

Ralph Lampman asked which method will be used to evaluate adult passage. Gingerich said, first, there needs to be a conversation about what the requirement says and whether the three criteria have been met. John Ferguson suggested reviewing the language, and Geris shared Section 4.4 of the White Sturgeon MP on WebEx, notably these three criteria:

> 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]

Jason McLellan asked whether this is talking about volitional passage. Ferguson said it does not say.

Laura Heironimus asked whether criterion iii means that if one of the other operators does not want to implement adult passage, then Douglas PUD does not have to? Does there have to be consensus? Gingerich said he thinks this is how the language reads. The footnote seems to mean the criterion would not be satisfied to just have passage at Wells Dam. Heironimus asked whether this language is included in the FERC licenses for the other Mid-Columbia PUDs. Gingerich said he does not know the answer to this question.

Ferguson said there is quite a bit to unpack here, and he asked whether this is due in 2023. Gingerich said these discussions must take place in Year 11 of the FERC license, so Douglas PUD is proposing to start the discussions in June 2023. It seems it might be a challenge to meet all three criteria in one year. For criterion i, he can see a situation where fish may leave the reservoir, then there are monitoring and evaluation (M&E) data showing that fish are surviving and occupying the Wells Reservoir. Does this indicate biological benefit? He does not know. For criterion ii, he has not done a deep dive on White Sturgeon passage and success. This might not necessarily only be ladder passage, it could also include trap and haul. For criterion iii, are there any issues for comanagers on this? To Heironimus's point, the footnote is clear. It is not enough to have passage only at Wells Dam; the intent is to have connectivity with the Hanford Reach population. Gingerich said this does not need to be figured out today; the Aquatic SWG just needs to address the objective this year.

Lampman asked whether there are any indications that White Sturgeon are approaching Wells Dam to try and pass. Gingerich said intent is hard to get at. White Sturgeon do spend time in the Wells Dam tailrace, where they feed. But are they trying to pass the dam? This he cannot say. There have been fish recaptured in the Wells Reservoir that were Chelan PUD releases. Those fish did not pass through the ladders; they were either released by anglers or "locked themselves though"[4] during a maintenance period. Douglas PUD has conducted a lot of M&E over the last near-decade and have only encountered one to three fish belonging to Chelan PUD.

Lampman asked whether any White Sturgeon have been observed at the count window. Gingerich said no. There have been detections of acoustically tagged Chelan PUD fish in the collection gallery

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

[4] When the upstream bulkhead is installed, fish can access the turbine scroll case from the tailrace before the downstream bulkhead is installed. During dewatering of the turbine unit, river water is continuously flowing into the scroll case and fish can hold here. Once the upstream bulkhead is removed the fish can then swim into forebay.

and maybe at Pool 19 (he would need to verify this) but never at the count window, which is located at about Weir 16 or so.

Ferguson said that at U.S. Army Corps of Engineers dams, he recalls: 1) ladder passage is low; 2) passage is primarily through the navigation locks; and 3) fish can also "lock themselves through," as Gingerich described.

McLellan said there has been evidence in some facilities in the Columbia River Basin of juvenile White Sturgeon using ladders. This is fairly infrequent, and some ladders seem to have more use than others. There are design considerations. Most of these fish are larger juveniles or subadults and are associated with using the navigation lock or what is suspected to have happened at Wells Dam in the past (locking themselves through). White Sturgeon historically have made long-distance movements for various reasons, mostly in a downstream direction since dams have been constructed, but there are some isolated upstream movements. For example, a fish with scute marks consistent with the Wells hatchery population was detected in Osoyoos Reservoir. A Lake Roosevelt PIT-tagged White Sturgeon was recaptured in the transboundary reach of the Upper Columbia River and then later in the Revelstoke Reach, which indicates the fish passed through Hugh Keenleyside Dam. He thinks there is some biological benefit for restoring upstream passage, but he thinks these criteria are challenging.

McLellan said, regarding criterion iii, he is curious about the strategy for how to evaluate this or how to have this discussion. He can see this easily being dismissed if the strategy by which the Aquatic SWG approaches the other operators is not well thought out. This is something to consider. He does not believe people will be open to this idea unless there is solid data to back it up. Kyger agreed, and said he thinks criterion i and criterion ii need to be addressed in order to get to criterion iii. Heironimus added that it does not seem as if criterion iii has a timeline, so maybe get started on these discussions, but nothing needs to be completed right away. Ferguson also suggested starting the discussions within the other fish forums ahead of June 2023.

<u>Bull Trout MP</u>

5. Continue Bull Trout Movement and Life History Investigation, Tag 60 Fish Greater than 450 Millimeters Fork Length, Bull Trout at Wells Dam and the Twisp Weir – January to April 2023

Gingerich said that this addresses whether to continue putting out PIT tags this year, notably this spring. Steelhead brood collection in the Methow River Basin starts as soon as next week. There is a chance crews will incidentally encounter Bull Trout, creating an opportunity to PIT-tag these fish to support the ongoing 2022 Bull Trout PIT Study. Douglas PUD wants confirmation from the Aquatic SWG to continue down this path.

Ferguson asked whether the Twisp Weir panel has been fixed. Gingerich said the weir will be in and fishing in a fixed status (i.e., cannot actuate the panels). There might be some opportunity to capture Bull Trout, but he is not optimistic there will be many caught. He believes the opportunity in the Methow associated with the collection of steelhead broodstock over the next several weeks will be the highest hope to get more study fish. He caveated there is no guarantee these fish will interact with the Twisp Weir or Wells Dam, but there is a chance.

McLellan said the CTCR are supportive of PIT-tagging any Bull Trout that are handled. Lampman said the YN supports the same. Heironimus and Patrick Verhey agreed that WDFW is in support of continued PIT-tagging.

6. Track Study Fish Throughout Study Range – January to November 2023
Lampman asked whether this date range should extent to December 2023 and whether Douglas PUD knows for certain there will be no tracking in December. Gingerich said that is a good question. Partly, Douglas PUD is hoping to develop a draft report, and this date range leaves 1 month to do this. Secondly, the intent of the 2022 Bull Trout PIT Study, in lieu of radio telemetry, was to track fish through spring 2023. The justification here was that by fall 2022, any handling effect incurred on fish was likely accounted for, so the plan was to tag fish in spring 2022 and monitor the fish in fall 2022 and subsequent spring 2023. There is likely no need to track fish this fall (2023) because generally speaking, downstream movement when fish are looking for a tributary in which to overwinter or downstream movement post-spawn occurs before the end of November. That said, as long as the fish still has a tag, it can be tracked. Douglas PUD can run another query in fall 2023 to include in the reporting. Kyger suggested editing this item to "Continue tracking from fall 2022 to fall 2023." Lampman agreed.

<u>Water Quality MP</u>
8. Draft 10-Year Water Quality Attainment Plan Report – June 2023
Gingerich said this is a 10-year check-in for water quality attainment, which will describe TDG performance at the Project and what actions were taken to minimize TDG at the Project. Back in 2013, Douglas PUD and the Aquatic SWG authored a Water Quality Attainment Plan. This was a 10-year planning document, and this report describes those 10 years of implementation.

<u>Pacific Lamprey MP</u>
4. Juvenile Pacific Lamprey PIT-Tagging and Migration Monitoring, Methow River at Carlton Rotary Screw Trap – March to August 2023
Lampman asked whether tagged Pacific Lamprey can be released upstream of the screw trap to help monitor trap efficiency and estimate overall run size. Kyger said this is done for all tagged fish for the reasons Lampman described. Lampman asked Kyger to double check. Kyger said Douglas PUD will

verify this. *(Note: Rohrback provided a response from WDFW on February 22, 2023, which Geris distributed to the Aquatic SWG that same day.)*

7. Incorporate Pacific Lamprey MP Activities into Aquatic Settlement Agreement Annual Report to the FERC – March 2023
Lampman asked why this is March and not May, similar to the other categories. Gingerich explained that the report is distributed for Aquatic SWG review in March and submitted to FERC in May. This date can be changed to May 2023.

Aquatic Nuisance Species MP
2. Verify Condition of Aquatic Nuisance Species Signs at Boat Launches and Add Northern Pike (Esox lucius) Signage – Throughout 2023
Lampman said the YN has a lamprey bait flyer that states that it is illegal to use lamprey as bait. He thinks this is a bigger issue in the Lower Columbia River, but it would be useful to have these posted in the Upper Columbia River too. He asked if he provides this flyer, can Douglas PUD post this around the reservoir next to other signage? Rohrback recalled doing this for WDFW's White Sturgeon reporting tool and said Douglas PUD can do this for the YN's lamprey flyer too. Lampman said he will provide a lamprey bait flyer to Douglas PUD for posting around the Wells Project.

5. Crayfish Incidental Captures Database Management – Throughout 2023
Lampman asked whether Douglas PUD can share these data with The River Mile Network, which also manages a crayfish database. Kyger said Douglas PUD is supportive of sharing these data upon request. Lampman said he will let The River Mile Network know. He asked whether Douglas PUD collects the global positioning system coordinates, date, and species. Kyger said yes. Lampman asked which species are typically observed. Kyger said only non-native Northern Crayfish (*Orconectes virilis*) and native Signal Crayfish (*Pacifastacus leniusculus*) have been detected in the Wells Reservoir. Mostly non-native crayfish are observed.

Ferguson asked how these are incidentally caught. Kyger said typically the crayfish are attached to acoustic receivers when they are brought to the surface for servicing or are collected during electrofishing. He does not encounter many. Gingerich said crayfish are also sometimes encountered when dewatering the fish ladders, in the collection gallery and lower ladders. Lampman asked whether Douglas PUD has photos, and Kyger said he has some that have been collected over past years.

6. Crayfish Monitoring – October 2023
Lampman asked whether this is a trapping effort. Kyger said yes, Douglas PUD conducts this every fall, and results are included in the Aquatic Nuisance Species MP Annual Report. Lampman asked

which type of traps are used. Kyger said prawn traps, which are rectangular, wire-mesh traps, baited with pikeminnow and deployed throughout the reservoir.

7. Northern Pike Monitoring, eDNA and Aquatic SWG-Approved Suppression – March to October 2023
McLellan asked, in the event a Northern Pike is detected, will Douglas PUD come back to the Aquatic SWG and any other entities associated with aquatic invasive species and implement whatever the Aquatic SWG agrees on for suppression? Kyger said yes and recalled that the Northern Pike Rapid Response Plan was developed for the Wells Reservoir for this very reason and was approved by the Aquatic SWG in 2019.[5] This plan identified potential suppression methods if Northern Pike were to be detected, which method to use, goals and objectives, and relies on consultation with the Aquatic SWG and comanagers.

8. Update, As Needed, the Northern Pike Rapid Response and Eradication Plan – Throughout 2023
McLellan said the CTCR funded a recently developed Regional Northern Pike Rapid Response Plan. First, he wonders how Douglas PUD's plan fits in with this regional plan. He has not reviewed either recently. Second, is Douglas PUD aware that WDFW is also developing a Statewide Northern Pike Rapid Response Plan, and again, how would updates to Douglas PUD's plan fit within the statewide plan? Kyger said Douglas PUD is aware of the other rapid response plans. He knows the CTCR-funded regional plan was finalized last year, and WDFW is currently working on the statewide plan. He understands Dr. Erika Rubenson (Four Peaks Environmental Science & Data Solutions [Four Peaks]) is helping develop the statewide plan and helped develop the regional plan. Kyger is not sure what updates are needed for the Douglas PUD plan. Perhaps the Aquatic SWG can review the other plans to see what to incorporate into Douglas PUD's plan. Douglas PUD was the first entity to finalize a plan, so other things may have solidified since then. Douglas PUD is open to any updates the Aquatic SWG believes need to be made to the plan.

McLellan said the CTCR-funded plan was supposed to be a Mid-Columbia regional collaboration rapid response plan. The plan was developed in consultation with Four Peaks, which reached out to interested entities to get feedback. This is a nonbinding plan. The intent was to develop a standardized process for responding to Northern Pike if encountered in any one of the Mid-Columbia reservoirs. He understands that Douglas PUD had an opportunity to provide input. Subsequent to this, WDFW contracted with Four Peaks to develop a statewide rapid response plan. His point is, it makes sense to have consistency among plans, and he wonders whether this many plans are even needed. It seems one overarching plan makes the most sense. He has not yet had a chance to look at consistencies between the existing plans, but it seems this needs to be done at some point.

[5] The *Northern Pike Monitoring and Response Plan* was approved by the Aquatic SWG on May 8, 2019.

Kyger said Douglas PUD has no strong preference for any one plan. He believes the CTCR-funded regional plan is similar to Douglas PUD's plan. Douglas PUD just felt a need to have something in place before any regional plans were available. If the Aquatic SWG agrees to adopt one overarching plan, Douglas PUD is supportive of this. Maybe the path forward is to wait and see what happens with the statewide plan and go from there.

Ferguson asked Verhey and Heironimus about the timeline for the statewide plan. Heironimus said she will inquire internally about this. Kyger said there is a meeting on Monday, February 13, 2023, where he understands WDFW and Four Peaks are providing an update on the statewide plan. Ferguson suggested hearing a presentation on all three plans, once available, then go from there. McLellan agreed with this plan. *(Note: Heironimus provided an update indicating the plan will be complete on July 1, 2023, which Geris distributed to the Aquatic SWG on February 21, 2023.)*

Resident Fish MP

Lampman asked whether monitoring for freshwater mussel species can be included under Resident Fish MP activities. Kyger said native mussels are not covered under any of the MPs, just monitoring for invasive mussels. Douglas PUD has information documenting Western Ridged Mussel (*Gonidea angulata*), but other than this, he is not sure how freshwater mussels would fit under an MP because these are not called out in specific actions. Ferguson asked Lampman whether this makes sense, that Douglas PUD needs to stay within the MP structure. Lampman said yes.

3. Resident Fish Electrofishing Monitoring – April to August 2023

Lampman asked whether this happens every year. Kyger said this process overlaps with aquatic nuisance species electrofishing for Northern Pike. There is also a nexus with the Water Quality MP for biological monitoring of resident fish.

McLellan asked about electrofishing as a Northern Pike monitoring activity. Kyger said yes, in the spring, this is done alongside eDNA sample collection. Douglas PUD conducts electrofishing from March to June in areas believed to be good Northern Pike habitat.

Lampman asked about the depth range for electrofishing. Kyger said generally, electrofishing is only effective in 10 feet or fewer of water, especially in water with lower conductivity that is typical of the Wells Reservoir. For example, Douglas PUD targets backwater slough areas for electrofishing.

5. Regional Coordination Including CRITFC Stomach Analysis – Throughout 2023

Lampman asked which species this is referring to. Kyger said Douglas PUD has a Northern Pikeminnow Removal Program that falls under the Wells Habitat Conservation Plan, but because Northern Pikeminnow is a resident fish, it is included here too. He cannot recall the percentage of fish examined for stomach contents, but sharing this information was added based on a

comment from the YN. This occurs every year. A contractor examines a certain number of fish to identify stomach contents.

McLellan asked, does Douglas PUD's contractor both capture the fish and conduct the analysis of stomach samples? Kyger said this is correct, whatever can be identified. For Pacific Lamprey, these are digested quickly, so there is not a lot of faith in identifying Pacific Lamprey unless it was recently consumed. The main interest is in salmon and steelhead smolts, which is the rationale behind the removal program—to reduce smolt predation. McLellan asked whether the stomach analysis is conducted in the lab or on the boat. Kyger said on the boat. McLellan asked whether this information is then shared with the Columbia River Inter-Tribal Fish Commission (CRITFC). Kyger said this was an action item Lampman requested last year. However, he is not sure that CRITFC has ever contacted Douglas PUD. Douglas PUD is supportive of sharing these data upon request.

Lampman asked whether these activities generally occur from March to June. Kyger said Northern Pikeminnow collection typically starts in March, depending on weather and water conditions. There is a lull in the summer, and then it picks up again in the October/November timeframe, weather permitting. Lampman asked whether the CRITFC involvement was related to eDNA work. Gingerich said he cannot recall. Lampman said he will review past meeting minutes to figure this out. *(Note: Lampman distributed an email following the Aquatic SWG conference call on February 8, 2023, with an excerpt from the Aquatic SWG conference call on February 10, 2021, explaining that CRITFC is interested in preserving any samples that have morphologically identifiable Pacific Lamprey for genetic analysis.)*

7. Draft 2024 Resident Fish Assemblage Study Plan to Aquatic SWG for Review – December 2023
Lampman asked whether this study is every 5 years or 10 years, Kyger said this study is conducted every 10 years. It was last conducted in 2014. Douglas PUD plans to develop a study plan for Aquatic SWG review later this year and then implement the study in 2024.

Discussion
Gingerich encouraged Aquatic SWG members to review the action plan and reach out with questions or comments to address before next month's meeting. Ferguson asked whether Douglas PUD plans to request approval of the plan next month. Gingerich said yes. He could not recall if RD Nelle has reviewed this action plan in past years. Ferguson said Anchor QEA will notify USFWS that Douglas PUD plans to request approval of the *2023 Aquatic Settlement Agreement and Workgroup Action Plan* during the Aquatic SWG conference call on March 8, 2023, and to reach out to Douglas PUD with questions. *(Note: Geris sent this notification following the Aquatic SWG conference call on February 8, 2023.)*

D. 2022/2023 Wells Dam Winter Maintenance Update (Chas Kyger)

Chas Kyger said the Wells Dam east fishway was dewatered for winter maintenance last month. He collected photographs and video of plating installed throughout the lower ladder and collection gallery, which he shared with the YN. All maintenance is now complete, and the east fishway has been rewatered. Ralph Lampman provided 2022/2023 Wells Dam Winter Maintenance East Fishway Photographs (Attachment B) prior to the Aquatic SWG conference call on February 8, 2023, which Kristi Geris distributed to the Aquatic SWG following the conference call. Geris shared Attachment B on WebEx.

Slide 1

Kyger said this spacing has been noted and remeasured several times, and it is always within specification. The spacing may appear wider than it is due to the adjacent bars being narrow. He can ask the mechanics to measure it again, or he can measure it himself next time the ladder is dewatered. Lampman said the spacing should be 3/4 inch.

Slide 2

Kyger said he has not seen this gap and does not know what it is. There is plating installed to the edge of the gap, and it does not appear to be wide enough to be out of specification, but he will measure this during the next outage. Lampman suggested installing wider plating and flat screws along the edges. He believes the current plating is 3 inches wide, but this is not wide enough to provide a continual surface for Pacific Lamprey to attach to when migrating up the ladder. Kyger said using wider plating starts to cover diffuser spacing and can affect the hydraulic properties of the flow coming out of the diffuser, so he will need to ask engineering if this is feasible. Lampman said connecting two plates should not create too big of a difference.

Slide 3

Kyger said this plating was broken, perhaps by netting during fish salvage operations. He already requested these repairs. The mechanical crew said this would be completed and photos would be provided; however, Kyger has not received these photos. He will request these.

Slides 4 to 7

Kyger said that, typically, these panels are flush with the floor. During maintenance, crews unbolt the bottom panels to remove debris from behind the panels, and then the panels are replaced. Lampman asked about the openings on the sides. Kyger said he believes those are bolt access holes, but he can verify this next year. The bolt head sticks out flush with the opening so there is no gap.

Discussion

John Ferguson summarized that Douglas PUD will coordinate with Wells Dam mechanical staff to: 1) ask about the feasibility of widening the 3-inch plating around diffuser gratings with regards to

hydraulics through the open area of the diffuser; 2) request any additional photographs taken of reducing gaps in the east fishway during the 2022/2023 Wells Dam winter maintenance period; and 3) make a note to recheck measurements of the areas depicted in the photographs shared during today's Aquatic SWG conference call (Attachment B).

Lampman said he believes Grant PUD installed 12-inch plating in the Priest Rapids Dam collection gallery. Ferguson asked whether this covered part of the diffuser grating. Lampman said it did but not enough to cause issues.

Lampman asked whether any photos were taken in the count station area. Kyger said he does not believe so. Crews focused on the lower ladder and collection gallery. There are photos of the count station from the past, and there have no further improvements in that area. Each time he has checked, there were no damage or gaps. He will resend or provide the location of the latest photographs taken of the Pacific Lamprey improvements installed in the Wells Dam count window areas.

Lampman asked whether the low-level entrance is still discontinued. Kyger said yes, this area kept refilling with sediment and there were no PIT detections in the lamprey boxes. The area was deemed more of a safety and maintenance nuisance, so the entrance was closed.

E. BY 2022 White Sturgeon Rearing Update (Chas Kyger)

A BY 2022 White Sturgeon Rearing Update (Attachment C) was distributed to the Aquatic SWG by Kristi Geris prior to the conference call on February 8, 2023.

Chas Kyger said that on Monday, February 6, 2023, crews scute-marked and PIT-tagged 328 BY 2022 White Sturgeon for the Douglas PUD Program. The remainder of fish on station will go to the Chelan PUD Program. Blood sampling for spontaneous autopolyploidy (SAP) for Douglas PUD fish will occur at a later date. Approximately 50 fish were lost after Chelan PUD fish were PIT-tagged and sampled for SAP. There were issues with the blood draw protocols, but these issues have since been resolved. There have been no additional mortalities since the last blood draw. Program targets will be met for Douglas PUD but will be a little short for Chelan PUD.

Jason McLellan further explained that last year, when the CTCR crews drew blood samples for SAP, typically, blood was drawn from a ventral location posterior to the anal fin. With smaller fish, sometimes less-experienced staff accidentally pushed the needle through the caudal peduncle when searching for the vein, drawing up other material besides blood, and requiring the fish to be resampled and the sample rerun. To remedy this, the blood draw location was changed to a location just anterior to the anal fin. Last fall, this was tested with 500 fish at Sherman Creek Hatchery with no issues observed. This year, on the first draw with less-experienced staff on a subsample of fish, while

trying to locate the vein, the needle hit the notochord, causing paralysis of the fish, and the fish did not recover. For the second draw, crews decided to go back to drawing from the location posterior to the ventral fin and were effective in withdrawing blood without any issues. Clearly, if staff are to draw blood from a location anterior to the anal fin, more training is needed.

Andrew Gingerich said he appreciates this update and explanation. He asked whether results are available from the first round of screening. McLellan said of the 500 fish sampled, there were no abnormal ploidy fish (i.e., all were 8N[6]). Crews are partway through the second session, and as of now, he has not been notified of any fish of abnormal ploidy. Last October 2022, the CTCR sampled a little more than 500 BY 2021 White Sturgeon at Sherman Creek Hatchery. These fish were the same as the 1,300 BY 2021 White Sturgeon for the Chelan PUD Program. That is, they were wild larvae collected from Lake Roosevelt in July 2021. Of the 500 fish sampled, there were 2 12N[7] fish, resulting in a total of 3 12N fish out of 1,800 BY 2021 White Sturgeon sampled. This equals approximately a rate of 0.17%, which is not a very high number.

Gingerich asked whether any surplus BY 2022 fish from Wells Fish Hatchery are still at the CTCR Resident Fish Hatchery. McLellan said the first batch of surplus fish from Wells were Calcein (Se-Mark) marked and released into Lake Roosevelt, along with a few thousand fish from Sherman Creek Hatchery. The second batch from Wells Fish Hatchery went to the CTCR Resident Fish Hatchery. The last he had heard, the CTCR still have approximately 1,000 fish, and they are destined for release into Rufus Woods Lake. If fish are needed to meet stocking objectives, he thinks a few hundred of these could be available. Additionally, there are also surplus fish (approximately 1,000 fish) at Sherman Creek Hatchery. McLellan has conveyed this to Chelan PUD, but he is unsure about what they want to do.

Ferguson asked when the SAP sampling will be complete. McLellan said there are at least two sessions remaining at Wells Fish Hatchery, likely three. Most large fish have been sampled. Some of the smaller fish may still be too small to sample. In total, approximately 2,100 BY 2022 White Sturgeon will be sampled for SAP. Surplus fish destined for Rufus Woods Lake will also be screened.

Ferguson recalled that at one point, the plan was to release all fish regardless of ploidy, and have Douglas PUD remove any 12N fish that are subsequently encountered during White Sturgeon M&E. McLellan explained that last year, the CTCR requested to screen BY 2021 White Sturgeon destined for the Wells Reservoir. This was a last-minute request. The CTCR offered to perform the screening at no cost. However, the CTCR's Coulter counter broke, and the screening did not take place. The

[6] White Sturgeon are normally evolutionary octoploids, which have eight copies of each chromosome (8N).
[7] Twelve copies of each chromosome or irregular fish.

agreement at that time was as Ferguson recalled. Moving forward, starting with BY 2022, all fish will be screened, and abnormal ploidy fish will be removed prior to release.

F. Bull Trout PIT-Tagging: Methow Basin Incidental Captures (Andrew Gingerich)

Andrew Gingerich said he has nothing more to add on this topic. He appreciates the feedback and will follow up with USFWS. Gingerich said RD Nelle expressed some support via email, but Nelle wanted to have the discussion with the Aquatic SWG.

Douglas PUD will follow up with USFWS regarding PIT-tagging of Bull Trout incidental captures in the Methow River basin for inclusion in the 2022 Bull Trout PIT Study.

III. Administration

A. 2022 Aquatic Settlement Agreement Annual Report (John Ferguson)

John Ferguson said the draft 2022 Aquatic Settlement Agreement Annual Report and six resource MP annual reports will be distributed on March 10, 2023, for a 45-day Aquatic SWG review with comments due April 24, 2023.

B. Upcoming Meetings (John Ferguson)

The Aquatic SWG meeting on March 8, 2023, will be held by conference call.

Other upcoming meetings include April 12 and May 10, 2023 (to be determined).

List of Attachments

Attachment A List of Attendees
Attachment B 2022/2023 Wells Dam Winter Maintenance East Fishway Photographs
Attachment C BY 2022 White Sturgeon Rearing Update

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
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
Jason McLellan	Aquatic SWG Technical Representative	Confederated Tribes of the Colville Reservation
Ralph Lampman	Aquatic SWG Technical Representative	Yakama Nation

Notes:
* Left the meeting after Item II-B.


Media Player
Some of the grates have wider spacing that needs filling
(not only in the gallery section but also in the lower ladder)
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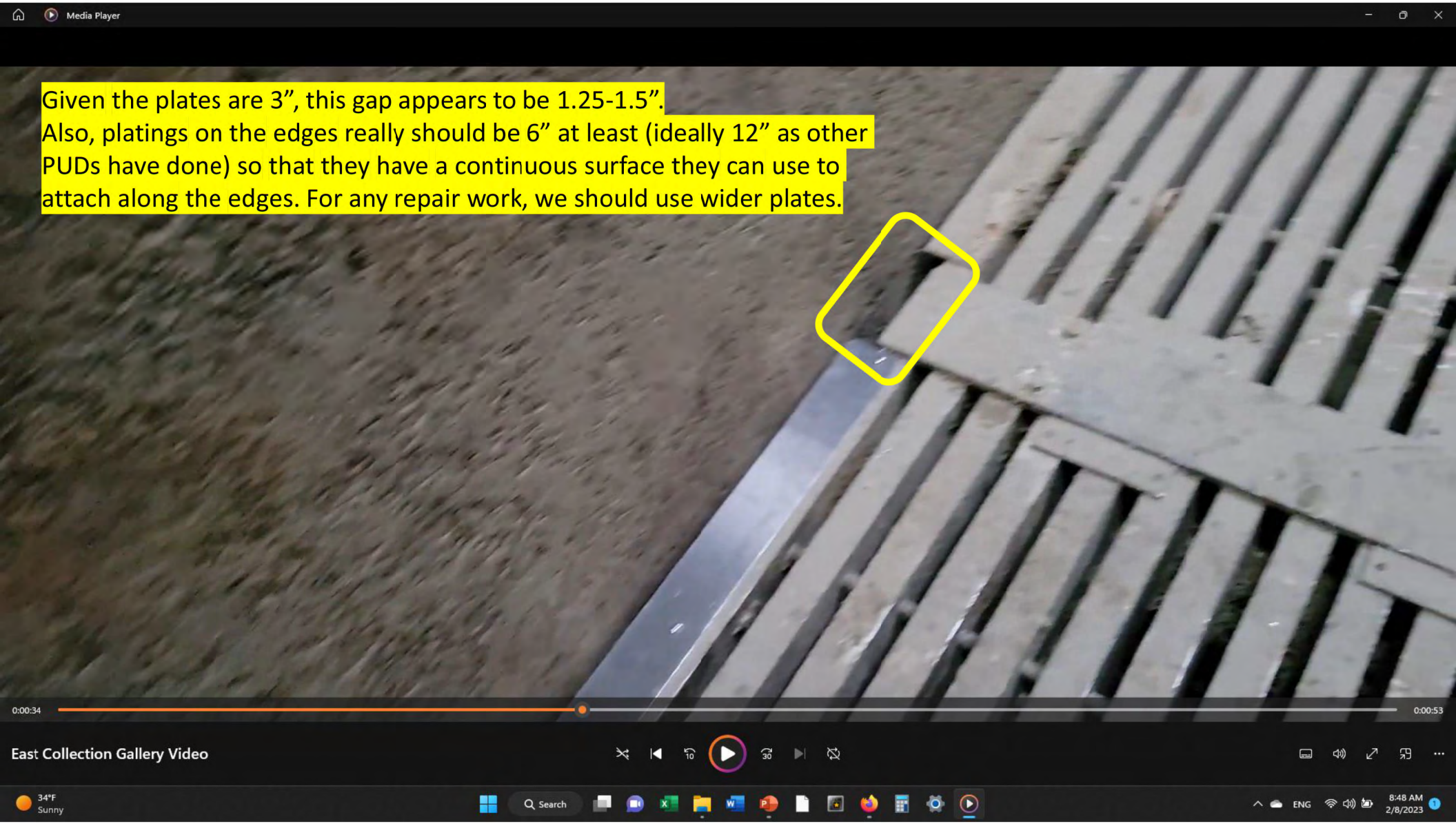
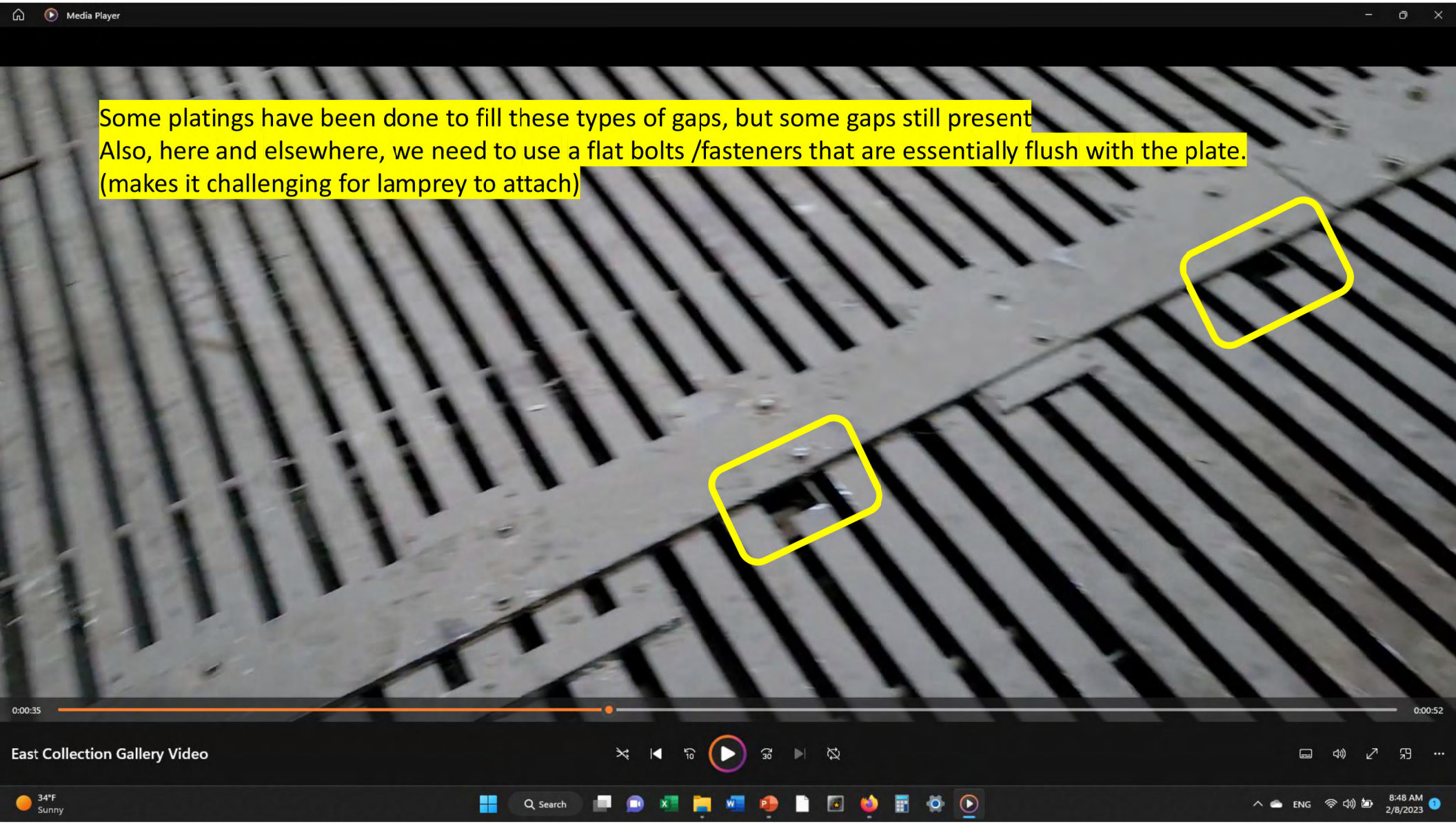
0:01:09
Skip back 10 seconds (Ctrl+Left)
East Collection Gallery Video
34°F
Sunny
Search
ENG
2/8/2023


Media Player
Given the plates are 3”, this gap appears to be 1.25-1.5”.
Also, platings on the edges really should be 6” at least (ideally 12” as other PUDs have done) so that they have a continuous surface they can use to attach along the edges. For any repair work, we should use wider plates.
0:00:34
0:00:53
East Collection Gallery Video
34°F
Sunny
Search
ENG
8:48 AM
2/8/2023


Media Player
Some platings have been done to fill these types of gaps, but some gaps still present
Also, here and elsewhere, we need to use a flat bolts /fasteners that are essentially flush with the plate.
(makes it challenging for lamprey to attach)
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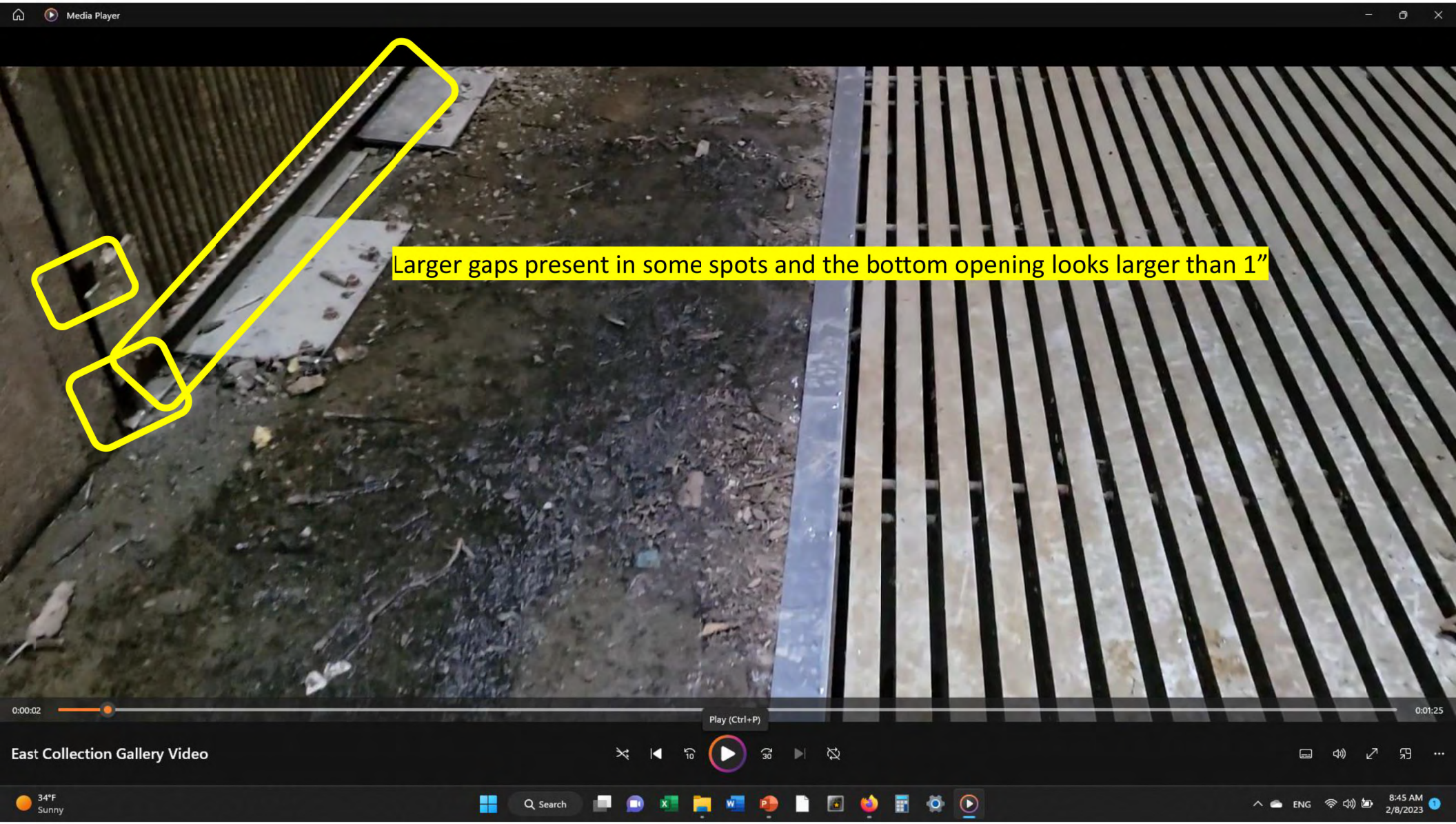
0:00:52
East Collection Gallery Video
34°F
Sunny
Search
ENG
8:48 AM
2/8/2023


Media Player
Larger gaps present in some spots and the bottom opening looks larger than 1”
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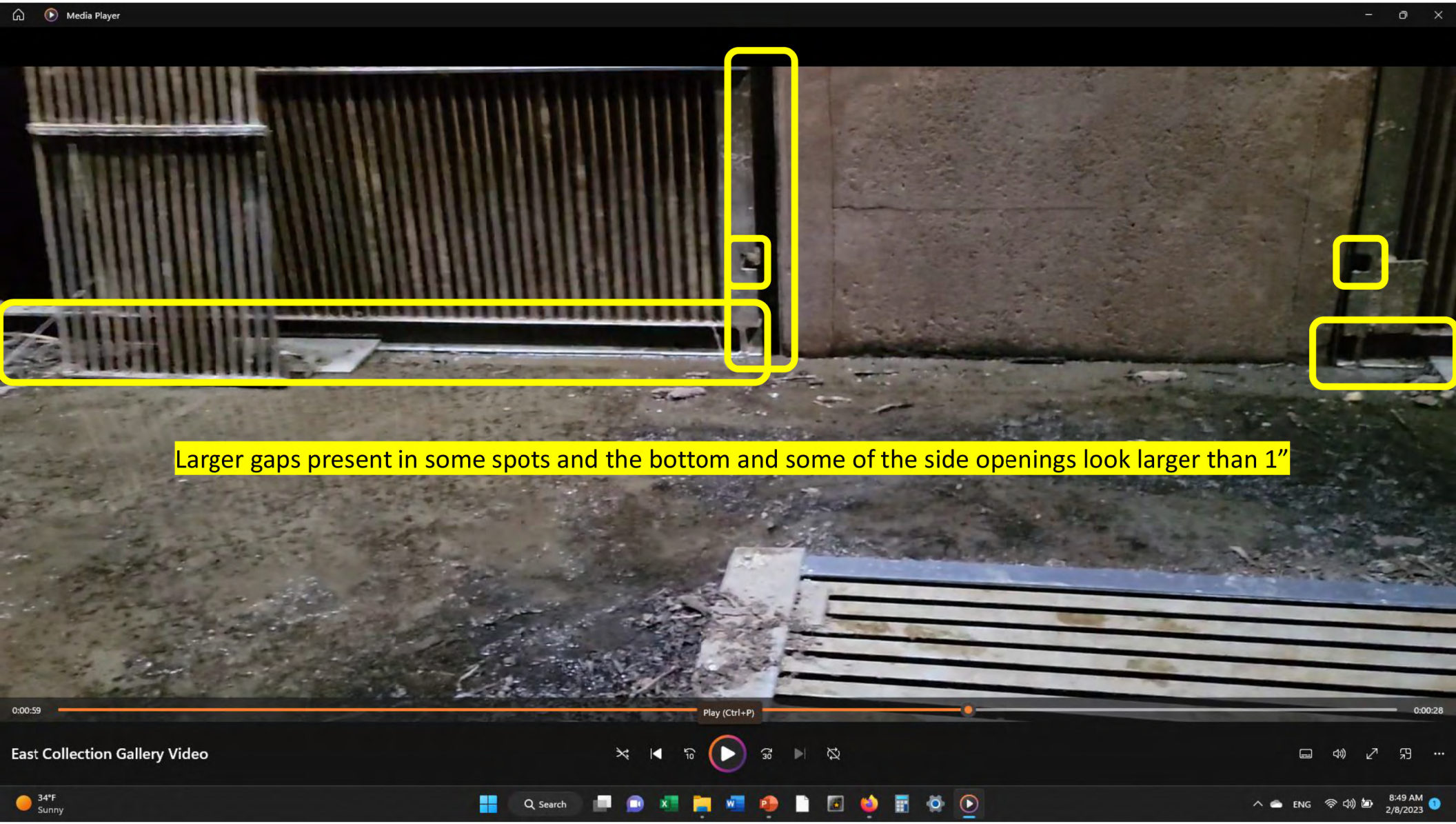
8:45 AM
2/8/2023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Larger gaps present in some spots and the bottom and some of the side openings look larger than 1”
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34°F
Sunny
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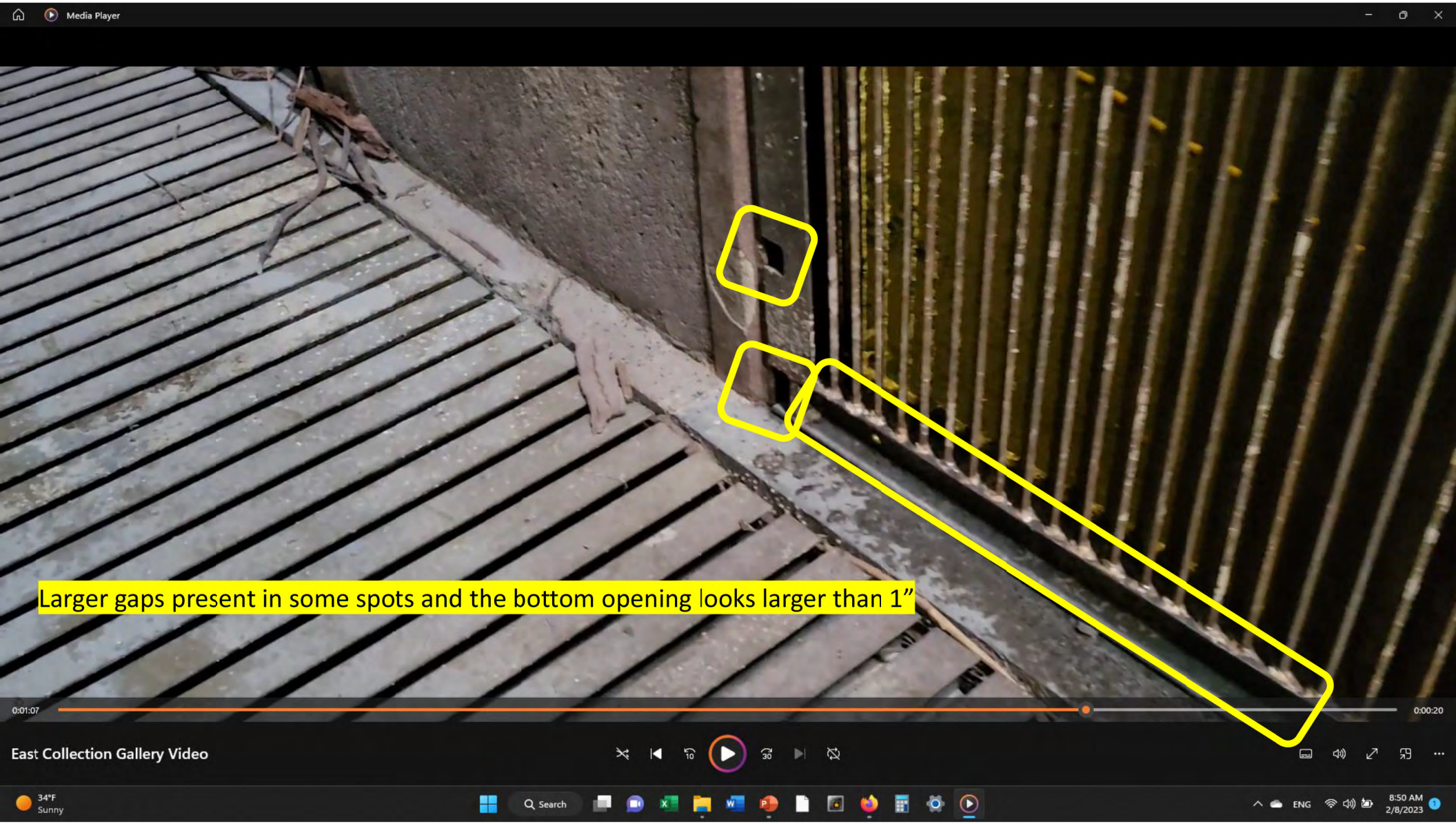
ENG
8:49 AM
2/8/2023


Media Player
Larger gaps present in some spots and the bottom opening looks larger than 1”
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Sunny
Search
ENG
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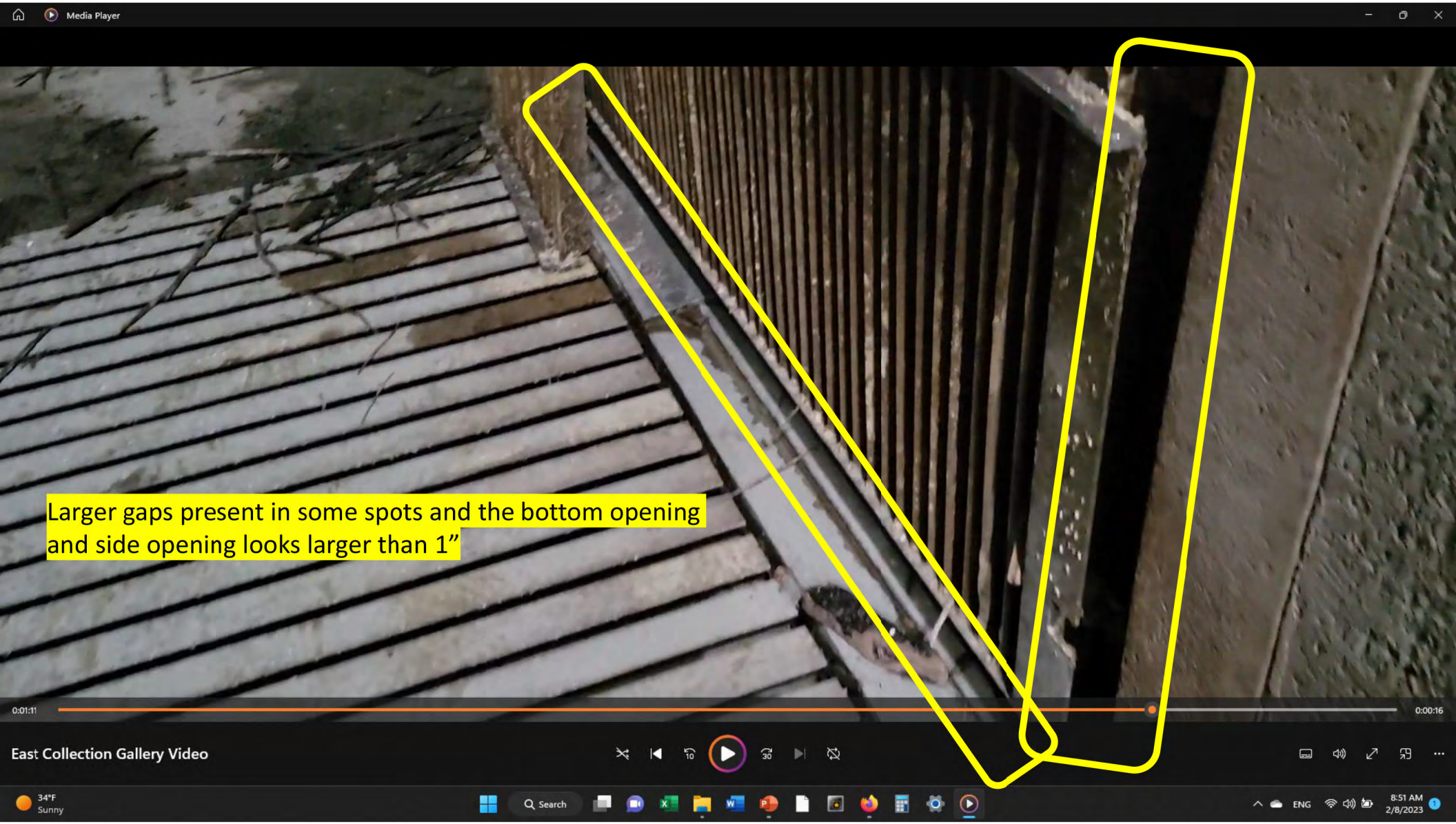
2/8/2023


Media Player
Larger gaps present in some spots and the bottom opening and side opening looks larger than 1”
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0:00:16
East Collection Gallery Video
34°F
Sunny
Search
ENG
8:51 AM
2/8/2023

	10-Jan		8-Feb	
Tank	Population	Grams	Population	Grams
1	116	181.6	179	50.7
2	217	68.8	155	66.8
3	90.00	26.7	110	267.1
4	115	174.6	109	267.1
5	219	49.9	109	267.1
6	198	129.7	--	--
7	156	30.1	236	68.8
8	54	13.9	41	18.5
9	215	98.7	98	152.9
10	--	--	224	46.3
11	135	27.9	122	31.6
12	225	49.7	136	127.2
Mag 1	797	224.8	--	--
Mag 2	--	--	948	206.4
Total	2,537	108.7	2,467	148.4

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

FINAL

Conference Call Minutes

Aquatic Settlement Work Group

To: Aquatic SWG Parties Date: April 12, 2023

From: John Ferguson, Chair, Anchor QEA, LLC

Re: Final Minutes of the March 8, 2023, Aquatic SWG Conference Call

The Aquatic Settlement Work Group (SWG) met by conference call on Wednesday, March 8, 2023, 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, LLC, will set a reminder to revisit this action item in November 2023: *Douglas PUD will coordinate with Wells Dam mechanical staff to do the following: 1) ask about the feasibility of widening the 3-inch plating around diffuser gratings with regards to hydraulics through the area; 2) request any additional photographs taken of reducing gaps in the east fishway during the 2022/2023 Wells Dam winter maintenance period; and 3) make note to recheck measurements of the areas depicted in the photographs shared during today's Aquatic SWG conference call (Attachment B to the Aquatic SWG February 8, 2023, conference call minutes)* (Item I-C). *(Note: Kristi Geris set this reminder, as discussed.)*
2. Anchor QEA will update the Yakama Nation (YN) Aquatic SWG Policy Representation and Technical Alternate designations to replace Donella Miller with David Blodgett, III (Item II-A). *(Note: Kristi Geris updated Aquatic SWG email lists and extranet access following the Aquatic SWG conference call on March 8, 2023.)*
3. Anchor QEA will share with Washington State Department of Ecology (Ecology) any new edits made to the *2023 Aquatic Settlement Agreement and Workgroup Action Plan* (2023 ASA Action Plan) after Ecology approved the action plan and left the conference call (Item II-B). *(Note: Kristi Geris notified Breean Zimmerman that there were no further edits to the action plan after Ecology approval.)*
4. Douglas PUD and the YN will discuss possibly convening an annual regional meeting to discuss the latest literature on Pacific Lamprey passage improvements and technology (Item II-B). *(Note: Douglas PUD and the YN discussed this over the phone on March 16, 2023).*
5. Douglas PUD and U.S. Fish and Wildlife Service (USFWS) will discuss possible approaches to address regional Bull Trout data gaps under the Recovery Planning Participation and Regional Coordination objectives of the Bull Trout Management Plan (MP) and will report back to the Aquatic SWG (Item II-B).

6. Anchor QEA will share with the Confederated Tribes of the Colville Reservation (CTCR) the new edits made to the 2023 ASA Action Plan, as approved by the Aquatic SWG members present (Item II-B). *(Note: Kristi Geris shared these new edits with Jason McLellan, which he approved via email following the Aquatic SWG conference call on March 8, 2023.)*
7. Douglas PUD will share with the CTCR and Ecology the discussion and Agreement (see the Agreements section) about White Sturgeon spontaneous autopolyploidy (SAP) screening of Douglas PUD Program brood year (BY) 2022 White Sturgeon and will report back to the Aquatic SWG before Monday, March 13, 2023, when SAP screening of Douglas PUD Program fish is currently scheduled to be performed (Item II-C). *(Note: Jason McLellan suggested postponing SAP screening until screening of Chelan PUD fish is complete in April or early May 2023, as distributed to the Aquatic SWG by Kristi Geris on March 10, 2023.)*
8. The Aquatic SWG meeting on April 12, 2023, will be held by conference call (Item III-B).

Summary of Decisions

1. Aquatic SWG members present approved the 2023 ASA Action Plan, as revised (Item II-B). *(Note: the CTCR approved the plan, as revised, via email following the Aquatic SWG conference call on March 8, 2023.)*

Agreements

1. Aquatic SWG members present agreed to postpone and possibly forgo White Sturgeon SAP screening related to the 328 BY 2022 White Sturgeon slated for the Douglas PUD mitigation Program, contingent on the following: 1) the high injury and mortality associated with the blood-draw process is not resolved; 2) detection of abnormal ploidy BY 2022 White Sturgeon for other programs remains low; and 3) CTCR and Ecology agree to postpone or forgo screening after Douglas PUD shares with the CTCR and Ecology the discussion and this Agreement about White Sturgeon SAP screening of Douglas PUD Program BY 2022 White Sturgeon (Item II-C). *(Note: Jason McLellan suggested postponing SAP screening until screening of Chelan PUD fish is complete in April or early May 2023, as distributed to the Aquatic SWG by Kristi Geris on March 10, 2023.)*

Review Items

1. The draft *Annual Report Calendar Year 2022 Activities Under the Aquatic Settlement Agreement* (2022 ASA Annual Report) and appended *2022 Annual Report White Sturgeon Management Plan*, *2022 Bull Trout Management Plan and Incidental Take Annual Report*, *2022 Annual Report Water Quality Management Plan* and appended *2022 Water Temperature Annual Report*, *Pacific Lamprey Management Plan 2022 Annual Report*, *Aquatic Nuisance Species Management Plan 2022 Annual Report*, and *Resident Fish Management Plan 2022 Annual*

Report were distributed to the Aquatic SWG by Kristi Geris on March 10, 2023, and are available for a 45-day review with edits and comments due to Geris by April 24, 2023 (Item III-A).

Documents Finalized

1. The final 2023 ASA Action Plan was distributed to the Aquatic SWG by Kristi Geris following the Aquatic SWG conference call on March 8, 2023 (Item II-B).

I. Welcome

A. Review Agenda (John Ferguson)

John Ferguson welcomed the Aquatic SWG members (Attachment A). Ferguson asked for any additions or changes to the agenda.

- Ralph Lampman added YN Aquatic SWG representation designation.
- Breean Zimmerman said she will need to leave the call by 10:30 a.m.
- Ferguson added a reminder about the draft 2022 ASA Annual Report timeline.

B. Meeting Minutes Approval (John Ferguson)

The revised draft February 8, 2023, conference call minutes were reviewed. Kristi Geris said all comments and revisions received from members of the Aquatic SWG were minor, and clarifying edits were incorporated into the revised minutes. She also closed out one action item for Douglas PUD and added distribution of the final study plan, *Wells Reservoir White Sturgeon Reproduction Assessment* under *Documents Finalized*. This study plan was approved during the Aquatic SWG conference call on May 11, 2022, and was distributed for the administrative record. The Aquatic SWG members present approved the February 8, 2023, conference call minutes, as revised. USFWS abstained because a representative did not participate in the February 8, 2023, meeting. *(Note: the CTCR approved the revised minutes via email on March 7, 2023.)*

C. Review of Action Items (John Ferguson)

Action items from the Aquatic SWG conference call on February 8, 2023, are as follows *(Note: The following italicized item numbers correspond to agenda items from the February 8, 2023, meeting)*:

1. *Anchor QEA will request from USFWS a vote via email on the* 2022 Annual Report Total Dissolved Gas Abatement Plan *and* 2023 Total Dissolved Gas Abatement Plan *and appended* Wells Bypass Operating Plan*, which were approved by Aquatic SWG members present during today's Aquatic SWG conference call (Item II-A and Item II-B).*
   Kristi Geris sent this request following the Aquatic SWG conference call on February 8, 2023, and USFWS approved via email on February 9, 2023.

2. *Douglas PUD will verify that juvenile Pacific Lamprey collected and passive integrated transponder (PIT) tagged at the Carlton rotary screw trap are released upstream of the trap to help monitor trap efficiency and estimate overall run size (Item II-C).*
   John Rohrback provided a response from Washington Department of Fish and Wildlife (WDFW) on February 22, 2023, which Kristi Geris distributed to the Aquatic SWG that same day.
3. *The YN will provide a lamprey bait flyer to Douglas PUD for posting around the Wells Project (Item II-C).*
   Ralph Lampman said he just provided this flyer, which Kristi Geris distributed to the Aquatic SWG following the Aquatic SWG conference call on March 8, 2023. *(Note: the lamprey bait flyer was posted by Douglas PUD staff at all boat launch facilities on March 28, 2023).*
4. *The YN will let The River Mile Network know that Douglas PUD is supportive of sharing crayfish monitoring data collected in the Wells Reservoir upon request (Item II-C).*
   Ralph Lampman said he just emailed The River Mile Network, which Kristi Geris forwarded to the Aquatic SWG following the Aquatic SWG conference call on March 8, 2023.
5. *WDFW will ask internally about the timeline and schedule for releasing the Northern Pike Rapid Response Statewide Plan (Item II-C).*
   Laura Heironimus provided an update indicating the plan will be complete on July 1, 2023, which Kristi Geris distributed to the Aquatic SWG on February 21, 2023.
6. *Anchor QEA will notify USFWS that Douglas PUD plans to request approval of the 2023 ASA Action Plan during the Aquatic SWG conference call on March 8, 2023 and to reach out to Douglas PUD with questions (Item I-C).*
   Kristi Geris sent this notification following the Aquatic SWG conference call on February 8, 2023.
7. *Douglas PUD will coordinate with Wells Dam mechanical staff to do the following: 1) ask about the feasibility of widening the 3-inch plating around diffuser gratings with regards to hydraulics through the area; 2) request any additional photographs taken of reducing gaps in the east fishway during the 2022/2023 Wells Dam winter maintenance period; and 3) make note to recheck measurements of the areas depicted in the photographs shared during today's Aquatic SWG conference call (Attachment B to the Aquatic SWG February 8, 2023, conference call minutes; Item II-D).*
   Chas Kyger said this is on his radar to address next maintenance period and suggested closing out the action item for now. Patrick Verhey suggested setting a reminder to add this back to the agenda in November 2023. Anchor QEA will set this reminder. *(Note: Kristi Geris set this reminder, as discussed.)*

8. *Douglas PUD will resend or provide the location of the latest photographs taken of the Pacific Lamprey improvements installed in the Wells Dam count window areas (Item II-D).* Chas Kyger provided this location on March 8, 2023, which was distributed to the Aquatic SWG by Kristi Geris that same day.
9. *Douglas PUD will follow up with USFWS regarding PIT tagging of Bull Trout incidental captures in the Methow River Basin for inclusion in the* Bull Trout Movement and Life History Investigation 2022 *(2022 Bull Trout PIT Study) (Item II-F).*
   Andrew Gingerich said that, since the last meeting, he and RD Nelle touched base on this topic, both on the phone and via email. Gingerich said Nelle discussed this internally, and this coordination is moving forward. That is, if Bull Trout are incidentally encountered during steelhead brood collection for Douglas PUD and Winthrop National Fish Hatchery (NFH), crews are PIT tagging these fish to support the ongoing 2022 Bull Trout PIT Study.

II. Summary of Discussions

A. YN Aquatic SWG Representation Designation (Ralph Lampman)

Ralph Lampman said Donella Miller accepted a position with the Columbia River Inter-Tribal Fish Commission, and David Blodgett, III, will fill Miller's role in the interim.

Anchor QEA will update the YN Aquatic SWG Policy Representation and Technical Alternate designations to replace Miller with Blodgett. *(Note: Kristi Geris updated Aquatic SWG email lists and extranet access following the Aquatic SWG conference call on March 8, 2023.)*

B. DECISION: 2023 ASA Action Plan (Andrew Gingerich)

The draft 2023 ASA Action Plan was distributed to the Aquatic SWG by Kristi Geris on February 7, 2023. Andrew Gingerich recalled having a comprehensive discussion on this document during last month's meeting, including inserting real-time edits in tracked changes. Gingerich shared these edits on WebEx and reviewed the revisions that were discussed last month. He said no additional comments or edits have been received. John Ferguson noted that the CTCR approved the action plan, as revised, via email on March 7, 2023. Gingerich asked whether there were any additional edits before requesting approval. Specific items were discussed, as follows:

<u>Bull Trout MP</u>

Judy Neibauer said she has a question about the timing of the 2022 Bull Trout PIT Study. She recalled the change in methodology from radio telemetry to PIT detection, which also changed what data can be collected. While the same data cannot be collected, with PIT tags, these fish can be tracked longer, so why only track these study fish for 1 year? Gingerich said he and Nelle discussed this. The requirement in the Bull Trout MP is for a 1-year study. The intention has always been to conduct a

1.5-year study to account for any handling effects. Ultimately, this report will include 2 years of data. That is, fish will be tagged during the spring of 2022 and 2023. Because these fish migrate downstream after spawning, typically in November, the plan is to include detection histories through the post-spawn period of 2023 and then file a final report with the Federal Energy Regulatory Commission. This will complete the actual Bull Trout MP requirement. He understands there is interest in continuing to track these fish, and Douglas PUD can provide verbal updates on study fish that continue to carry a tag and are detected in PIT-tag arrays each year. Over time, there will be natural mortality, and sample size will decrease. Neibauer said this is what she was thinking. The goal should be to get as much data out of these PIT-tagged fish as possible. She asked whether this annual update on PIT-tag detection histories for study fish can be added to the action plan. Gingerich said yes, and he added this item, as requested.

Pacific Lamprey MP

4. Juvenile lamprey PIT tagging and migration monitoring Methow River at Carlton RST – March to August 2023

Ralph Lampman requested a similar addition, specifically, to add an annual update on PIT-tag detection histories for juvenile Pacific Lamprey PIT tagged at the Carlton Rotary Screw Trap. Gingerich said Douglas PUD can accommodate these modest requests but cautioned to be mindful of creeping outside the scope of MP requirements. This item was added, as requested.

Bull Trout MP

Neibauer asked whether there are plans to conduct a subadult study. Gingerich said there is no specific subadult requirement in the Bull Trout MP aside from the ongoing 2022 Bull Trout PIT Study. Neibauer said this is a big data gap. Fish should be living a good amount of time, and it is unknown why these fish are not making it back to the spawning grounds for more than 2 to 3 years. She requested that addressing this data gap be added to the action plan as well. Gingerich said, regarding not getting back to the spawning grounds, it is more about fish getting off the spawning grounds. He is not sure whether this movement is energetically intensive, or fish become entrapped somewhere, or something else. That aside, Douglas PUD is fascinated with this species and has an obligation to have these discussions, but this action plan outlines activities that are required under the Bull Trout MP and Biological Opinion. Neibauer asked whether this discussion would be more appropriate under regional coordination, and Gingerich agreed that this is exactly where the discussion belongs.

Pacific Lamprey MP

1. Continued implementation of Adult Approach and Passage Study – January to July 2023

Lampman said this year's migration will start soon, and he asked whether there is a plan for a 2023 study. John Rohrback said that he queried the Columbia Basin PIT Tag Information System this

morning, and for the 170 dual-tagged study fish and approximately 640 PIT only-tagged study fish, there has been no additional PIT detections after the one fish was detected at the Wells Fish Hatchery voluntary channel in late 2022. The acoustic tags are still in winter mode but should be "waking up" and starting to ping more frequently this month into April. Typically, Douglas PUD checks the acoustic receivers in April. After April, an updated "Last Seen" table can be provided. Douglas PUD will check the acoustic receivers again after October when the acoustic tag battery life will expire. Douglas PUD will then produce a draft report for Aquatic SWG review. Because the study fish also have a PIT tag, Douglas PUD can also provide a PIT detection update in July. Lampman asked, so the plan is to let the adults from last year reach their destination before starting a new study? Rohrback said he thinks so and suggested to wait for this study to run its course. Lampman said, based on initial results, there are a lot more fish approaching Wells Dam compared to earlier studies—approximately 60% compared to 25%. He said it seems attraction is increasing overall, and he asked whether this is Douglas PUD's interpretation as well. Rohrback said yes, to date the approach rate to Wells Dam in the current study is higher than in the last approach study. While translocation is one variable, other things could be affecting this outcome, and he cannot say with a high degree of certainty what is causing this change.

Laura Heironimus joined the conference call.

John Ferguson asked, being mindful of Breean Zimmerman's time, is Ecology comfortable with voting on this action plan, as revised? Zimmerman said yes, Ecology approves the action plan as revised thus far. Ferguson said Anchor QEA will share with Ecology any new edits made to the 2023 ASA Action Plan, if any, after Zimmerman leaves the conference call. Zimmerman left the conference call. *(Note: Geris notified Zimmerman that there were no further edits to the action plan after Ecology approval.)*

8. Update lamprey literature review document libraries – November 2023
Lampman said other fish forums maintain these libraries as well. Douglas PUD has done a good job at updating these libraries, but he thinks it would be more useful to convene a regional coordination meeting with all PUDs to discuss the latest literature, design ideas, what each PUD is working on, and any new understandings, techniques, and approaches. He believes this is what the literature reviews were intended to accomplish. He wants to make sure everyone is learning from each other. He suggested that instead of just updating these libraries, this action should include a regional meeting of the PUDs to discuss the libraries. Rohrback said he prefers not to commit other PUDs in Douglas PUD's action plan, but he is open to further discussing this idea. Douglas PUD and the YN will discuss possibly convening an annual regional meeting to discuss the latest literature on Pacific Lamprey passage improvements and technology. *(Note: Douglas PUD and the YN discussed this over the phone on March 16, 2023).*

Bull Trout MP

10. Recovery planning participation/regional coordination – Throughout 2023

Neibauer requested a similar action, specifically, to create an action item for Douglas PUD and USFWS to discuss possible approaches to address regional Bull Trout data gaps under the Recovery Planning Participation and Regional Coordination objectives of the Bull Trout MP and then report back to the Aquatic SWG. Gingerich said Douglas PUD is supportive of this.

Neibauer said, also as part of recovery planning, USFWS is funding the development of a Bull Trout action plan for the Methow River Basin and has intentions to develop action plans for the Wenatchee and Entiat river basins. There is already an action plan for the Yakima River Basin. The goal across a 3-year period is to link and prioritize actions ongoing within the region. She would like for Douglas PUD and the Aquatic SWG to participate in this effort. Gingerich said Douglas PUD is interested in participating in all regional planning efforts, but he does not believe an edit is needed in the action plan for this since regional coordination is already included under the Bull Trout MP section of the Action Plan.

Aquatic SWG members present approved the 2023 ASA Action Plan, as revised.

Anchor QEA will share with the CTCR the new edits made to the 2023 ASA Action Plan, as approved by the Aquatic SWG representatives present. *(Note: Geris shared these new edits with Jason McLellan, which he approved via email following the Aquatic SWG conference call on March 8, 2023.)*

The final 2023 ASA Action Plan was distributed to the Aquatic SWG by Geris following the Aquatic SWG conference call on March 8, 2023.

C. BY 2022 White Sturgeon Rearing Update (Chas Kyger)

A BY 2022 White Sturgeon Rearing Update (Attachment B) was distributed to the Aquatic SWG by Kristi Geris prior to the conference call on March 8, 2023. Chas Kyger said the blue shaded rows represent fish for the Douglas PUD program. Fish are averaging 412.7 grams per fish, which already exceeds the 350-gram target. These fish were scute marked and PIT tagged last month. The current schedule is to conduct SAP screening next Monday, March 13, 2023; however, there has been an abnormally high injury and mortality rate in Chelan PUD program fish screened for SAP to date. Initially, crews thought this was due to the location of the blood draw; however, after switching locations the injury and mortality rate is still high. Douglas PUD is concerned about killing fish such that the number released will drop below the -10% threshold stipulated in the current Statement of Agreement (SOA).[1] Mortality associated with SAP screening for Chelan PUD program fish has exceeded

[1] The SOA, *Statement of Agreement Regarding Wells Reservoir White Sturgeon Supplementation 2023–2026*, approved by the Aquatic SWG on August 10, 2022, stipulates releasing 325 (±10%) White Sturgeon into the Wells Reservoir annually between 2023 and 2026.

10% in some cases. Kyger said he discussed this with Jason McClellan, and the cause of this mortality is unknown. It does not appear to be associated with fish size. Kyger said McLellan also shared SAP screening results thus far. To date, the CTCR have sampled 1,245 fish and there have been no detections of abnormal ploidy in individual fish. Five of these samples need to be rerun because the samples were bad. Douglas PUD would like to open this up for discussion. That is, should Douglas PUD go forward with screening for something that has not been prevalent to date and potentially fall below the stocking target if mortality continues to be high?

Ralph Lampman asked whether the approximate 1,000 fish remaining to be screened are the same group of fish that have already been sampled. Kyger said yes, these are the same batch of larvae from Lake Roosevelt that were collected and delivered to Wells Fish Hatchery by the CTCR. The tanks have been graded by size, fish remaining to be sampled are smaller, and crews are waiting for them to grow larger. Initially, the thought was that smaller fish would not handle the blood draw as well; however, this was not the case for the last batch.

Kyger said of the approximate 1,000 fish remaining left to be screened, 328 fish will go to the Douglas PUD program, and the remainder are Chelan PUD program fish. Douglas PUD is asking about moving forward with SAP screening of the 328 fish for the Douglas PUD program.

Laura Heironimus asked whether anything else has changed, such as who conducted the sampling or diet. Kyger said the only change has been the location of the blood draw. After switching locations, the injury and mortality rates decreased but then spiked again, so staff switched back to the original location. He thought there was something to do with fish size, but it is not necessarily only the smaller fish that are becoming injured. In the past, he has observed only a handful of injured fish resulting from blood draws, but this is not the case this year. Heironimus said this makes her think there is a secondary stressor, like water temperature or something else. Kyger said the injuries are the same: paralysis, so the fish cannot move or take feed. Douglas PUD thinks it is an injury not a stressor.

John Ferguson said Douglas PUD has 328 fish. If there is a 10% loss, this leaves the program right at the edge of 325 (±10%), or 295 fish or so. This is a resource question. Does sampling for SAP, when there have been no detections out of 1,245 fish sampled, outweigh the loss of up to 30-plus fish?

Lampman said, considering there have been no detections and sampling mortality rate is high, the YN votes to forgo sampling.

Heironimus said she understands this logic. However, she also does not want to set a precedent to not test because staff are not good at testing. Managers need to work through what is causing this mortality and do better. That said, in this case, she is supportive of forgoing sampling to meet the stocking target, given the low likeliness of SAP presence in this group of fish, but she does not want

to see this again and again. Kyger agreed and said once more is understood about mortality rates associated with SAP screening, this will be taken into consideration during larval collection to meet program requirements in subsequent years. Ideally, the goal is to reduce the mortality rate. Heironimus said she has additional SAP screening results from McLellan. For Wells, among 1,256 fish sampled, there were 0 fish with abnormal ploidy. For Lake Sherman, among 502 fish sampled, there were 2 fish with abnormal ploidy. For another population, among 1,879 fish sampled, there were 3 fish with abnormal ploidy. Across all populations, the prevalence of SAP has been low this year.

(Note: McLellan clarified SAP screening results to date, via email on March 21, 2023. For BY 2022 White Sturgeon, in January and February 2023 at Wells Fish Hatchery, the CTCR screened 1,256 fish, and 0 fish had abnormal ploidy. For BY 2021, in winter/spring 2022 at Wells Fish Hatchery, the CTCR screened 1,377 fish for the Chelan PUD program, and 1 fish had abnormal ploidy. Additionally, in November 2022 at Sherman Creek Hatchery, the CTCR screened 502 fish, and 2 fish had abnormal ploidy. In total, for BY 2021 White Sturgeon, the CTCR screened 1,879 fish, and 3 had abnormal ploidy. All BY 2022 and BY 2021 fish were captured as larvae from Lake Roosevelt.)

Judy Neibauer said she has no strong position on this but asked whether staff are monitoring water quality and are other conditions similar across all tanks. Kyger said there are few differences across rearing tanks. Some tanks are larger, and some water temperatures are higher to increase growth rates, but there are no significant differences in water quality parameters to explain this mortality. There is no evidence that fish husbandry is playing a role in this.

Ferguson asked, to Heironimus's point about learning, will the CTCR sample more Chelan PUD fish so that Aquatic SWG representatives might learn more about what is going on this year? Kyger said he understands that the CTCR still plan to screen the remainder of Chelan PUD's fish in April 2023. He and McLellan discussed this high injury and mortality rate, and McLellan was also surprised and perplexed by this issue. Kyger said he did not discuss weighing the risk of sampling or not sampling and meeting the stocking rate with McLellan. Ferguson suggested including McLellan in this conversation before Monday when SAP screening is scheduled for Douglas PUD fish.
Andrew Gingerich agreed and suggested contacting Breean Zimmerman as well. Without the CTCR and Ecology formally agreeing to forgo screening, the default is to sample, per the SOA. Regarding environmental differences at the hatchery, when staff PIT tag and scute mark these fish, mortalities are unexpected, in fact have been zero in each of the last five years of PIT and scute marking. The issue seems to be linked to the blood-draw process. Douglas PUD is in the same camp as the YN and WDFW. This year, SAP prevalence is low, mortality is associated with the blood-draw process, and Douglas PUD does not want to risk missing their White Sturgeon mitigation targets.

Aquatic SWG members present agreed to postpone and possibly forgo White Sturgeon SAP screening related to the 328 BY 2022 White Sturgeon slated for the Douglas PUD mitigation

Program, contingent on the following: 1) the high injury and mortality associated with the blood-draw process is not resolved; 2) detection of abnormal ploidy BY 2022 White Sturgeon for other programs remains low; and 3) CTCR and Ecology agree to postpone or forgo screening after Douglas PUD shares with the CTCR and Ecology the discussion and this Agreement about White Sturgeon SAP screening of Douglas PUD Program BY 2022 White Sturgeon.

Douglas PUD will share with the CTCR and Ecology the discussion and Agreement about White Sturgeon SAP screening of Douglas PUD Program BY 2022 White Sturgeon and will report back to the Aquatic SWG before Monday, March 13, 2023, when SAP screening of Douglas PUD Program fish is currently scheduled to be performed. *(Note: McLellan suggested postponing SAP screening until screening of Chelan PUD fish is complete in April or early May 2023, as distributed to the Aquatic SWG by Geris on March 10, 2023.)*

D. Bull Trout Update (Chas Kyger)

Chas Kyger said after approximately 3 weeks of steelhead brood collection in the Methow River Basin, there have been four Bull Trout incidental encounters; none of the fish were previously PIT tagged. These fish were given a PIT tag, and a tissue sample was obtained. These fish add to the existing 11 fish tagged and sampled last year. There are approximately 2 to 3 weeks left of this brood collection effort to potentially capture more Bull Trout for inclusion in the ongoing 2022 Bull Trout PIT Study.

Judy Neibauer asked whether the target sample size is still 60 fish. Kyger said 60 fish was the original goal, but this likely will not be reached. Currently, there are 15 fish in the study. Neibauer asked about other options to increase sample size. Kyger said there is no targeted effort to capture Bull Trout for the study (there is no trapping at Wells Dam or the Twisp Weir). The main reason to operate the trap at the weir is to collect spring Chinook Salmon broodstock, which has not been needed since brood collection moved to Wells Dam. Neibauer asked about hook and line sampling and suggested contacting USFWS staff at Winthrop NFH, who likely have good information on locations where Bull Trout can be targeted. She recently learned that Bull Trout are becoming entrapped in the upper Methow River Basin and freezing to death. She suggested hook and line sampling in these areas. Kyger said Douglas PUD is already coordinating with Charles Frady (USFWS) and staff at Winthrop NFH. These folks are aware that Douglas PUD is trying to tag more fish for the study, and they plan to contribute to the effort.

Neibauer said RD Nelle was interested in whether Douglas PUD had a plan if not enough Bull Trout are encountered for the study. She said 15 fish is quite a bit less than 60 fish and asked whether there should be an action item to address what happens if the study does not reach 60 fish. John Ferguson suggested further discussing this topic once there are final numbers. He clarified that

the Aquatic SWG did not expect to get 60 fish. Kyger suggested revisiting this agenda item in April or May 2023. Andrew Gingerich further clarified that the study requirement as stipulated in the Bull Trout MP and Biological Opinion is 10 fish. Douglas PUD believes that 10 fish is a bit light to draw any conclusions on, even with radio telemetry, which is why the target sample size is larger. However, in terms of regulatory requirements, the number of fish needed for this study has already been met.

III. Administration

A. 2022 ASA Annual Report (John Ferguson)

John Ferguson said the draft 2022 ASA Annual Report and six aquatic resource MP annual reports will be distributed this Friday, March 10, 2023, for a 45-day Aquatic SWG review with comments due Monday, April 24, 2023. The final draft reports for approval will be distributed on May 3, 2023, and Douglas PUD will request approval of the reports during the Aquatic SWG meeting on May 10, 2023. The final approved reports are due to the Federal Energy Regulatory Commission on May 31, 2023.

The draft reports were distributed to the Aquatic SWG by Kristi Geris on March 10, 2023, as discussed.

B. Upcoming Meetings (John Ferguson)

The Aquatic SWG meeting on April 12, 2023, will be held by conference call.

Other upcoming meetings include May 10 and June 14, 2023 (conference call).

List of Attachments

Attachment A List of Attendees
Attachment B BY 2022 White Sturgeon Rearing Update

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
Judy Neibauer	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

Notes:

* Heironimus joined and Zimmerman left the meeting near the end of Item II-B.

	8-Feb		6-Mar	
Tank	Population	Grams	Population	Grams
1	179	50.7	194	56.0
2	155	66.8	134	55.4
3	110	267.1	82	412.7
4	109	267.1	82	412.7
5	109	267.1	82	412.7
6	--	--	82	412.7
7	236	68.8	156	168.1
8	41	18.5	60	20.5
9	98	152.9	91	216.2
10	224	46.3	194	46.8
11	122	31.6	105	54.7
12	136	127.2	117	66.8
Mag 1	--	--	--	--
Mag 2	948	206.4	1052.0	302.7
Total	2,467	148.4	2,431	222.9

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

FINAL

Conference Call Minutes

Aquatic Settlement Work Group

To: Aquatic SWG Parties Date: May 10, 2023

From: John Ferguson, Chair, Anchor QEA, LLC

Re: Final Minutes of the April 12, 2023, Aquatic SWG Conference Call

The Aquatic Settlement Work Group (SWG) met by conference call on Wednesday, April 12, 2023, 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 continue planning for an annual regional meeting to discuss the latest literature on Pacific Lamprey passage improvements and technology (Item I-C).
2. Douglas PUD and the U.S. Fish and Wildlife Service (USFWS) will discuss possible approaches to address regional Bull Trout data gaps under the Recovery Planning Participation and Regional Coordination objectives of the Bull Trout Management Plan (MP) and will report back to the Aquatic SWG (Item I-C).
3. Douglas PUD will draft a Pacific Lamprey Translocation Statement of Agreement (SOA), for implementation from 2023 to 2024, that is consistent with the Pacific Lamprey MP and with a commitment to continue discussing a potential study design for implementation in 2025, for discussion and possible decision during the Aquatic SWG conference call on May 10, 2023 (Item II-B). *(Note: this SOA was distributed to the Aquatic SWG by Kristi Geris on May 10, 2023.)*
4. The Aquatic SWG meeting on May 10, 2023, 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. Aquatic SWG members present agreed to proceed with White Sturgeon spontaneous autopolyploidy (SAP) screening of the 328 brood year (BY) 2022 White Sturgeon slated for the Douglas PUD mitigation program, understanding the following: 1) there is a slight risk of mortality associated with the blood-draw process; 2) should fish losses reduce the in-

hatchery population below the target stocking number stipulated in the current SOA,[1] the Confederated Tribes of the Colville Reservation (CTCR) agree to make up the shortfall with surplus BY 2022 White Sturgeon from the CTCR Resident Fish Hatchery; 3) transferred fish would be screened by the CTCR prior to transfer; and 4) if surplus BY 2022 White Sturgeon from the CTCR Resident Fish Hatchery are needed to supplement the Douglas PUD program and are below the target fish size stipulated in the current SOA, the Aquatic SWG agrees Douglas PUD still meets the stocking obligation stipulated in the current SOA (Item II-A).

Review Items

1. The draft *Annual Report Calendar Year 2022 Activities Under the Aquatic Settlement Agreement* (2022 ASA Annual Report) and appended *2022 Annual Report White Sturgeon Management Plan*, *2022 Bull Trout Management Plan and Incidental Take Annual Report*, *2022 Annual Report Water Quality Management Plan* and appended *2022 Water Temperature Annual Report*, *Pacific Lamprey Management Plan 2022 Annual Report*, *Aquatic Nuisance Species Management Plan 2022 Annual Report*, and *Resident Fish Management Plan 2022 Annual Report* were distributed to the Aquatic SWG by Kristi Geris on March 10, 2023, and are available for a 45-day review with edits and comments due to Geris by April 24, 2023 (Item III-A).
2. The draft SOA, *To translocate adult Pacific Lamprey from Priest Rapids Dam to areas within or upstream of the Wells Project 2023-2024*, was distributed to the Aquatic SWG by Kristi Geris on May 10, 2023 (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). Ferguson asked for any additions or changes to the agenda. The following revisions were requested:

- RD Nelle requested a Bull Trout tagging update.
- Andrew Gingerich added notification of upcoming White Sturgeon reports for review.

[1] *Statement of Agreement Regarding Wells Reservoir White Sturgeon Supplementation 2023-2026*, approved by the Aquatic SWG on August 10, 2022, stipulates stocking 325 (±10%) White Sturgeon into the Wells Reservoir annually, with a target fish size of ≥350 grams per fish.

B. Meeting Minutes Approval (John Ferguson)

The revised draft March 8, 2023, conference call minutes were reviewed. Kristi Geris said all revisions received from members of the Aquatic SWG were minor, and clarifying edits were incorporated into the revised minutes.

Geris said there is one comment to be discussed under *Item II-B. DECISION: 2023 ASA Action Plan* regarding Bull Trout not getting off the spawning grounds. Andrew Gingerich said he referenced something without a citation. His comment was based on a 1-year study where, in fall 2016, a large percentage of study fish passed upstream into the presumed spawning reaches of the Twisp River and were not observed moving back downstream and interacting with the Twisp Weir. Judy Neibauer thanked Gingerich for this explanation. Neibauer recalled her action item to discuss Bull Trout recovery with Douglas PUD, and she thinks this is a good topic to add to this discussion. Gingerich agreed and said he believes there was evidence of tributary dewatering, so mortality could be attributed to stranding or entrapment issues. Whatever the mechanism, one-third of the study fish appeared to have been lost. Neibauer said one-third is significant. RD Nelle said the reports by Mark Nelson (USFWS) also mention that freezing as a possible issue. Gingerich said Douglas PUD monitoring and evaluation (M&E) crews have also encountered similar conditions as reported by Nelson. Neibauer recalled the approximately 60 fish that were stranded in the Methow River Basin and froze or died because the pools became deoxygenated. It sounds like when there is no fall freshet, fish can get stranded in these upper basins. There is a larger, ongoing discussion with the tribe and the state about a possible fall or winter entrapment survey in the Methow River Basin. John Ferguson suggested maybe a salvage effort because this is done in other areas.

The Aquatic SWG members present approved the March 8, 2023, conference call minutes, as revised. Washington State Department of Ecology (Ecology) approved, but Breean Zimmerman noted that she did leave the meeting early. The CTCR abstained because a representative did not participate in the March 8, 2023, conference call.

C. Review of Action Items (John Ferguson)

Action items from the Aquatic SWG conference call on March 8, 2023, are as follows *(Note: The following italicized item numbers correspond to agenda items from the March 8, 2023, meeting)*:

1. *Anchor QEA, LLC, will set a reminder to revisit this action item in November 2023:* Douglas PUD will coordinate with Wells Dam mechanical staff to do the following: 1) ask about the feasibility of widening the 3-inch plating around diffuser gratings with regards to hydraulics through the area; 2) request any additional photographs taken of reducing gaps in the east fishway during the 2022/2023 Wells Dam winter maintenance period; and 3) make note to recheck measurements of the areas depicted in the photographs shared during today's Aquatic SWG

conference call (Attachment B to the Aquatic SWG February 8, 2023, conference call minutes) *(Item I-C)*.
Kristi Geris set this reminder, as discussed.

2. *Anchor QEA will update the YN Aquatic SWG Policy Representation and Technical Alternate designations to replace Donella Miller with David Blodgett, III (Item II-A)*.
   Kristi Geris updated Aquatic SWG email lists and extranet access following the Aquatic SWG conference call on March 8, 2023.
3. *Anchor QEA will share with Ecology any new edits made to the* 2023 Aquatic Settlement Agreement and Workgroup Action Plan *(2023 ASA Action Plan) after Ecology approved the action plan and left the conference call (Item II-B)*.
   Kristi Geris notified Breean Zimmerman that there were no further edits to the action plan after Ecology approval.
4. *Douglas PUD and the YN will discuss possibly convening an annual regional meeting to discuss the latest literature on Pacific Lamprey passage improvements and technology (Item II-B)*.
   Douglas PUD and the YN discussed this over the phone on March 16, 2023. John Rohrback said Ralph Lampman plans to develop a list of potential attendees along with a draft agenda, and Douglas PUD will help with scheduling and logistics, as needed. Lampman said he still needs to do this. Another option might be to combine this meeting with the annual Pacific Lamprey Conservation Initiative (PLCI) Upper Columbia Regional Management Unit (RMU) meeting, which is upcoming in May 2023. John Ferguson asked whether the PUDs typically attend this meeting. Lampman said, typically, yes. Ferguson suggested, timing-wise, that it may make sense to convene this meeting after the field season and before the annual winter maintenance periods, as opposed to May, but he will defer to Lampman's preference. Laura Heironimus asked whether Lampman is referring to the PLCI Mainstem Columbia/Snake RMU Workgroup. Lampman said the PLCI Upper Columbia RMU Workgroup is separate, but the PLCI Mainstem Columbia/Snake RMU meeting is also upcoming in May 2023, and might actually be a better option to convene this regional meeting. He noted that Ann Grote (USFWS) just sent out a notification for the PLCI Upper Columbia RMU meeting. Lampman said he will continue thinking on this and will report back to the Aquatic SWG.
5. *Douglas PUD and USFWS will discuss possible approaches to address regional Bull Trout data gaps under the Recovery Planning Participation and Regional Coordination objectives of the Bull Trout MP and will report back to the Aquatic SWG (Item II-B)*.
   Andrew Gingerich said Judy Neibauer called him, and he owes her a call back. Gingerich added, it is worth noting that Douglas PUD's participation in recovery is ongoing but is not always reported back to the Aquatic SWG. For example, Douglas PUD attended a Bull Trout

status review check-in on January 26, 2023, led by Erin Britton Kuttel (USFWS). Additionally, Douglas PUD plans to participate in a U.S. Army Corps of Engineers (USACE) Regional Bull Trout Workshop at McNary Dam in May 2023, where Douglas PUD will share a presentation on Bull Trout in the Wells Reservoir, as requested by Sean Tackley (USACE). Neibauer recalled discussing subadults last month, which prompted the discussion about recovery planning and how it fits under the regional coordination objective in the Bull Trout MP. The issue of fish not returning downstream was part of this discussion. She also plans to discuss with Douglas PUD a USACE study on the Columbia River to locate cool water pockets via aerial Light Detection and Ranging imagery. The study is planned for the Lower Columbia River, but USACE is looking for funding to survey up to Chief Joseph Dam. Neibauer said she can provide a presentation on this work if there is interest. This action item will be carried forward.

6. *Anchor QEA will share with the CTCR the new edits made to the 2023 ASA Action Plan, as approved by the Aquatic SWG members present (Item II-B).*
   Kristi Geris shared these new edits with Jason McLellan, which he approved via email following the Aquatic SWG conference call on March 8, 2023.
7. *Douglas PUD will share with the CTCR and Ecology the discussion and Agreement (see the Agreements section of the March 8, 2023, minutes) about White Sturgeon SAP screening of Douglas PUD Program BY 2022 White Sturgeon and will report back to the Aquatic SWG before Monday, March 13, 2023, when SAP screening of Douglas PUD Program fish is currently scheduled to be performed (Item II-C).*
   Jason McLellan suggested postponing SAP screening until screening of Chelan PUD fish is complete in April or early May 2023, as distributed to the Aquatic SWG by Kristi Geris on March 10, 2023. This will be further discussed during today's meeting.

II. Summary of Discussions

A. BY 2022 White Sturgeon Rearing and SAP Screening Update (Chas Kyger)

A BY 2022 White Sturgeon Rearing Update (Attachment B) was distributed to the Aquatic SWG by Kristi Geris prior to the conference call on April 12, 2023.

Chas Kyger said Attachment B shows fish sizes and number of BY 2022 White Sturgeon on station at Wells Fish Hatchery. He pointed out that the average fish size of Douglas PUD fish is above the 350-gram-per-fish target. Fish will be released at the end of May 2023.

Since the last meeting, there was an incident with one tank of Chelan PUD fish where mineral deposits in the pipes clogged the cold-water valves that mix cold and hot water. This resulted in losing 20 Chelan PUD fish before hatchery staff could remedy the issue. Hatchery staff flushed all pipes that could cause a similar issue in the other tanks. Staff are also considering installing

temperature alarms on the tanks since the incident occurred overnight. When the water temperature increased, the dissolved oxygen decreased, resulting in the losses. There have been no additional losses since.

Last month, Douglas PUD and the Aquatic SWG discussed the higher-than-usual mortality associated with the blood-draw process for SAP screening of Chelan PUD fish and concerns about this happening to Douglas PUD fish. The Aquatic SWG agreed to wait until screening of Chelan PUD fish was complete before deciding whether to move forward with screening of Douglas PUD fish. So far, no additional Chelan PUD fish have tested positive for abnormal ploidy. This likely means there is a low likelihood of positive detections in Douglas PUD fish. The laboratory can return results within a week; therefore, there is time if SAP screening of Douglas PUD fish occurs into May 2023. Douglas PUD is still concerned about the mortality associated with the blood-draw process and risk of missing their White Sturgeon mitigation stocking targets.

John Ferguson said the next Aquatic SWG meeting is on May 10, 2023. So, if members are not ready to decide today, a decision can wait until next month. Kyger said that is correct and sampling could occur into late May and still a release date by June 1, 2023.

Jason McLellan said he does not see a lot of risk associated with screening Douglas PUD fish. These fish are much larger in size compared to the Chelan PUD mortalities, and there were new staff conducting that sampling (with less experience) during the days of high loss. The second day of losses were the smaller fish in the group, while sampling from a location anterior to the anal fin, which had been done with hundreds of fish without incident. Additionally, he contacted Mike Clement (Grant PUD) who confirmed that Grant PUD had been drawing blood from this location with no issues. McLellan thinks the high mortality was a fluke incident associated with inexperienced staff. The blood-draw location was switched back to the location posterior to the ventral fin and was conducted with experienced staff and there were no issues. He believes risk is low with these larger fish. Plus, there are still surplus fish available in the event there are losses that bring the numbers below the stocking target.

Kyger clarified that the second day of losses were not only the smallest fish; rather, the average fish size of the mortalities was among the smaller sizes in that group of fish. Douglas PUD's fish on station now are pretty large. He just wanted to make the Aquatic SWG aware of the potential to lose fish and fall under the SOA stocking target.

Ferguson asked whether the sampling team will consist of experienced staff. Kyger said Douglas PUD uses their in-house Fish Veterinarian (DVM), Betsy Bamberger, whom they are confident will do a good job.

Laura Heironimus said she is hearing that risk is low, staff sampling the fish are more experienced, and the fish are larger. She thinks the screening should proceed. As McLellan mentioned, there are also surplus fish available, if needed.

Andrew Gingerich said the remaining concern from Douglas PUD is that the District meets its requirements under the current SOA, in terms of fish quantity and size, with what is on station right now. If there is loss during screening, the District is concerned about not meeting its stocking obligations. It would help to obtain agreement from the Aquatic SWG that if numbers drop below the stocking targets, Douglas PUD is still okay in terms of meeting the obligation. In the past, there has been resistance to this type of support. He hopes the Aquatic SWG can appreciate the position Douglas PUD is in, considering the low incidences of SAP observed in this population of fish to date.

Heironimus asked whether it would be challenging to get surplus fish. McLellan said it would be easy. These fish are currently at the CTCR Resident Fish Hatchery and were surplus fish from the Douglas PUD program initially. He said, for example, if there were a 20% loss, this would equal approximately 65 fish, which can easily be supplemented with the surplus fish available. The fish may not be 500 grams each, like the Douglas PUD fish on station now, but he thinks the largest fish at the CTCR Resident Fish Hatchery are about 200 grams each. Transferred fish would be screened by the CTCR prior to transfer. The sooner these fish are screened, the sooner they can be transferred to Wells Fish Hatchery to adjust rations and temperature to increase their size. He thinks these fish can likely get up to 300 grams each before being released.

Ferguson asked whether these surplus fish will remain at the CTCR Resident Fish Hatchery until screening of Douglas PUD fish has been completed. McLellan said yes. Gingerich said this seems like a good solution, as long as the Aquatic SWG agrees releasing fish under the 350-gram size target still meets the obligation in the SOA.

Aquatic SWG members present agreed to proceed with White Sturgeon SAP screening of the 328 BY 2022 White Sturgeon slated for the Douglas PUD mitigation program, understanding the following: 1) there is a slight risk of mortality associated with the blood-draw process; 2) should fish losses reduce the in-hatchery population below the target stocking number stipulated in the current SOA,[2] the CTCR agrees to make up the shortfall with surplus BY 2022 White Sturgeon from the CTCR Resident Fish Hatchery; 3) transferred fish would be screened by the CTCR prior to transfer; and 4) if surplus BY 2022 White Sturgeon from the CTCR Resident Fish Hatchery are needed to supplement

[2] *Statement of Agreement Regarding Wells Reservoir White Sturgeon Supplementation 2023-2026*, approved by the Aquatic SWG on August 10, 2022, stipulates stocking 325 (±10%) White Sturgeon into the Wells Reservoir annually, with a target fish size of ≥350 grams per fish.

the Douglas PUD program and are below the target fish size stipulated in the current SOA, the Aquatic SWG agrees Douglas PUD still meets the stocking obligation stipulated in the current SOA.

Kyger said he will try to schedule screening of the Douglas PUD fish sooner than later, and he asked when screening of the Chelan PUD fish will be complete. McLellan said that screening is tentatively scheduled for mid-May 2023, but this needs to be confirmed with Chelan PUD.

B. 2023 Adult Pacific Lamprey Translocation (Ralph Lampman)

John Ferguson recalled last year, approving a 1-year SOA to implement the *Wells Dam 2022 Adult Lamprey Approach and Passage Study* (2022 Adult Pacific Lamprey Approach and Passage Study) and base next steps on the 2022 study results. However, this SOA did not address what to do in 2023, while waiting for the 2022 study results, and Ralph Lampman wanted to discuss potential opportunities for this year.

Lampman said it seems the earliest opportunity for the next study is 2024, considering that adults in the current study are still migrating, with most finishing their final migration this year and a small percentage perhaps overwintering into 2024. Currently, there is nothing planned for 2023, and he would like to avoid doing nothing at all. One option is to continue adult translocation. He shared on WebEx an email showing adult Pacific Lamprey translocation numbers to date (Attachment C), which Lampman distributed to the Aquatic SWG during the conference call on April 12, 2023. He recalled that translocation started in 2015 to 2016 but occurred just in the Methow River Basin. Translocation in 2017 and 2018 involved collaboration with Grant PUD and included the Okanogan and Methow river basins, along with the mainstem Columbia River. Then the Aquatic SWG started translocation in 2018. Depending on the start date, translocation has been ongoing for up to 7 to 8 years now. Recall that in the Umatilla River, a large increase in adults was observed after 10 years, whereas in the Yakima River, an increase was observed after 5 years. He would like to understand what these translocation numbers represent in terms of overall spawning habitat, and he asked how much salmonid spawning habitat is available in the mainstem Columbia River from Wells Dam to Chief Joseph Dam.

John Rohrback said a patch of habitat suitable for summer Chinook Salmon spawning has been documented on the Carpenter Island bar, which is essentially in the immediate tailrace of Wells Dam. Upstream of Wells Dam, he believes there are Washington Department of Fish and Wildlife radio telemetry data from 2010 and 2012 that identified two primary locations where summer Chinook Salmon were observed during the spawning period. One location is downstream of Foster Creek in the Chief Joseph Dam tailrace, and the other location is by Washburn Island. Rohrback recalled back while working with the CTCR, doing stable isotope analyses with juvenile Chinook Salmon otoliths comprised of fish passive integrated transponder (PIT) tagged at the mouth of the Methow River and

upstream in the mainstem Columbia River. Most of these fish were of Okanogan River origin, but some traced back to the mainstem Columbia River.

Lampman said habitat suitable for Chinook Salmon spawning is typically suitable for Pacific Lamprey spawning. He guessed there may be approximately 500 river kilometers available for spawning above Wells Dam, including the Methow, Okanogan, and mainstem combined. This equals one fish per kilometer. Pacific Lamprey are a fecund species. One female can lay over 100,000 eggs, so there can be a lot of offspring from a small number of adults. He is curious what other Aquatic SWG members feel is the best path forward.

Ferguson summarized that Lampman proposed two options: 1) study in 2024; and 2) additional translocation in 2023.

RD Nelle said for this year, as long as Douglas PUD is tracking study fish, a portion of the fish might as well be translocated upstream. He asked whether Lampman is also proposing a new study to quantify potential spawning habitat in and around Wells Dam. Lampman clarified that for the next study he was referring to the next at-dam passage study at Wells Dam, to look at what other improvements might be needed for adult upstream passage. Ferguson added that the next study would tie back to the Pacific Lamprey MP. Nelle asked whether this would be a continuation of the current study. Lampman said the current study focuses on approach and replicates the previous study. It is not set up to evaluate detailed behavior at the dam. This type of evaluation may require something based on radio telemetry. Nelle thanked Lampman for the clarification.

Lampman suggested a 1-year SOA to continue translocation in 2023 and continue discussing a study for implementation in 2024. Gingerich said Douglas PUD is largely supportive of translocation. The preliminary results are encouraging; however, he thinks it is too early to conclusively say translocation is responsible for the increase in approach behavior that has initially been observed. He suggested that an agreement longer than 1 year be considered to allow time to fully discuss study design questions, methods, and tools for a passage approach study. He thinks Lampman suggested radio telemetry given the concerns about frequencies and signals bouncing around in the fishways. However, there may be a way to use acoustic telemetry, especially in the larger sections of the fishway. It would be useful to have these discussions about the objectives to identify the right tool. For translocation, there are considerations regarding setting up logistics with Grant PUD. The most important thing from Douglas PUD's perspective is to tie translocation back to reasonable progress under the Pacific Lamprey MP because translocation is not called out in the Pacific Lamprey MP.

Rohrback provided a status update on the current 2022 Adult Pacific Lamprey Approach and Passage Study. He said there has been one detection since the last meeting, which was in the Chewuch River on March 25, 2023. As of yet, there does not appear to be any substantial movement of PIT-tagged

fish this year. The acoustic tags are "waking up" from winter mode right now. Douglas PUD plans to retrieve data from the acoustic receivers next week and will notify the Aquatic SWG if there have been additional detections since last fall. Douglas PUD will download the acoustic receivers once more in October 2023, which will be the end point of the current study. Douglas PUD will then draft a report for Aquatic SWG review and approval, which will hopefully be final by the end of this year. He is a little concerned about the timeline of a study in 2024. Douglas PUD would not want to start drafting a study plan until there has been enough time to review and discuss the current study results, which will be used to inform how to set up the next study. Douglas PUD will also need time to procure study supplies. Therefore, his preference would be for a 2-year translocation SOA.

Nelle said he thinks this is probably a prudent approach. Douglas PUD needs time to understand the data coming in instead of rushing into another study. Nelle agreed with finding out what can be learned from this study and using the information to plan the next study.

Lampman said he is also supportive of this approach.

Laura Heironimus said this makes sense to her as well. She suggested including language in the SOA about reviewing information to plan for future studies to make sure this topic stays on the agenda in 2025. Lampman said this type of language has been included in previous SOAs. Gingerich agreed.

Ferguson said he is not hearing any objections and summarized that Douglas PUD will draft a Pacific Lamprey Translocation SOA, for implementation from 2023 to 2024, that is consistent with the Pacific Lamprey MP and with a commitment to continue discussing a potential study design for implementation in 2025, for discussion and possible decision during the Aquatic SWG conference call on May 10, 2023. *(Note: this SOA was distributed to the Aquatic SWG by Kristi Geris on May 10, 2023.)*

C. Bull Trout Tagging Update (Chas Kyger)

Chas Kyger said collection of Bull Trout through incidental steelhead broodstock angling is now complete. This year crews tagged 6 fish, which are in addition to 10 fish tagged last year and 1 fish tagged in 2021. A total of 17 fish have been tagged for inclusion in the *Bull Trout Movement and Life History Investigation 2022*. Of these fish, tissue samples were collected from 16 fish and were sent to the laboratory last week. Douglas PUD will run another query for PIT detections in the next couple of months once the migration starts again and then will produce a report to complete this effort.

Rd Nelle said this is a lot fewer fish than what he thought would be collected with angling, but he guessed this is it in terms of the total number of fish. Kyger said that is correct, there are no further plans for angling, and there is no more trapping planned at the dam. If additional Bull Trout are incidentally encountered, they will be PIT-tagged and included in the study, but this is not likely

given the number of Bull Trout encountered during other types of activities. Nelle asked whether the Twisp Weir is still not working. Kyger said the Twisp Weir likely will not be used again for spring Chinook Salmon broodstock collection because those fish are now collected at the dam. Plus, there are still mechanical issues at the weir. John Ferguson asked whether the panel is still not working. Kyger said when the panels are installed, steelhead can still get through. Then when there is high river flow, spring Chinook Salmon can go over the trap with the panels installed. Nelle asked why no collection is occurring at the dam. Kyger said in the past, crews tailored their trapping operations to collect Bull Trout, which move through the ladder at different times than Chinook Salmon, but there are no plans to target Bull Trout. Nelle said this is just the way it goes sometimes, especially because the population is so low. Kyger agreed and recalled this was the reason for switching to PIT tags—because USFWS wanted to minimize risk of impacting survival to an already small population. Nelle said he hopes to collect meaningful data from these PIT-tagged fish in order to talk about how to get the information needed moving forward. He asked whether the next similar study will be in 10 years. Kyger said yes, and hopefully in 10 years the population will be doing better and well enough to conduct a radio telemetry study. Nelle said it may not be too early to start these conversations. Kyger agreed and said Douglas PUD plans to monitor the population. It seems there is a cycle with numbers at Wells Dam. If the population rebounds as in the past, Douglas PUD can align this with the next study. Nelle agreed. Sometimes these MPs do not correspond with what is going on in the different populations. This is something to keep discussing so as to not miss the next opportunity or be constrained by a 10-year timeline. Kyger agreed and said at the beginning of the Federal Energy Regulatory Commission (FERC) license, the Twisp Weir and Wells Dam studies were separate. This did not make sense, so Douglas PUD combined the studies. There is this flexibility to do what is best for these study fish.

Judy Neibauer recalled discussing last month not only tracking these fish for the duration of this study, but continually monitoring these PIT-tagged fish through time with regular updates. Andrew Gingerich said Douglas PUD can do this, along with filing a formal report on the study with FERC. Neibauer suggested including plans to continue monitoring these fish in the report. Kyger said he thinks it is reasonable to continue tagging fish during angling efforts for steelhead broodstock, which will keep building upon the existing dataset. Neibauer suggested that the current Bull Trout action item include thinking about the next study and what might be a good backup plan to address in the next 10 years. Perhaps piggybacking on other acoustic telemetry studies by tagging a portion of Bull Trout to take advantage of equipment in the water (i.e., consider ways to gather information that might not happen on a 10-year timeline). It is good to think about working on all species together.

D. White Sturgeon Reports for Review (Andrew Gingerich)

Andrew Gingerich said last year, Douglas PUD completed a White Sturgeon M&E effort focused on indexing adult and juvenile White Sturgeon along with an adult reproductive assessment. Reports summarizing these efforts are drafted and ready to distribute to the Aquatic SWG for review. He has not forgotten about these reports; rather, he was waiting to get through these several year-end FERC deliverables with more pressing deadlines before adding more to the Aquatic SWG's workload. Typically, these types of reports are available for a 30-day review, but Douglas PUD can accommodate a longer review period, if needed.

III. Administration

A. 2022 ASA Annual Report (John Ferguson)

John Ferguson said the draft 2022 ASA Annual Report and six aquatic resource MP annual reports have been out for a 45-day Aquatic SWG review. Comments are due Monday, April 24, 2023. The final draft reports for approval will be distributed on May 3, 2023, and Douglas PUD will request approval of the reports during the Aquatic SWG meeting on May 10, 2023. The final approved reports are due to FERC on May 31, 2023.

B. Upcoming Meetings (John Ferguson)

The Aquatic SWG meeting on May 10, 2023, will be held by conference call.

Other upcoming meetings include June 14 and July 12, 2023 (conference call).

List of Attachments

Attachment A List of Attendees
Attachment B BY 2022 White Sturgeon Rearing Update
Attachment C Adult Pacific Lamprey Translocation To Date

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
RD Nelle	Aquatic SWG Technical Representative	U.S. Fish and Wildlife Service
Judy Neibauer	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
Jason McLellan	Aquatic SWG Technical Representative	Confederated Tribes of the Colville Reservation
Ralph Lampman	Aquatic SWG Technical Representative	Yakama Nation

	8-Feb		10-Apr	
Tank	Population	Grams	Population	Grams
1	194	56.0	55	527.9
2	134	55.4	55	527.9
3	82	412.7	55	527.9
4	82	412.7	55	527.9
5	82	412.7	54	527.9
6	82	412.7	54	527.9
7	156	168.1	183	189.2
8	60	20.5	66	52.2
9	91	216.2	189	108.1
10	194	46.8	170	156.6
11	105	54.7	145	106.3
12	117	66.8	116	245.4
Mag 1	--	--	103	238.9
Mag 2	1052.0	302.7	1,105	306.8
Total	2,431	222.9	2,405	276.8

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

From: Ralph Lampman
To: Kristi Geris
Cc: Amber Nealy; Andrew Gingerich (andrewg@dcpud.org); Blanchard, Monica R (DFW); Brandon Rogers; Bret Nine; Chad Jackson; Chas Kyger; Chris Sheridan; David Blodgett, III; Heironimus, Laura B (DFW); Hoenes, Brock D (DFW); Jason McLellan; Joe Blodgett; John Ferguson; John Rohrback; Judy Neibauer; kirk.truscott; Peterschmidt, Mark F. (ECY); Verhey, Patrick M (DFW); RD Nelle; Ritchie Graves; Scott Carlon; Shane Bickford (sbickford@dcpud.org); Sonja Kokos; Tara Callaway; william_gale@fws.gov; bzim461; Jim Craig (jim_l_craig@fws.gov); Tracy Hillman
Subject: Re: Aquatic SWG: 4/12 conf call agenda
Date: Wednesday, April 12, 2023 10:49:21
Attachments: image.png

Brood Year	2015-2016	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022	average
# of lamprey	249	170	694	1246	361	592	773	584

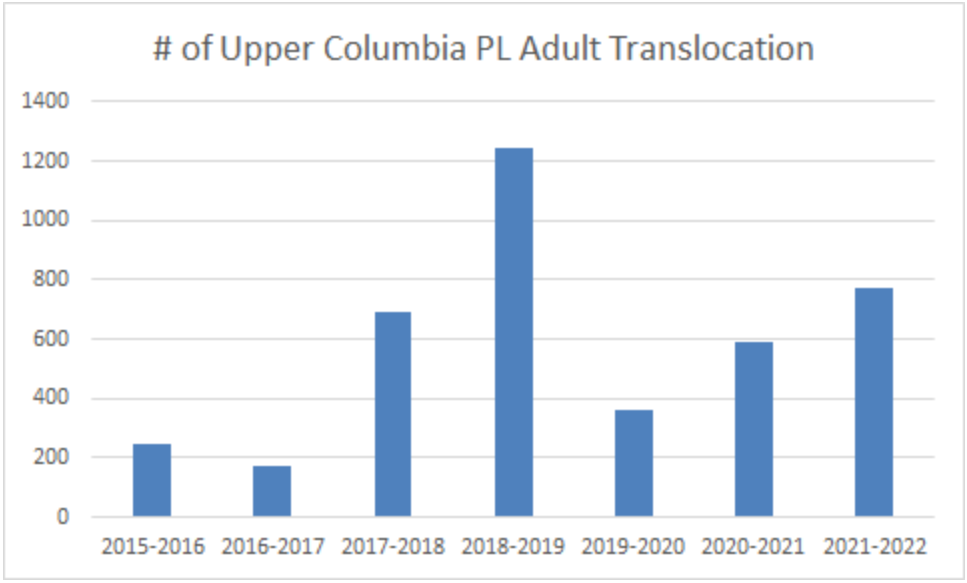
Table format

~Warm Regards~

Ralph Lampman
COLUMBIA RIVER| Honor. Protect. Restore
Yakama Nation FRMP, Pacific Lamprey Project
lamr@yakamafish-nsn.gov
509-388-3871

On Wed, Apr 12, 2023 at 10:44 AM Ralph Lampman <lamr@yakamafish-nsn.gov> wrote:

> Translocation to date: (I don't have the 2022 #s handy, but a much smaller #)



FINAL

Conference Call Minutes

Aquatic Settlement Work Group

To: Aquatic SWG Parties Date: June 14, 2023

From: John Ferguson, Chair, Anchor QEA, LLC

Re: Final Minutes of the May 10, 2023, Aquatic SWG Conference Call

The Aquatic Settlement Work Group (SWG) met by conference call on Wednesday, May 10, 2023, 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, LLC (Anchor QEA) will distribute the typo corrections to the final revised *Pacific Lamprey Management Plan 2022 Annual Report* (2022 Pacific Lamprey MP Annual Report) that were discussed during the Aquatic SWG conference call on May 10, 2023 (Item II-C). *(Note: Kristi Geris distributed these corrections following the conference call on May 10, 2023.)*
2. Douglas PUD will provide via email a comprehensive summary table (similar to the "Last Seen" table) showing the year that juvenile Pacific Lamprey were captured and passive integrated transponder (PIT)-tagged at the different smolt trap locations, including the PIT-tag size and type and their downstream detections, over the course of the entire tagging effort (2021 to 2022), and these data will also be incorporated into future Pacific Lamprey MP annual reports (Item II-A). *(Note: John Rohrback provided this summary on June 12, 2023, which was distributed to the Aquatic SWG by Kristi Geris that same day.)*
3. Anchor QEA will add "Juvenile Pacific Lamprey Studies" to the Aquatic SWG agenda for June 14, 2023 (Item II-A). *(Note: this has been added to the agenda.)*
4. Anchor QEA will distribute the edits to the draft Statement of Agreement (SOA), *To translocate adult Pacific Lamprey from Priest Rapids Dam to areas within or upstream of the Wells Project 2023-2024* (2023–2024 Adult Pacific Lamprey Translocation SOA), that were crafted during the Aquatic SWG conference call on May 10, 2023 (Item II-C). *(Note: Geris distributed these edits following the conference call on May 10, 2023.)*
5. Douglas PUD will coordinate with the Yakama Nation (YN) and U.S. Fish and Wildlife Service (USFWS) on further edits to the draft 2023-2024 Adult Pacific Lamprey Translocation SOA for discussion and decision during the Aquatic SWG conference call on June 14, 2023 (Item II-C). *(Note: this draft SOA was distributed to the Aquatic SWG by Kristi Geris on June 5, 2023.)*
6. The Aquatic SWG meeting on June 14, 2023, will be held by conference call (Item III-A).

Summary of Decisions

1. Aquatic SWG members present approved the *Annual Report Calendar Year 2022 Activities Under the Aquatic Settlement Agreement* (2022 ASA Annual Report), as revised, and appended *2022 Annual Report White Sturgeon Management Plan* (2022 White Sturgeon MP Annual Report), as revised; *2022 Bull Trout Management Plan and Incidental Take Annual Report* (2022 Bull Trout MP Annual Report), as revised; *2022 Annual Report Water Quality Management Plan* (2022 Water Quality MP Annual Report) and appended *2022 Water Temperature Annual Report*; 2022 Pacific Lamprey MP Annual Report, as revised; *Aquatic Nuisance Species Management Plan 2022 Annual Report* (2022 Aquatic Nuisance Species MP Annual Report), as revised; and *Resident Fish Management Plan 2022 Annual Report* (2022 Resident Fish MP Annual Report), as revised (Item II-A).

Agreements

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

Review Items

1. The draft 2023–2024 Adult Pacific Lamprey Translocation SOA was distributed to the Aquatic SWG by Kristi Geris prior to the conference call on May 10, 2023. An edited SOA was distributed after the conference call that same day (Item-II-C). A revised SOA for approval was distributed on June 5, 2023. The CTCR submitted comments on the revised SOA, which were distributed on June 9, 2023.
2. The draft *White Sturgeon Supplementation and Management Plan Implementation in the Wells Reservoir, 2022* was distributed to the Aquatic SWG by Kristi Geris on May 17, 2023, and is available for a 45-day review with edits and comments due to Chas Kyger by July 1, 2023.
3. The draft *Wells Reservoir, 2022 White Sturgeon Reproduction Assessment* was distributed to the Aquatic SWG by Geris on May 17, 2023, and is available for a 45-day review with edits and comments due to Kyger by July 1, 2023.

Documents Finalized

1. The final 2022 ASA Annual Report and appended 2022 White Sturgeon MP Annual Report, 2022 Bull Trout MP Annual Report, 2022 Water Quality MP Annual Report and appended *2022 Water Temperature Annual Report*, 2022 Pacific Lamprey MP Annual Report, 2022 Aquatic Nuisance Species MP Annual Report, and 2022 Resident Fish MP Annual Report were filed with the Federal Energy Regulatory Commission (FERC) on May 16, 2023, as distributed to the Aquatic SWG by Kristi Geris on May 17, 2023 (Item II-A).

I. Welcome

A. Review Agenda (John Ferguson)

John Ferguson welcomed the Aquatic SWG members (Attachment A). Ferguson asked for any additions or changes to the agenda. The following revisions were requested:

- Breean Zimmerman said she needs to leave the meeting at 10:30 a.m.
- Andrew Gingerich added a Water Supply Update.

Jerrmaine Treadwell (USFWS) introduced herself. Treadwell said she works with Judy Neibauer and is attending today's conference call to take notes in Neibauer's absence.

B. Meeting Minutes Approval (John Ferguson)

The revised draft April 12, 2023, conference call minutes were reviewed. Kristi Geris said all revisions received from members of the Aquatic SWG were minor, and clarifying edits were incorporated into the revised minutes. Geris also added distribution of the draft 2023–2024 Pacific Lamprey Translocation SOA. The Aquatic SWG members present approved the April 12, 2023, conference call minutes, as revised.

C. Review of Action Items (John Ferguson)

Action items from the Aquatic SWG conference call on April 12, 2023, are as follows *(Note: The following italicized item numbers correspond to agenda items from the April 12, 2023, meeting)*:

1. *The YN will continue planning for an annual regional meeting to discuss the latest literature on Pacific Lamprey passage improvements and technology (Item I-C).*
   Ralph Lampman said he is simultaneously working on a juvenile Pacific Lamprey passage regional meeting, which is a little more urgent, so his focus has been on that. The adult portion might be combined with a future Pacific Lamprey Conservation Initiative (PLCI) Upper Columbia Regional Management Unit (RMU) meeting. John Ferguson asked whether the PLCI RMU meeting is scheduled. Lampman said this year's annual meeting already occurred last month and focused on U.S. Army Corps of Engineers projects. However, maybe next year there can be an opportunity for the PUDs to discuss adult Pacific Lamprey passage improvements and technology. Lampman suggested closing out this action item for now.
2. *Douglas PUD and USFWS will discuss possible approaches to address regional Bull Trout data gaps under the Recovery Planning Participation and Regional Coordination objectives of the Bull Trout MP and will report back to the Aquatic SWG (Item I-C).*
   Andrew Gingerich said there are no updates since what was shared during the last meeting. This action item is ongoing, and he is not sure it needs to be a recurring item. RD Nelle

recalled this action item was linked to updates on the last PIT-tagging effort, which is now complete, so he suggested closing out this item for now.

3. *Douglas PUD will draft a Pacific Lamprey Translocation SOA, for implementation from 2023 to 2024, that is consistent with the Pacific Lamprey MP and with a commitment to continue discussing a potential study design for implementation in 2025, for discussion and possible decision during the Aquatic SWG conference call on May 10, 2023 (Item II-B).*
   This SOA was distributed to the Aquatic SWG by Kristi Geris on May 10, 2023.

II. Summary of Discussions

A. DECISION: 2022 ASA Annual Report (John Ferguson)

John Ferguson said the draft 2022 ASA Annual Report and six aquatic resource MP annual reports have been out for a 45-day Aquatic SWG review. He suggested Kristi Geris review comments received on the draft 2022 ASA Annual Report and then have Andrew Gingerich cover the six aquatic resource MP annual reports.

Geris said for the draft 2022 ASA Annual Report, the only edits received were from Jason McLellan. All edits were minor clarifications that were distributed to the Aquatic SWG in tracked changes.

Gingerich said no edits or comments were received on the draft 2022 Water Quality MP Annual Report and appended *2022 Water Temperature Annual Report*. For the other five aquatic resource MP annual reports, the only edits received were from McLellan. Like the 2022 ASA Annual Report, all edits were minor. In the interest of time, he suggested that McLellan share anything remarkable and then the Aquatic SWG vote to approve the annual report in its entirety. McLellan said he has nothing to report. Ferguson asked whether any members are opposed to approving the 2022 ASA Annual Report and six aquatic resource MP annual reports, in total. No objections were expressed.

Aquatic SWG members present approved the 2022 ASA Annual Report, as revised, and appended 2022 White Sturgeon MP Annual Report, as revised; 2022 Bull Trout MP Annual Report, as revised; 2022 Water Quality MP Annual Report and appended *2022 Water Temperature Annual Report*; 2022 Pacific Lamprey MP Annual Report, as revised; 2022 Aquatic Nuisance Species MP Annual Report, as revised; and 2022 Resident Fish MP Annual Report, as revised.

Ralph Lampman noted two typos in the draft 2022 Pacific Lamprey MP Annual Report. In Section 3.2.3.1 and Section 3.2.4.1, the date 2021 needs to be changed to 2022. Gingerich agreed with these edits. Anchor QEA will distribute these typo corrections to the final revised 2022 Pacific Lamprey MP Annual Report. *(Note: Geris distributed these corrections following the conference call on May 10, 2023.)*

Lampman said in Section 3.2.4.1 of the draft 2022 Pacific Lamprey MP Annual Report, it would be helpful to clarify the type of PIT tag used for tagging juveniles at the smolt traps. Based on the size distribution, most individuals could be tagged with 12-millimeter (mm) tags. The size threshold for 12-mm tags is 3 grams in weight and 130 mm in length. The smaller individuals would receive 10-mm tags. Chas Kyger confirmed that individuals large enough to receive 12-mm tags were tagged with 12-mm tags. Only the small ammocoetes received 10-mm tags. Lampman said it would also be helpful if this section included a summary table, similar to the "Last Seen" translocation table, that shows the year individuals were captured and PIT-tagged at the different smolt traps and their downstream detections over the course of the entire tagging effort. Gingerich said that, because this annual report has already been approved, he suggested providing this information and summary table via email and including these items in future annual reports. Lampman agreed this makes sense. Douglas PUD will provide via email a comprehensive summary table (similar to the "Last Seen" table) showing the year that juvenile Pacific Lamprey were captured and PIT-tagged at the different smolt trap locations, including the PIT tag size and type, and their downstream detections, over the course of the entire tagging effort (2021 to 2022), and these data will also be incorporated into future Pacific Lamprey MP annual reports. *(Note: John Rohrback provided this summary on June 12, 2023, which was distributed to the Aquatic SWG by Geris that same day.)*

Lampman said, lastly, these annual reports provide a good summary of what has been done; however, he would like more clarity on when the next juvenile study can take place. Ferguson suggested that Lampman request this agenda item when he is ready to discuss this topic. Lampman suggested adding this topic to next month's agenda. Anchor QEA will add "Juvenile Pacific Lamprey Studies" to the Aquatic SWG agenda for June 14, 2023. *(Note: this has been added to the agenda.)*

The final 2022 ASA Annual Report and appended 2022 White Sturgeon MP Annual Report, 2022 Bull Trout MP Annual Report, 2022 Water Quality MP Annual Report and appended *2022 Water Temperature Annual Report*, 2022 Pacific Lamprey MP Annual Report, 2022 Aquatic Nuisance Species MP Annual Report, and 2022 Resident Fish MP Annual Report were filed with FERC on May 16, 2023, as distributed to the Aquatic SWG by Geris on May 17, 2023.

B. PRESENTATION: Water Supply Update (Andrew Gingerich)

Andrew Gingerich said the presentation, *Wells Project Water Year Forecast* (Attachment B), was distributed to the Aquatic SWG by Kristi Geris prior to the conference call on May 10, 2023. Gingerich said this presentation was developed by John Rohrback, and Gingerich added a few updates as conditions have recently changed.

Slide 2
Gingerich said the orange line on this graph shows average daily discharge at the Wells Project through March 24, 2023. The blue line is the 10-year average.

Slide 3
There continued to be below-average discharge throughout the month of April, until April 30, 2023, when there was a remarkable shift in discharge at Wells. A really cold spring held back snowpack until about 1 week ago when it warmed up. Additionally, Grand Coulee Dam was conducting drum gate maintenance, which was completed at the end of April. This resulted in a collision of inflow from Canadian snowpack, Grand Coulee Dam, and side flows from the Methow and Okanogan river basins. He cannot recall ever seeing such a shift in discharge.

Slide 4
Douglas PUD tracks a water supply volume monthly forecast compiled by the National Oceanic and Atmospheric Administration. In April 2023, total discharge at Grand Coulee Dam was well below the 30-year average. This plot was created on May 1, 2023, at which time it was forecasted that the runoff volume for the month of May would be about average. The Northwest River Forecast Center predicted that water supply at Grand Coulee would be 84% of average.

Slide 5
Now looking at a plot created on May 10, 2023, 10 days later, the water supply forecast at Grand Coulee is now 139% of average.

Slide 6
The circled data on the left side show forecasts for the water supply forecast at Grand Coulee for the April to September period, which is now 92% and 94% of average. This was 84% one week ago. The right side also shows an increase in the seasonal runoff forecast. This is a remarkable change. He also noted that the error bars come closer together moving throughout the year.

Slide 7
The Northwest River Forecast Center was remarking about the above-average precipitation during the month of May 2023. This slide shows the percent of average at SNOTEL sites. In the upper basin, some sites are not reporting 10 days later, but some show disappearance of yellow and orange and more-prevalent green, which is closer to average. This helps explain what is occurring in the upper basin. The Snake River Basin had a better late winter and early spring, partly due to the extended colder weather holding back snowpack runoff. He believes the Snake River Basin at Lower Granite Dam was 104% of average, and the Columbia River at The Dalles was slightly below average but not by much.

Slide 8
This shows El Niño and La Niña forecasting. For June, July, and August of 2023, there is a shift from a La Niña event toward an El Niño event. In the Pacific Northwest, the outlook is for above-average temperatures and below-average precipitation.

Slide 9
The data shared in this presentation can be accessed at the link in this slide.

(Note: Breean Zimmerman left the conference call.)

Discussion
Ralph Lampman asked, knowing that below-average precipitation is expected for June, July, and August of 2023, is there capacity to hold back water during May 2023 to try and balance this out? Gingerich said he can only speak about the Wells Project and not about the Federal Columbia River Power System upstream of Wells Dam. Wells Dam is a run-of-the-river project with no ability for excess storage. The project has 10 feet of operating range, and the project typically operates in the upper foot. He does not know about storage above Wells Dam. Grand Coulee will capture some water because that reservoir is typically operated to be at full pool by the July 4th holiday; therefore, there will be some muting of the total hydrograph over the next couple of months.

Jason McLellan said the flood control elevation for Lake Roosevelt in March was approximately 1,270 feet mean sea level (MSL). Full pool is 1,290 feet MSL, so this was a relatively minor drawdown. Grand Coulee had two drum gates fail, so the pool was drawn down to 1,250 feet MSL for drum gate repairs. Additionally, with the colder temperatures, less runoff, and the need to provide flows for Chum Salmon spawning below Bonneville Dam, this resulted in additional water being released and the reservoir being drawn down to 1,240 feet MSL. Therefore, Grand Coulee will have to retain a lot of the forecasted runoff to bring the reservoir back to full pool. John Ferguson asked about the water level currently. McLellan said the pool is already up around the mid-1,250s. Runoff has increased a lot in the last week, like Gingerich's graphs showed.

Ferguson asked about the White Sturgeon wild larvae collection effort, with the cooler spring and now warmer temperatures. McLellan said the Confederated Tribes of the Colville Reservation (CTCR) are watching this closely, notably with the quickly increasing temperatures. He is not sure what to expect regarding river flow and timing. There is a lot of variability right now.

C. Adult Pacific Lamprey Translocation SOA (Andrew Gingerich)

Andrew Gingerich said the draft 2023–2024 Adult Pacific Lamprey Translocation SOA was distributed to the Aquatic SWG by Kristi Geris prior to the conference call on May 10, 2023. Gingerich believes this SOA is consistent with what was discussed last month, which is collecting, PIT-tagging, and

translocating up to 800 Pacific Lamprey in both 2023 and in 2024. The fish would be captured at Priest Rapids Dam (PRD) and released above Wells Dam. The target of 800 fish is based on collecting 200 fish during each 4-week trapping period. Logistically, 200 fish is about the limit that can be handled each week in terms of travel time, tagging, and releasing the fish. Additionally, a target of 800 fish is dependent on run strength at PRD. He did not include details about which 4 weeks will be targeted. He expects this will be the same as in the past. That is, Douglas PUD will coordinate with the Aquatic SWG and Ralph Lampman to make a prediction of when the run will arrive and schedule this in concert with Grant PUD and the Aquatic SWG to target the peak of the run. Gingerich recalled that Laura Heironimus and others found value in including in the Statement a commitment to conduct an active tag study. While the nature of the objectives is not yet clear, he included this language at the end of the Statement. Lastly, the Background of the draft SOA is straightforward.

Gingerich said Douglas PUD is not expecting that the SOA be approved this month, but approval next month will be needed to provide time to coordinate with Grant PUD. John Ferguson noted that only 12 fish have been counted at Bonneville Dam, so the run is just starting.

Lampman said 200 fish per week is a change from the last SOA,[1] which was 1,000 fish over 15 days. He also recalled from the past an agreement[2] for Douglas PUD to translocate Grant PUD's fish farther upstream during the second 4-week period, thereby creating 8 weeks of translocation above Wells Dam. He suggested either renewing this agreement or increasing the target number to 250 fish per 4-week period to try and get as many fish above Wells Dam as possible.

Ferguson noted that 250 fish per week inflates the weekly number beyond what Douglas PUD thinks they can handle, and extending translocation above Wells Dam from 4 to 8 weeks requires a mid-season meeting and decision to proceed or not proceed.

Lampman asked how large the tank space is. Gingerich said the tank can fit more than 200 fish, which is not the limiting factor. Logistically, this becomes a challenge when handling so many animals. Regarding the other suggestion, if after 4 weeks of translocation the Aquatic SWG wants Douglas PUD to continue translocation above Wells Dam by meeting Grant PUD at Kirby Billingsley Hydro Park as was done in the past, he thinks Douglas PUD would be supportive of this. While he is receptive to editing the SOA to reflect this, he is not sure how to capture this because the additional effort is tied to Grant PUD's obligation, and if this changes it could put Douglas PUD in a weird spot. In terms of the overall number, this is a guessing game. He does not know of any technical data for the right number or for identifying a threshold.

[1] The last translocation SOA, *To translocate adult Pacific Lamprey from Priest Rapids Dam to areas within or upstream of the Wells Project and postpone passage evaluations*, was approved by the Aquatic SWG on June 13, 2018, and was distributed by Kristi Geris on June 14, 2018.

[2] Aquatic SWG conference call on August 12, 2020

Ferguson, Lampman, and Gingerich discussed various edits to the draft SOA, including copying in language from the last SOA while Geris made these edits real time on the WebEx. Lampman wanted to include more specifics on target numbers, and Gingerich did not want to commit Douglas PUD to something unachievable due to a low run size. RD Nelle suggested setting a goal based on a proportion of the run. Ferguson recalled this was the approach a few years ago. Gingerich said that if Douglas PUD traps 3 of 7 days per week, this is roughly 42% of the fish available at PRD. If trapping only occurs at night, then the total proportion of fish trapped would be less than 42%. This still seems like a lot of the run being translocated above Wells. Lampman noted that considering the total run, this is only about 17% at maximum (in 2020) based on number trapped versus overall number trapped or passed within the year (note: 42% represents the percent of days being trapped but it does not equate to the actual number being trapped). He said there are roughly 500 river kilometers (rkms) of habitat above Wells Dam. Assuming roughly 1 fish per rkm and targeting 1,000 fish equals 2 fish per rkm. There is more available habitat above Wells Dam compared to between PRD and Wells. He is supportive of translocating more fish above Wells Dam for this reason. Nelle said this is somewhat speculative and that quality of habitat could also be a factor. He prefers to be conservative when considering the needs of the Wenatchee and Entiat river basins.

Nelle said he cannot see the live edits to the SOA because he is taking the call from his car, and he would like an opportunity to review the edits before voting. Ferguson said Douglas PUD may want to further edit the language to reflect a level of effort versus tying the SOA to a numerical goal. Gingerich said he would also like to discuss these edits with John Rohrback, who could not attend today's call, and perhaps have Rohrback further discuss the SOA with Lampman and Nelle.

Geris said she will distribute the edits to the draft 2023–2024 Adult Pacific Lamprey Translocation SOA that were crafted during the Aquatic SWG conference call on May 10, 2023. *(Note: Geris distributed these edits following the conference call on May 10, 2023.)*

Douglas PUD will coordinate with the YN and USFWS on further edits to the draft 2023–2024 Adult Pacific Lamprey Translocation SOA for discussion and decision during the Aquatic SWG conference call on June 14, 2023. *(Note: this draft SOA was distributed to the Aquatic SWG by Geris on June 5, 2023.)*

D. BY 2022 White Sturgeon Rearing and SAP Screening Update (Chas Kyger)

A brood year (BY) 2022 White Sturgeon Rearing Update (Attachment C) was distributed to the Aquatic SWG by Kristi Geris prior to the conference call on May 10, 2023. Chas Kyger said 328 fish are on station at Wells Fish Hatchery for the Douglas PUD program, averaging 667 grams in weight. Blood sampling for spontaneous autopolyploidy (SAP) for Douglas PUD fish was completed on Monday, May 8, 2023. Samples were shipped to the lab, and results are expected by the end of next week. Following the blood sampling there were no mortalities or injuries. Once results are back, fish

will be weighed and measured prior to release. Any fish testing positive for SAP will be culled. Release of BY 2022 White Sturgeon is planned for the week of June 1, 2023.

John Ferguson asked whether the release will be done in coordination with Bridgeport High School, as done in the past. Kyger said he plans to reach out to the school with an invitation to participate.

Andrew Gingerich asked whether the CTCR will sample Chelan PUD fish next week. McLellan said the CTCR plan to draw blood on over the next 2 months on the 15th and 22nd of each month.

III. Administration

A. Upcoming Meetings (John Ferguson)

The Aquatic SWG meeting on June 14, 2023, will be held by conference call.

Other upcoming meetings include July 12 and August 9, 2023 (conference call).

List of Attachments

Attachment A List of Attendees
Attachment B *Wells Project Water Year Forecast*
Attachment C BY 2022 White Sturgeon Rearing Update

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
RD Nelle	Aquatic SWG Technical Representative	U.S. Fish and Wildlife Service
Jerrmaine Treadwell	Aquatic SWG Technical Support	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
Jason McLellan	Aquatic SWG Technical Representative	Confederated Tribes of the Colville Reservation
Ralph Lampman	Aquatic SWG Technical Representative	Yakama Nation

Notes:
* Left the conference call after Slide 9 of Item II-B.

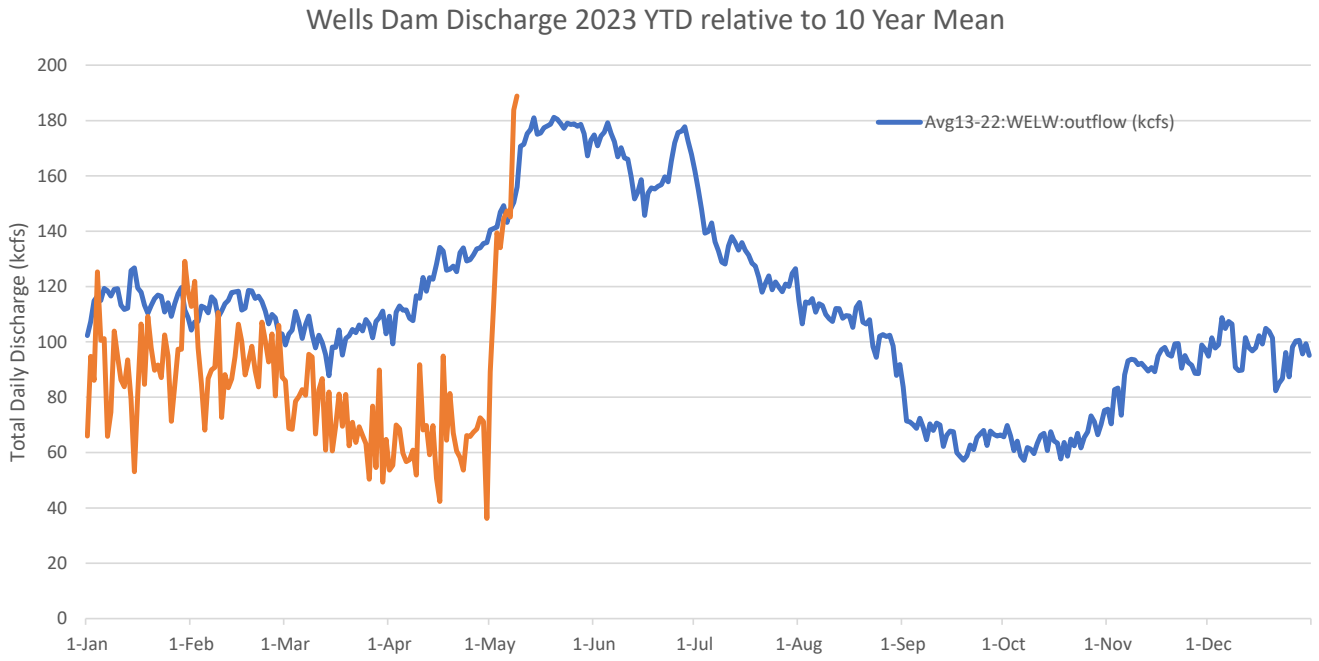
Wells Project Water Year Forecast

Aquatic Settlement Work Group

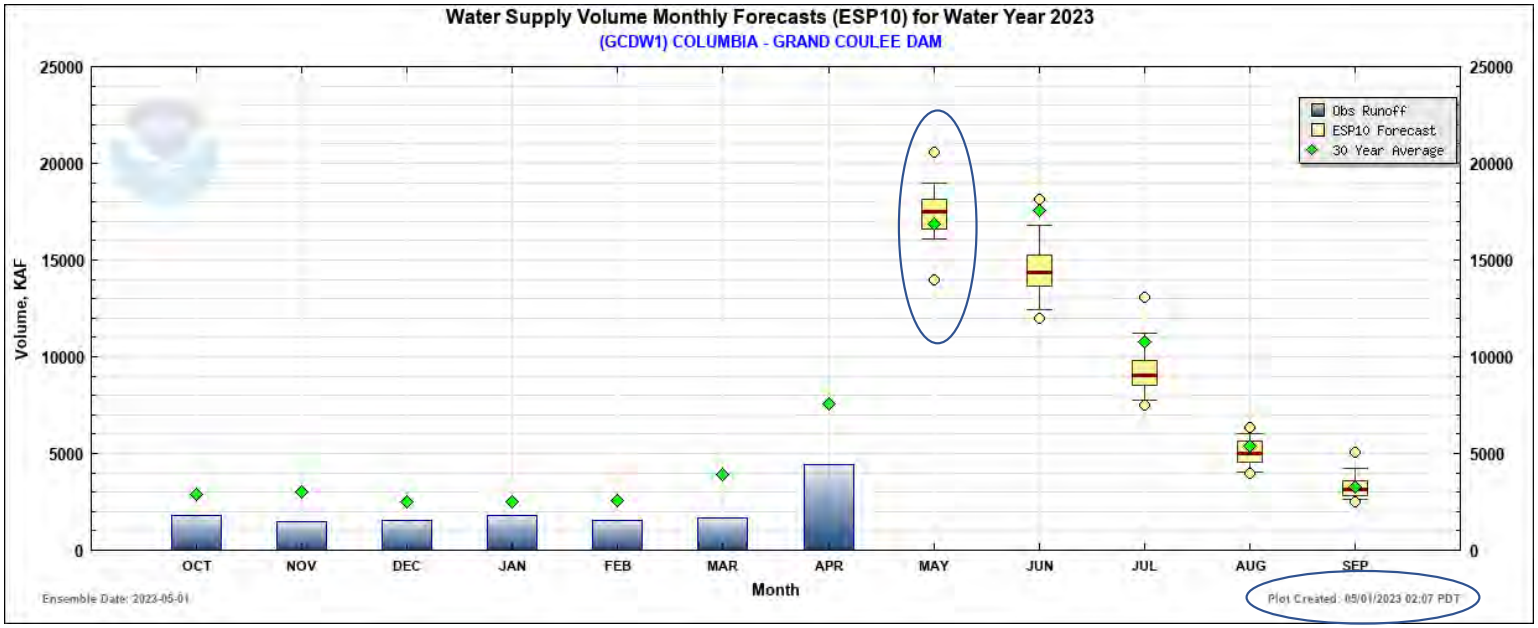
May 10, 2023

Through March 24, 2023, Columbia River discharge has consistently been a little below average at Wells Dam

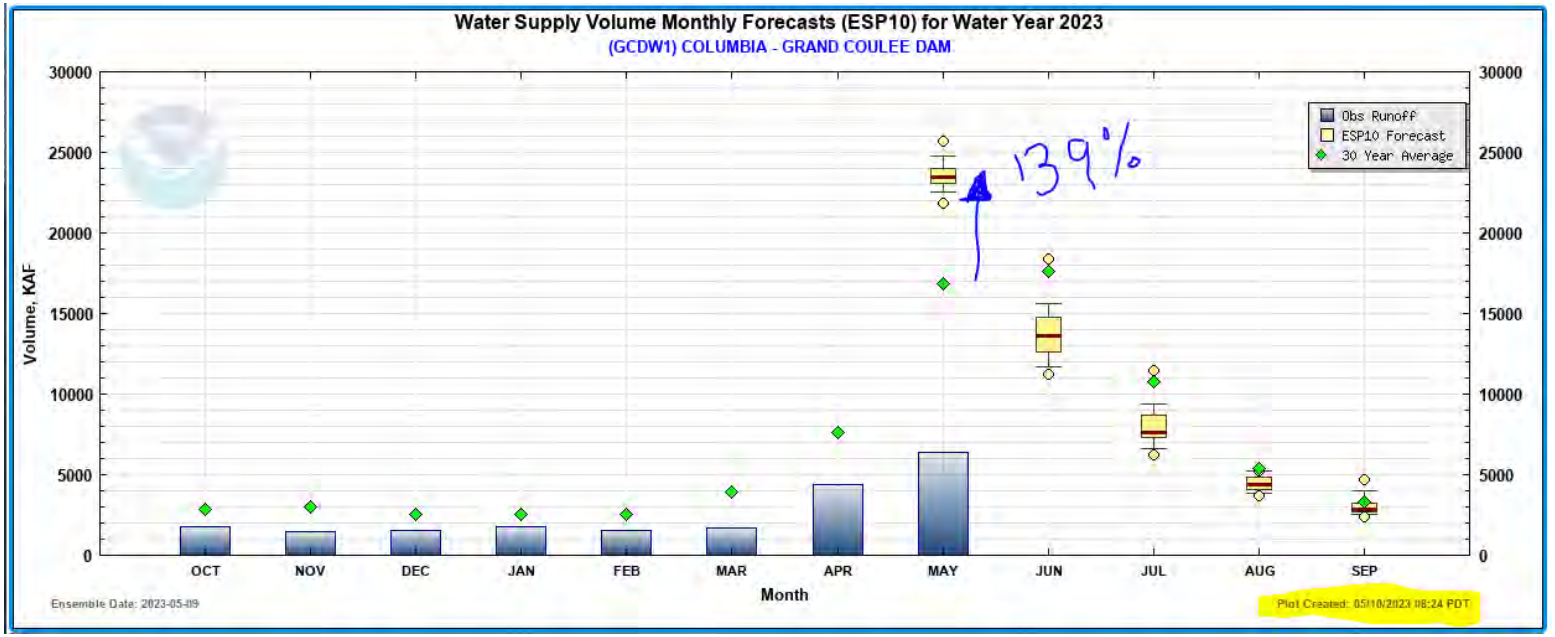
“Quite the Shift”: FCRPS Drum gate completion and a fast warm up



NOAA's water supply volume monthly forecasts predict a slightly below average water year in 2023 (the official water supply forecast at Grand Coulee is currently 94% of average). Two weeks ago 84%.



May forecast from 100% to 139% in just 10 days



From 84% 2 Weeks ago to 92-94%

Northwest River Forecast Center

Water Supply Forecasts

Home | Data/Normals | Rankings | ENSO / Runoff | Adjustments | Verification | Verify All Years | Archive | Monthly Water Supply Forecasts | Help

Choose Date: 05/10/2023 Archive: Water Year

COLUMBIA - GRAND COULEE DAM (GCDW1)
Forecasts for Water Year 2023

Official Water Supply

ESP with 10 Days QPF ***Ensemble:*** 2023-05-09 ***Issued:*** 2023-05-09

Forecast Period	Forecasts Are in KAF				30 Year Average (1991-2020)
	90 %	50 %	% Average	10 %	
APR-SEP	53579	56861	92	61694	61483
APR-JUL	46683	49052	93	53845	52774
APR-AUG	50846	53364	92	58751	58186
JAN-SEP	58601	61882	88	66715	70457
JAN-JUL	51704	54073	88	58866	61749
OCT-SEP	63464	66745	85	71579	78842

Experimental Water Supply

HEFS with 15 days EQPF ***Ensemble:*** 2023-05-09 ***Issued:*** 2023-05-09

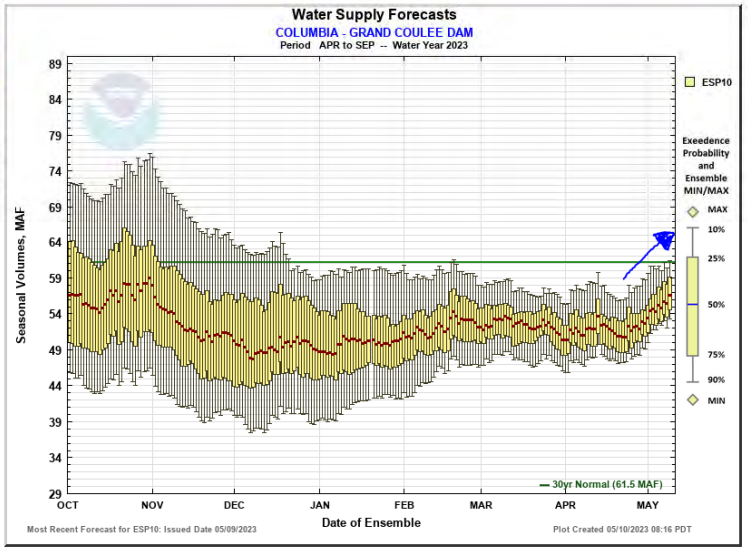
APR-SEP	54536	57500	94	62539	61483
APR-JUL	47324	50062	95	54623	52774
APR-AUG	51613	54420	94	59658	58186
JAN-SEP	59557	62521	89	67560	70457
JAN-JUL	52345	55083	89	59645	61749
OCT-SEP	64421	67385	85	72423	78842

Reference

ESP with 0 Days QPF ***Ensemble:*** 2023-05-09 ***Issued:*** 2023-05-09

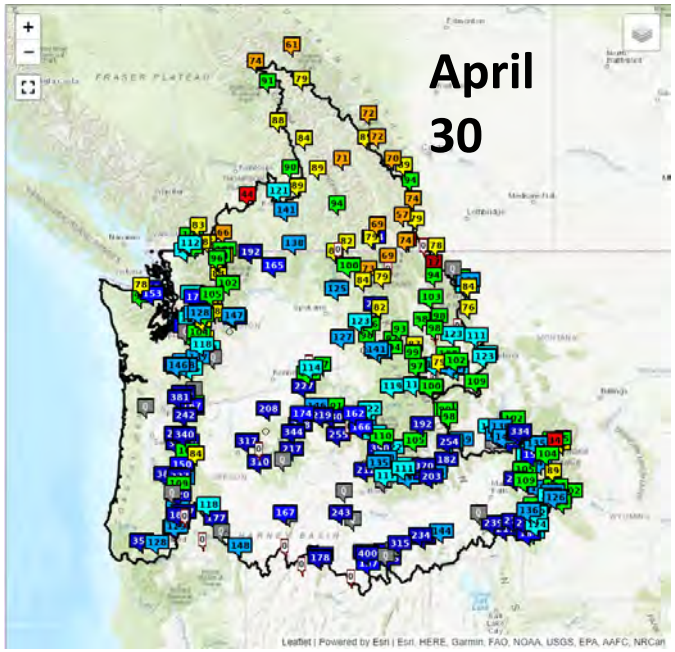
APR-SEP	54382	57999	94	64123	61483
APR-JUL	46758	49567	94	55687	52774
APR-AUG	51797	54950	94	61136	58186
JAN-SEP	59403	63020	89	69144	70457
JAN-JUL	51779	54588	88	60708	61749
OCT-SEP	64266	67883	86	74007	78842

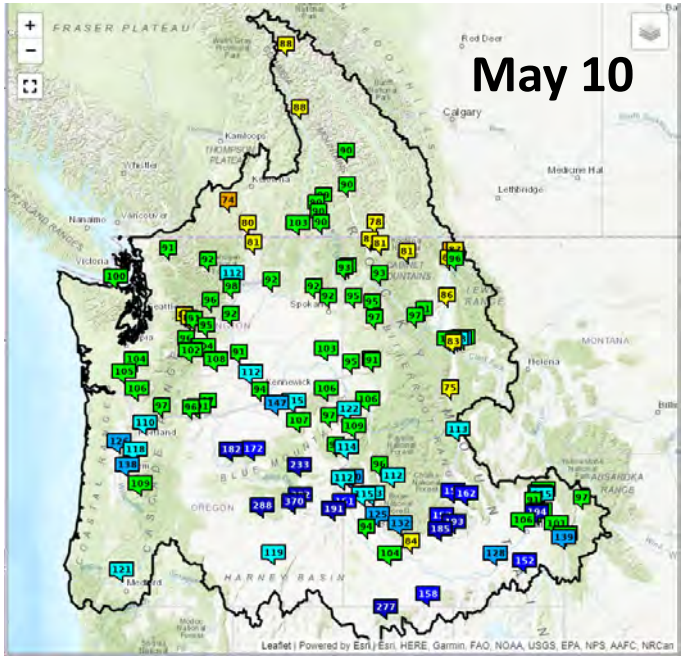
Move the mouse over the desired "Forecast Period" to display a graph.



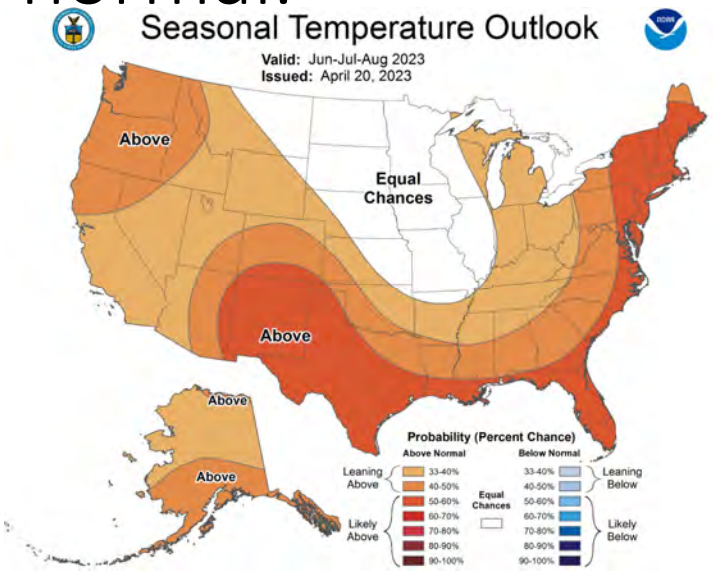
Max Scale | Scale To Data | Scale To Last 45 Days | Show Min/Max Ensemble Volume | Show Tooltips Help

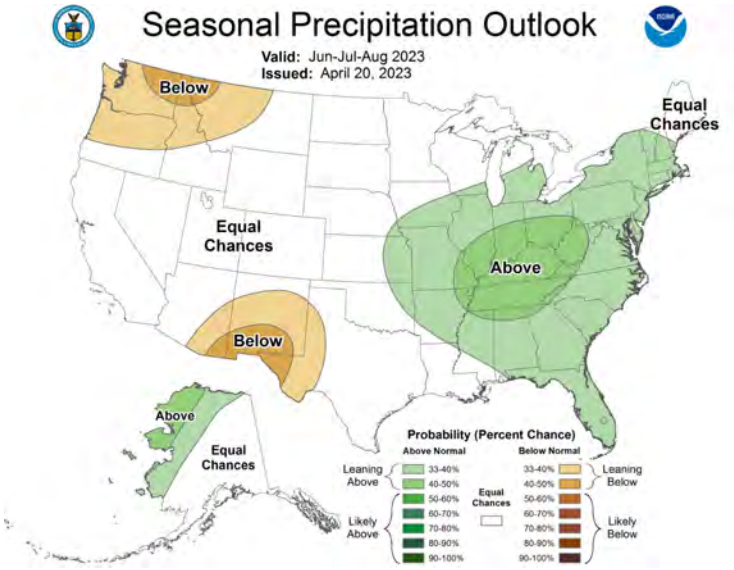
As a percent of average, snowpack is a bit low at SNOTEL sites above Wells Dam





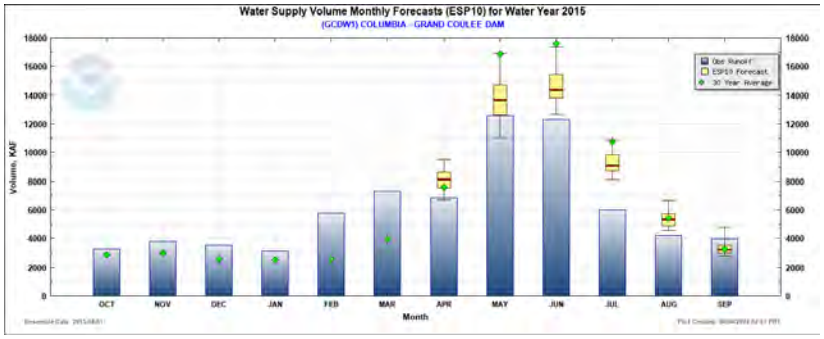
The seasonal temperature outlook is leaning above normal, and the seasonal precipitation outlook is leaning below normal.



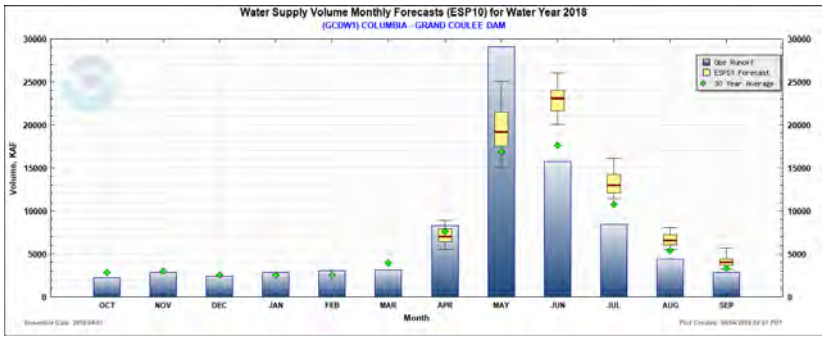


Of course, all models are wrong, but some are accurate enough to be useful…

April, 2015



April, 2018



If you want a more detailed water supply forecast presentation, you can find it here:

https://www.nwrfc.noaa.gov/presentations/html/wy2023_ws/dp.cgi

	10-Apr		8-May	
Tank	Population	Grams	Population	Grams
1	55	527.9	55	667.6
2	55	527.9	55	667.6
3	55	527.9	55	667.6
4	55	527.9	55	667.6
5	54	527.9	54	667.6
6	54	527.9	54	667.6
7	183	189.2	149	168.1
8	66	52.2	51	95.6
9	189	108.1	181	229.3
10	170	156.6	167	232.8
11	145	106.3	147	275.2
12	116	245.4	--	--
Mag 1	103	238.9	256	313.1
Mag 2	1,105	306.8	1,105	391.4
Total	2,405	222.9	2,384	370.1

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

FINAL

Conference Call Minutes

Aquatic Settlement Work Group

To: Aquatic SWG Parties Date: July 12, 2023

From: John Ferguson, Chair, Anchor QEA, LLC

Re: Final Minutes of the June 14, 2023, Aquatic SWG Conference Call

The Aquatic Settlement Work Group (SWG) met by conference call on Wednesday, June 14, 2023, 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. The Confederated Tribes of the Coville Reservation (CTCR) will discuss internally the feasibility of passive integrated transponder (PIT)-tagging and collecting genetic samples from adult Pacific Lamprey picked up from Priest Rapids Dam for translocation into the Okanogan River basin in 2023 (Item II-A).
2. Anchor QEA, LLC, will coordinate with Tracy Hillman (Priest Rapids and Rocky Reach Fish Forums [PRFF and RRFF] Chairman) regarding convening a joint Juvenile Pacific Lamprey Studies Subgroup meeting in late summer to early fall 2023 (Item II-B). *(Note: On Monday, August 21, 2023, Aquatic SWG representatives are invited to join a virtual meeting, hosted by the PRFF, of the PRFF and RRFF Pacific Lamprey Subgroups to discuss models and assumptions of models used to estimate juvenile survival and behavior. This will also include a discussion about juvenile studies to be conducted in the lower Columbia River.)*
3. Douglas PUD will provide a ramp down profile for the recent "Methow Flush and Wells Project Draft" for distribution to the Aquatic SWG (Item II-H). *(Note: Andrew Gingerich provided these data following the Aquatic SWG conference call on June 14, 2023, which Kristi Geris distributed that same day.)*
4. The Yakama Nation (YN) will share a white paper on ramp down rates and impacts to lamprey for distribution to the Aquatic SWG (Item II-H). *(Note: Ralph Lampman distributed a link to the document,* Best Management Guidelines for Native Lampreys*, following the Aquatic SWG conference call on June 14, 2023.)*
5. The YN will share literature on restoration and habitat modeling on lake sturgeon for distribution to the Aquatic SWG (Item II-I). *(Note: Ralph Lampman provided this literature following the Aquatic SWG conference call on June 14, 2023, which Kristi Geris distributed that same day.)*
6. The Aquatic SWG meeting on July 12, 2023, will be held by conference call (Item III-A).

Summary of Decisions

1. Aquatic SWG members present approved the Statement of Agreement (SOA), *To Translocate Adult Pacific Lamprey from Priest Rapids Dam to Areas Within or Upstream of the Wells Project 2023–2024* (2023–2024 Adult Pacific Lamprey Translocation SOA), as revised (Item II-A).

Agreements

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

Review Items

1. The draft *White Sturgeon Supplementation and Management Plan Implementation in the Wells Reservoir, 2022* (2022 White Sturgeon M&E Report) and draft *Wells Reservoir, 2022 White Sturgeon Reproduction Assessment* (2022 White Sturgeon Reproduction Assessment Study Report) were distributed to the Aquatic SWG by Kristi Geris on May 17, 2023, and are available for a 45-day review with edits and comments due to Chas Kyger by July 1, 2023 (Item II-D). The revised reports for approval were distributed on July 10, 2023.

Documents Finalized

1. The final memorandum, *Wells Hydroelectric Project No. 2149, Low Pool Elevation Bull Trout Survey – License Article 402* (Bull Trout Stranding Survey Memorandum), was distributed to the Aquatic SWG by Kristi Geris on June 12, 2023 (Item II-H).
2. The final 2023–2024 Adult Pacific Lamprey Translocation SOA was distributed to the Aquatic SWG by Kristi Geris on June 15, 2023 (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. Prior to the meeting, Kristi Geris added a Bull Trout Stranding Survey Memorandum, per an email from Andrew Gingerich. No other additions were requested at this time.

The following revisions were added throughout the conference call:

- Laura Heironimus added the following: 1) Washington Department of Fish and Wildlife (WDFW) Coulter counter; and 2) White Sturgeon thiamine studies.
- Gingerich added Bull Trout and the Twisp Weir.
- Ralph Lampman added restoration and habitat modeling on lake sturgeon.

B. Meeting Minutes Approval (John Ferguson)

The revised draft May 10, 2023, conference call minutes were reviewed. Kristi Geris said the only edits received were from Ralph Lampman, which clarified comments about numbers of fish available for trapping under the Pacific Lamprey translocation discussion (Item II-C). These were incorporated into the revised minutes. Geris also added distribution of the following: 1) John Rohrback's table accounting for all Pacific Lamprey tagged and released at rotary screw trap locations within the Methow watershed, per his action item; and 2) Jason McLellan's edits to the 2023–2024 Adult Pacific Lamprey Translocation SOA, which will be discussed today. Lastly, Geris said Andrew Gingerich planned to review the revised minutes prior to today's meeting, and she asked if Gingerich had any last edits to the revised minutes. Gingerich said he has no further edits.

The Aquatic SWG members present approved the May 10, 2023, conference call minutes, as revised.

C. Review of Action Items (John Ferguson)

Action items from the Aquatic SWG conference call on May 10, 2023, are as follows *(Note: The following italicized item numbers correspond to agenda items from the May 10, 2023, meeting)*:

1. *Anchor QEA will distribute the typo corrections to the final revised* Pacific Lamprey Management Plan 2022 Annual Report *(2022 Pacific Lamprey MP Annual Report) that were discussed during the Aquatic SWG conference call on May 10, 2023 (Item II-C).*
   Kristi Geris distributed these corrections following the conference call on May 10, 2023.
2. *Douglas PUD will provide via email a comprehensive summary table (similar to the "Last Seen" table) showing the year that juvenile Pacific Lamprey were captured and PIT-tagged at the different smolt trap locations, including the PIT-tag size and type and their downstream detections, over the course of the entire tagging effort (2021 to 2022), and these data will also be incorporated into future Pacific Lamprey MP annual reports (Item II-A).*
   John Rohrback provided this summary on June 12, 2023, which was distributed to the Aquatic SWG by Kristi Geris that same day. Ralph Lampman said this summary only enumerates detections immediately downstream, and he asked if it could show the individual detection arrays to better understand the general time frame of detections. Rohrback explained that all fish detected in the Methow were subsequently detected at LMR.[1] Nine of the 12 fish tagged in the Methow in 2021 were detected in 2021, and three fish were detected in 2022. All but one of the fish tagged in the Twisp were subsequently detected at TWR[2] in 2022. One fish tagged in the Twisp was subsequently detected at MRC[3] on April 27, 2023. Rohrback said these are fish tagged at the rotary screw trap and released

[1] Lower Methow River PIT array.
[2] Lower Twisp River PIT array.
[3] Methow River at Carlton PIT array.

at the site. He likes this summary table, as is. It is difficult to include an entire tag history in one table. Rohrback suggested querying the Columbia Basin PIT Tag Information System (PTAGIS) for additional information. Lampman said it would also be helpful to distinguish between larvae and juveniles, which need to be entered in PTAGIS as a comment or abbreviation. Rohrback said these data are collected and he can work with WDFW to make sure this information, and tag type as previously requested by Lampman, are entered into PTAGIS. Rohrback noted that these data are also included in the Pacific Lamprey Management Plan (MP) annual reports. John Ferguson commented that it seems the fish are tagged at the trap and are then detected at a downstream location but are not seen after that. He asked if this is abnormal. Lampman said it seems a little abnormal. Typically for fish tagged in the Yakima River, approximately 1% to 3% of these fish are subsequently detected at John Day Dam or Bonneville Dam. Lampman said information on recapture rates would also be helpful to understand overall numbers. Rohrback said he is unaware of any recaptures but can let Lampman know if he finds anything different. Ferguson said it seems juveniles should be released below the trap and not above. Lampman recalled discussing that juveniles are released above the trap because there is no information on how many fish are migrating through the system, and understanding recapture rates and trap efficiency will help inform the overall number of fish migrating in the river. RD Nelle asked if WDFW scans all Pacific Lamprey collected in the trap. Rohrback said yes. Andrew Gingerich said he has growing concerns about the scope creep evolving with this tagging exercise. Douglas PUD agreed to accommodate the initial PIT tagging request, but now the request has increased to include efficiency trials, all which have an associated effort and cost. He suggested tabling this topic until the Aquatic SWG is ready to have a more formal discussion about how these actions tie to obligations in the Pacific Lamprey MP. Lampman said he understands the requests seem to be growing and suggested that the YN take on the data portion of the request. He appreciates Douglas PUD's willingness to conduct this tagging effort, and the YN is willing to help so that Douglas PUD can continue this effort. Gingerich said he appreciates Lampman's offer. Ferguson asked if Douglas PUD plans to continue PIT-tagging fish in coordination with the contractor, or if this effort will be paused until further discussion can take place. Gingerich said Douglas PUD is supportive of continuing PIT-tagging of incidentally encountered juvenile Pacific Lamprey, with WDFW as a partner for the salmon obligation. This may change and evolve with any subsequent and new contracts. He suggested that Rohrback continue providing high level summaries as he has done. If the Aquatic SWG wants additional data or studies, this will require further discussions and possibly an SOA. Lampman said this sounds good. No other objections were expressed by Aquatic SWG members.

3. *Anchor QEA will add "Juvenile Pacific Lamprey Studies" to the Aquatic SWG agenda for June 14, 2023 (Item II-A).*
   This has been added to the agenda.
4. *Anchor QEA will distribute the edits to the draft 2023–2024 Adult Pacific Lamprey Translocation SOA that were crafted during the Aquatic SWG conference call on May 10, 2023 (Item II-C).*
   Kristi Geris distributed these edits following the conference call on May 10, 2023.
5. *Douglas PUD will coordinate with the YN and U.S. Fish and Wildlife Service (USFWS) on further edits to the draft 2023–2024 Adult Pacific Lamprey Translocation SOA for discussion and decision during the Aquatic SWG conference call on June 14, 2023 (Item II-C).*
   This draft SOA was distributed to the Aquatic SWG by Kristi Geris on June 5, 2023.

II. Summary of Discussions

A. DECISION: 2023–2024 Adult Pacific Lamprey Translocation SOA (John Rohrback)

A draft 2023–2024 Adult Pacific Lamprey Translocation SOA was distributed to the Aquatic SWG by Kristi Geris prior to the conference call on May 10, 2023. An edited SOA was distributed after the conference call that same day. John Rohrback said that he, Ralph Lampman, and RD Nelle met and developed a revised SOA for approval, which was distributed on June 5, 2023. Rohrback said McLellan then provided additional comments on the revised SOA, which was distributed on June 9, 2023.

Rohrback said this SOA proposes to continue what has been done in the past, including capturing adult Pacific Lamprey at Priest Rapids Dam (PRD) and releasing PIT-tagged and fin clipped fish upstream of Wells Dam. Douglas PUD will endeavor to capture no fewer than 500 fish per year, understanding there is no control over the number of fish trapped or run size. Additionally, no more than 1,000 fish will be translocated within each year during the 8-week collection and tagging period.

Rohrback noted that one of McLellan's comments is that the he would like the meeting minutes to show that the CTCR would like 25% of the translocated Pacific Lamprey to be released in the Okanogan River basin. Douglas PUD is supportive of the CTCR picking up this allocation from Wells Dam for release into the Okanogan. McLellan said he appreciates Douglas PUD's willingness to support this.

John Ferguson asked about the release location of the other 75% of translocated fish. Rohrback said from his perspective, as long as these fish are released upstream of Wells Dam, this will be consistent with this SOA. That said, Douglas PUD plans to release fish at Starr Boat Launch.

Lampman said the YN is supportive of the CTCR picking up 25% of the fish for release into the Okanogan River basin. Regarding Starr Boat Launch, the YN just released fish at this location 1 week

ago, and the water temperature was 19°C. He asked if slack water in the area is causing the high temperature or are these high temperatures also in other parts of the Upper Columbia River. He is concerned about releasing fish in hot water. Rohrback asked if Lampman is confusing this location with the Methow Boat Launch, because water temperatures at Starr Boat Launch are similar to those at Wells Dam, which are typical Columbia River temperatures. Lampman confirmed he was at Starr Boat Launch. Rohrback said he is unaware of high temperatures in the area.

Lampman asked if it might be possible during the peak of the run to make two trips per week to try and boost translocation numbers. If target numbers are met, trapping might be reduced to 7 weeks instead of 8 weeks, which could be cost effective. Rohrback does not believe this is feasible given the nature of the agreement with Grant PUD, which stipulates one trip per week. Additionally, Douglas PUD staff have other commitments and forecasted work and cannot support two trips per week. Lampman said this makes sense.

Rohrback said that in the event more than 200 Pacific Lamprey are trapped for translocation in a given week, would the CTCR be interested in picking up the balance from PRD to translocate into the Okanogan River basin, as was done last year? McLellan said he would think so but needs to verify this internally. Lampman said if this occurs, the YN requests that the CTCR strive to maintain a PIT-tagging and fin clip rate close to 100%. McLellan said he understands the value here, but he does not supervise the staff conducting this work. He can discuss internally the feasibility of PIT-tagging and collecting genetic samples from adult Pacific Lamprey picked up from Priest Rapids Dam for translocation into the Okanogan River basin in 2023 and report back.

Rohrback said lastly, the final paragraph in the SOA was copied from the last translocation SOA,[4] as requested by Lampman.

Ferguson asked for comments or questions before voting. Lampman said the YN was not supportive of the 1,000-fish upper limit but agreed to include it in the interest of moving this SOA forward. Gingerich said the last paragraph of the SOA is consistent with what Douglas PUD would do anyway and he does not believe it is needed, but he agreed to include it because the YN requested it.

Aquatic SWG members present approved the 2023–2024 Adult Pacific Lamprey Translocation SOA, as revised.

The final 2023–2024 Adult Pacific Lamprey Translocation SOA was distributed to the Aquatic SWG by Geris on June 15, 2023.

[4] Titled, *To Translocate Adult Pacific Lamprey from Priest Rapids Dam to Areas Within or Upstream of the Wells Project and Postpone Passage Evaluations*, approved by the Aquatic SWG on June 13, 2018, and distributed by Kristi Geris on June 14, 2018.

B. Juvenile Pacific Lamprey Studies (Ralph Lampman)

Ralph Lampman said the PRFF and RRFF have discussed convening a joint meeting of the three regional fish forums to discuss a path forward for juvenile Pacific Lamprey studies in the Upper Columbia River, possibly in the August or September 2023 time frame. The impetus for this is that the U.S. Army Corps of Engineers is conducting an acoustic telemetry study in the Snake and lower Columbia rivers. The study is scheduled to cover McNary to John Day dams in 2024 and The Dalles to Bonneville Dam in 2025. This is a large-scale study and a good opportunity to conduct a coordinated study to look at overall passage and survival through the entire Columbia River system.

Lampman said Tracy Hillman planned to reach out to Anchor QEA about a possible joint meeting with the PRFF, RRFF, and Aquatic SWG. John Ferguson said Hillman has not yet reached out, and he asked if Douglas PUD or others were aware of these discussions or have questions or concerns about a joint meeting. Andrew Gingerich said Douglas PUD was unaware of these discussions but is supportive of this regional coordination. RD Nelle said USFWS is supportive of a joint meeting. No other comments were shared. Ferguson said Anchor QEA will coordinate with Hillman regarding convening a joint Juvenile Pacific Lamprey Studies Subgroup meeting in late summer to early fall 2023. *(Note: these planning discussions are underway.)*

C. Brood Year 2022 Wells White Sturgeon Release, Outreach, and Size Distribution (Chas Kyger)

Chas Kyger said on May 31, 2023, Douglas PUD released 328 brood year (BY) 2022 Wells White Sturgeon that averaged 541 grams each, and only two fish were below the 350-gram target size. As part of Douglas PUD's public outreach efforts, students from the Bridgeport High School Advanced Placement Biology class participated in this release, which included handling some of the fish. Wells Fish Hatchery staff are prepping the facility to receive BY 2023 larvae.

Jason McLellan said he is currently on the barge setting up for BY 2023 larval collection. His crew will deploy gear this week to start fishing next Monday or Tuesday, June 19 or June 20, 2023. In Canada, he knows at least one fish spawned because one free embryo was collected last week. River temperatures also reached 14°C last week.

D. Draft 2022 White Sturgeon M&E Report and Draft 2022 White Sturgeon Reproduction Assessment Study Report (Chas Kyger)

Chas Kyger said the draft 2022 White Sturgeon M&E Report and draft 2022 White Sturgeon Reproduction Assessment Study Report were distributed to the Aquatic SWG by Kristi Geris on May 17, 2023, and are available for a 45-day review. Kyger said comments on both reports have been received from Jason McLellan. John Ferguson said edits and comments are due to Kyger by July 1, 2023.

Ralph Lampman asked about the carrying capacity for White Sturgeon in the Wells Project. Andrew Gingerich recalled that the Aquatic SWG agreed on an estimate of carry capacity being 1,100 to 1,200 adults to help inform a stocking target. This was based on the Bonneville reservoir pool surface area, with the understanding there is some density dependence in the Bonneville Pool. The Bonneville estimate was extrapolated for the size of the Wells Reservoir.

E. WDFW Coulter Counter (Laura Heironimus)

Laura Heironimus said WDFW is currently purchasing a Coulter counter, which will be stationed at the Spokane Washington office, hopefully by the end of June 2023. In talking with Mitch Combs (WDFW, Sherman Creek Hatchery Manager), she discovered there is interest in coordinating with the CTCR, Spokane Tribe of Indians, and the YN on the methods and process for White Sturgeon spontaneous autopolyploidy (SAP) screening to make sure everyone is using the same techniques. With this coordination, if there is a shortage of counter availability at one location, there may be an opportunity to conduct SAP screening at another location.

F. White Sturgeon Thiamine Studies (Laura Heironimus)

Laura Heironimus said she was recently in Toppenish Washington and met Dr. Aimee Reed (Oregon Department of Fish and Wildlife, Fish Health Specialist), who is collecting unfertilized eggs from female White Sturgeon as these fish are being spawned. Dr. Reed is looking to evaluate baseline levels of thiamine in these eggs with a goal of understand whether this sex is suffering from thiamine deficiency. There is a concern that adults may have a thiamine deficiency that causes poor egg and larvae survival. This deficiency could be attributed to diet, such as feeding on shad. Shad have high thiaminase activity. The way thiamine deficiency is resolved in lake trout is to directly inject thiamine into adults or treat the eggs in-hatchery. In Oregon, thiamine deficiency has been documented in salmon and steelhead. It is unclear whether this is an issue in White Sturgeon, but this work is just getting started. Heironimus is trying to figure whether there are other ways to help collect information to support this preliminary work. It is her understanding there are no shad in the Wells Reservoir, and she is unsure of the opportunities available to collect unfertilized eggs. She thinks this might be limited. Heironimus said Jason McLellan provided her with potential contacts, and she asked that Aquatic SWG members let her know of any opportunities to help.

John Ferguson said this is an interesting topic and new to many folks. This topic was raised a few years ago in California, due to salmon in the ocean having a high proportion of anchovies in their diet. He has not heard anything related to White Sturgeon, and he appreciates the update.

Note: In the WebEx chat, Ralph Lampman said the YN is sending egg samples to Dr. Jacques Rinchard (State University of New York College Brockport) for lamprey thiamine baseline investigations.

G. Bull Trout and the Twisp Weir (Andrew Gingerich)

Andrew Gingerich said, typically, spring Chinook Salmon brood collection occurs at Wells Dam to meet Douglas PUD's spring Chinook Salmon mitigation obligation. As of last week, there had been no spring Chinook Salmon assigning to the Twisp; therefore, Douglas PUD started fishing the Twisp Weir. This was unanticipated but may present an opportunity to incidentally encounter Bull Trout. In the spirit of ongoing monitoring, if Bull Trout are encountered at the weir, Douglas PUD will collect lengths and weights and will PIT-tag these fish for inclusion in the 2022 Bull Trout PIT Study. There are no guarantees on numbers. The Twisp Weir still has a broken wing, which is currently in the down position. John Ferguson noted that the broken wing had a big effect in 2022. Gingerich agreed and said whether any Bull Trout will be encountered in 2023 is hard to predict.

H. Bull Trout Stranding Survey Memorandum (Andrew Gingerich)

Andrew Gingerich said that per the Wells Project Federal Energy Regulatory Commission (FERC) License and Bull Trout MP, Douglas PUD, in coordination with USFWS and the Aquatic SWG, developed a Bull Trout Stranding, Entrapment, and Take Study Plan (submitted to FERC in 2013). This plan required Douglas PUD to conduct stranding surveys within the first 5 years of the FERC license when the Wells Project is drawn down below 773 feet above sea level (msl). Douglas PUD has done this, which is summarized in past annual reports. During all of these surveys, no Bull Trout were encountered. This year, while project operators were looking at river flows, it was forecasted that river flow in the Methow River was expected to increase. When conditions are right, there may be a call to draw down the Wells Reservoir to facilitate scouring of fine sediments in the lower 1 mile of the Methow River, using four rock groins installed in the lower Methow River. Removing fine sediment in this area provides flood control for the City of Pateros. The last time Douglas PUD performed this "Methow Flush and Wells Project Draft" was in 2018. In mid-May, conditions set up nicely to do this and Douglas PUD notified residents and performed the drawdown. There was no requirement to conduct a Bull Trout stranding survey, but Douglas PUD felt it was prudent to do so. A Bull Trout Stranding Survey Memorandum was distributed to the Aquatic SWG by Kristi Geris on June 12, 2023. Gingerich said the memorandum includes the history on why the reservoir has been drawn down. The memorandum explains that the reservoir was drawn down below 773 feet msl, and the following day crews surveyed known stranding pool areas and no Bull Trout were encountered. The memorandum also describes the locations surveyed and effort utilized. The memorandum was sent to RD Nelle and forwarded to the Aquatic SWG.

Ralph Lampman asked what is involved in a stranding survey. Chas Kyger explained that there are areas throughout the reservoir that form pools when the reservoir elevation is drawn down. During these surveys, crews navigate to these known areas by boat and check each pool for stranded fish. If the pool is too deep to visually inspect it for fish, crews run a seine through the pool. During this

survey, only three-spined stickleback were encountered. Lampman asked if these areas are characterized as fine sediment. Kyger said this varies. Some areas are sandy silt, while others are more gravel and cobble. Lampman said the Wells Reservoir has a lot of fine sediment, which is ideal larval lamprey habitat. He asked in the future if the YN can be notified of these activities. Although, he is unsure how much can be done for larval monitoring. Kyger asked if Lampman's concern is about the mouth of the Methow River. Lampman said yes. Kyger clarified that there are no stranding pools in that area, just in the main reservoir. Ferguson asked if Lampman is interested in surveying for lamprey when Douglas PUD is surveying for Bull Trout. Lampman said yes, that there may not be anyone available, but it would be nice to try. Kyger said sometimes there is more advance notice ahead of these drawdowns, but sometimes when the conditions line up there is only a short window. In the future, if there is advance notice, Douglas PUD will notify the Aquatic SWG ahead of the drawdown.

Lampman asked if Douglas PUD calculated how much the water elevation changed during the ramping down. Gingerich said yes, the reservoir was drawn down about 6 feet in elevation over a period of approximately 36 hours, for a ramping rate of approximately 2 inches per hour. Ferguson asked if this worked well for the scour objective. Gingerich said yes, the landowners were quite pleased because their properties adjacent to the Methow River were getting silted in. Since 2017, there has been a lot of fire activity in the Methow Basin, which created a lot of fine sediment deposits. As water moves into the confluence, it slows, and fines build. Additionally, there are two elevation sensors that project operators monitor, and there is a fairly large difference in their readings due to fine sediment accumulation. These elevation sensors are reading more consistent with each other now. *(Note: Upon further review of the data, the actual ramping rate was approximately 2.5 inches per hour, as distributed to the Aquatic SWG in the data package noted below.)*

Lampman asked whether the ramp down rate was similar across the event or whether there were some fluctuations, as this is important in understanding the potential impacts. He asked if Douglas PUD can provide the ramp down profile for the drawdown for this reason. He said issues have been observed at 10 centimeters per hour, and 2 inches per hour is about half of this, so it is hard to say. Gingerich said Douglas PUD will provide a ramp down profile for the recent Methow Flush and Wells Project Draft for distribution to the Aquatic SWG. *(Note: Gingerich provided these data following the Aquatic SWG conference call on June 14, 2023, which Geris distributed that same day.)*

Gingerich said it would also be helpful to review any information Lampman has on this topic. Lampman said he will share a white paper on ramp down rates and impacts to lamprey for distribution to the Aquatic SWG. *(Note: Lampman distributed a link to the document,* Best Management Guidelines for Native Lampreys*, following the Aquatic SWG conference call on June 14, 2023.)*

I. Restoration and Habitat Modeling on Lake Sturgeon (Ralph Lampman)

Ralph Lampman said the other fish forums recently discussed new information on lake sturgeon, including artificial reef restoration and spawning habitat modeling. He forgot to forward this information to the Aquatic SWG, but he will. The RRFF and PRFF are interested in inviting presenters to highlight this work in July or August 2023, on the first Wednesday of the month, and he wanted to pass along this invitation to the Aquatic SWG, as well. *(Note: Lampman provided this literature following the Aquatic SWG conference call on June 14, 2023, which Kristi Geris distributed that same day.)*

III. Administration

A. Upcoming Meetings (John Ferguson)

The Aquatic SWG meeting on July 12, 2023, will be held by conference call.

Other upcoming meetings include August 9 and September 13, 2023 (conference call).

List of Attachments

Attachment A List of Attendees

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
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

Notes:

* Joined after Aquatic SWG members present approved the May 10, 2023, conference call minutes, as revised (Item I-B).

FINAL

Conference Call Minutes

Aquatic Settlement Work Group

To: Aquatic SWG Parties Date: August 9, 2023

From: John Ferguson, Chair, Anchor QEA, LLC

Re: Final Minutes of the July 12, 2023, Aquatic SWG Conference Call

The Aquatic Settlement Work Group (SWG) met by conference call on Wednesday, July 12, 2023, from 10:00 a.m. to 10:45 a.m. Attendees are listed in Attachment A of these conference call minutes.

Summary of Action Items

1. Douglas PUD will provide weekly updates throughout the 2023 adult Pacific Lamprey translocation effort (Item II-B). *(Note: Douglas PUD has been providing weekly updates since July 14, 2023.)*
2. The Aquatic SWG meeting on August 9, 2023, will be held by conference call (Item III-B).

Summary of Decisions

1. Aquatic SWG members present approved the *White Sturgeon Supplementation and Management Plan Implementation in the Wells Reservoir, 2022* (2022 White Sturgeon M&E Report), as revised, and the *Wells Reservoir, 2022 White Sturgeon Reproduction Assessment* (2022 White Sturgeon Reproduction Assessment Study Report), as revised (Item II-A).

Agreements

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

Review Items

1. There are no items that are currently available for review.

Documents Finalized

1. The final 2022 White Sturgeon M&E Report and final 2022 White Sturgeon Reproduction Assessment Study Report were distributed to the Aquatic SWG by Kristi Geris on July 13, 2023 (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 June 14, 2023, conference call minutes were reviewed. Kristi Geris said all comments and edits received from Aquatic SWG members were incorporated into the revised minutes. There were a few outstanding comments, some of which were resolved after distributing the revised minutes. Geris reviewed these comments and revisions, and the applicable Aquatic SWG representatives agreed with the revisions. There was one outstanding comment remaining, under *Item II-H. Bull Trout Stranding Survey Memorandum*: Ralph Lampman wanted to confirm the ramping rate. Andrew Gingerich said he does not recall what he said during the meeting, but the data emailed to the Aquatic SWG show a ramping rate of 2.5 inches per hour. Gingerich suggested, however, to let the minutes reflect 2 inches per hour if this is what Lampman recalls was said during the meeting. Geris suggested adding parenthetically that it was later confirmed that the ramping rate was 2.5 inches per hour. Aquatic SWG members agreed with these revisions.

Geris said that she also closed out one action item about coordinating with Tracy Hillman (Priest Rapids and Rocky Reach Fish Forums [PRFF and RRFF] Chairman) on a Juvenile Pacific Lamprey Subgroup meeting, which is now scheduled for August 21, 2023. She also added distribution of the revised White Sturgeon reports that are on today's agenda for approval. John Ferguson noted that, although the Juvenile Pacific Lamprey Subgroup meeting is a PRFF event, Douglas PUD is supportive of Geris taking notes so that Hillman can focus on Chairing the meeting.

Lampman provided last-minute edits to the revised minutes. Under *Item I-C. Review of Action Items*, Lampman clarified the location of juvenile Pacific Lamprey detections relative to the screw traps. He also clarified that all fish detected (not tagged) in the Methow were subsequently detected at LMR.[1] Aquatic SWG members agreed with these revisions.

The Aquatic SWG members present approved the June 14, 2023, conference call minutes, as revised. Washington State Department of Ecology abstained because a representative did not participate in the June 14, 2023, conference call.

[1] Lower Methow River PIT array.

C. Review of Action Items (John Ferguson)

Action items from the Aquatic SWG conference call on June 14, 2023, are as follows *(Note: The following italicized item numbers correspond to agenda items from the June 14, 2023, meeting)*:

1. *The Confederated Tribes of the Coville Reservation (CTCR) will discuss internally the feasibility of passive integrated transponder (PIT)-tagging and collecting genetic samples from adult Pacific Lamprey picked up from Priest Rapids Dam for translocation into the Okanogan River Basin in 2023 (Item II-A).*

   Jason McLellan said that he contacted Kirk Truscott and Matt Young (CTCR) and was told that the staff performing the transfers do not have the resources to PIT tag or collect genetic samples for the fish picked up from Grant PUD at Kirby Billingsley Hydro Park. McLellan recalled that this is regarding fish that are in addition to the 200 fish that Douglas PUD will release at Starr Boat Launch (the latter are already PIT-tagged and genetically sampled by Douglas PUD). Ralph Lampman said his audio was not clear, and he asked whether the 25% allocation going to the CTCR for release into the Okanagan River, per the statement of agreement (SOA), would not receive PIT tags or genetic sampling. Rohrback clarified that all fish that Douglas PUD picks up from Grant PUD, including the 25% allocation to the CTCR, will receive PIT tags and genetic sampling. If additional fish are available for the CTCR to pick up from Grant PUD at Kirby Billingsley Hydro Park, these are the fish the CTCR do not have capacity to PIT tag and collect genetic samples from. These fish are outside of the SOA. McClellan confirmed that Rohrback was correct. Lampman said that he thinks McLellan can appreciate how powerful collecting genetic samples can be for understanding future populations, and he asked whether there is a way the CTCR could at least collect genetic samples from some of these fish. McLellan said that he agrees with Lampman; he expressed this desire to Truscott and Young, but was told the staff do not have the resources to do the work. McLellan encouraged Lampman to reach out to Truscott and Young directly if he wants to make this point again on his own.
2. *Anchor QEA, LLC, will coordinate with Tracy Hillman (PRFF and RRFF Chairman) regarding convening a joint Juvenile Pacific Lamprey Studies Subgroup meeting in late summer to early fall 2023 (Item II-B).*

   On Monday, August 21, 2023, Aquatic SWG representatives are invited to join a virtual meeting, hosted by the PRFF, of the PRFF and RRFF Pacific Lamprey Subgroups to discuss models and assumptions of models used to estimate juvenile survival and behavior. This will also include a discussion about juvenile studies to be conducted in the lower Columbia River.
3. *Douglas PUD will provide a ramp down profile for the recent "Methow Flush and Wells Project Draft" for distribution to the Aquatic SWG (Item II-H).*

   Andrew Gingerich provided these data following the Aquatic SWG conference call on June 14, 2023, which Kristi Geris distributed that same day.

4. *The Yakama Nation (YN) will share a white paper on ramp down rates and impacts to lamprey for distribution to the Aquatic SWG (Item II-H).*
   Ralph Lampman distributed a link to the document, "Best Management Guidelines for Native Lampreys," following the Aquatic SWG conference call on June 14, 2023.
5. *The YN will share literature on restoration and habitat modeling on Lake Sturgeon for distribution to the Aquatic SWG (Item II-I).*
   Lampman provided this literature following the Aquatic SWG conference call on June 14, 2023, which Geris distributed that same day.

II. Summary of Discussions

A. DECISION: 2022 White Sturgeon Reproduction Assessment Study Report (Chas Kyger)

The draft 2022 White Sturgeon Reproduction Assessment Study Report and draft 2022 White Sturgeon M&E Report were distributed to the Aquatic SWG by Kristi Geris on May 17, 2023, and were available for a 45-day review with edits and comments due to Chas Kyger by July 1, 2023. The revised reports for approval were distributed on July 10, 2023.

Kyger said that the only comments received on both reports were from Jason McLellan.

Kyger said that the main comments were regarding the discussion section of the 2022 White Sturgeon Reproduction Assessment Study Report, which clarified that these are not necessarily baseline data that completely characterize reproduction in the Wells Reservoir. Rather, this was the first initial effort, which did not show evidence of reproduction. The comments also highlighted other areas to investigate during future assessments. Kyger said that he edited the report per these comments. The rest of the edits were editorial in nature, including adding a figure to show acoustic tracking zones.

Kyger said that comments on the 2022 White Sturgeon M&E Report were minor, such as clarifying figure captions. Nothing substantial.

John Ferguson asked whether there were any additional comments or requests for additional review time. None were expressed.

Aquatic SWG members present approved the 2022 White Sturgeon Reproduction Assessment Study Report, as revised, and the 2022 White Sturgeon M&E Report, as revised.

The final reports were distributed to the Aquatic SWG by Geris on July 13, 2023.

B. Adult Pacific Lamprey Translocation Update (John Rohrback)

John Rohrback said that trapping began this week. To date, 18 individuals were collected on July 11, and 29 individuals were collected on July 12, totaling 47 Pacific Lamprey ready to transport up to Wells Dam for PIT-tagging and genetic sampling, followed by release at Starr Boat Launch. This week's efforts would also include whatever is collected overnight Wednesday into Thursday morning.

John Ferguson asked how the run looks at Bonneville Dam. Rohrback said that the run is strong and a bit early compared to the 10-year average. It will be interesting to see whether these numbers continue throughout the run period or whether this year the run is just early.

Ralph Lampman asked, via the WebEx chat, whether Douglas PUD would be able to collect water temperature (and time) during each release event. He is still concerned about the high temperature at the Starr Boat Launch site. Rohrback said that Douglas PUD can do this. Andrew Gingerich said that Douglas PUD will provide weekly updates throughout the 2023 adult Pacific Lamprey translocation effort. *(Note: Douglas PUD has been providing weekly updates since July 14, 2023.)*

C. Brood Year 2023 Wells White Sturgeon Larval Collection Update (Chas Kyger and Jason McLellan)

Chas Kyger said that there are approximately 7,500 larvae at Wells Fish Hatchery, which is expected to be enough to meet target fish numbers for both the Douglas PUD and Chelan PUD programs.

Jason McLellan said that, for the most part, this year has been characterized by historically low flows. The CTCR have fished 23 consecutive nights. It has been a challenging year, requiring several more deliveries to supply fish to Wells Fish Hatchery for both programs. Total catch is more than 17,000 larvae, including 7,583 larvae to Wells Fish Hatchery and 7,682 larvae to Sherman Creek Hatchery. The CTCR are currently trying to collect more larvae for mark-recapture releases associated with research studies.

D. PRFF Lake Sturgeon Presentation (Ralph Lampman)

John Ferguson provided this update because Ralph Lampman's audio was not working. Ferguson recalled Lampman announcing a potential Lake Sturgeon presentation to the fish forums. This is now scheduled for August 2, 2023, during a PRFF meeting. The speaker will review spawning habitat for Lake Sturgeon in the St. Clair-Detroit River System. The speaker is asking attendees to pass along any information they would like to hear during this presentation. Please send these requests to Lampman or Tracy Hillman. Ferguson said that he and Kristi Geris are unavailable to attend, but Douglas PUD plans to attend. Andrew Gingerich said that this is correct. Ideally, Hillman can send an agenda and Douglas PUD can call in for the presentation.

III. Administration

A. Mariah Mayfield – Douglas PUD (Andrew Gingerich)

Andrew Gingerich said that John Rohrback has accepted a role within the Natural Resources Department, supporting more salmonid and hatchery work, which creates too many tasks for Rohrback. Therefore, Douglas PUD advertised for an aquatic resource biologist, and Mariah Mayfield has accepted this position. Mayfield worked as a fish biologist for the U.S. Forest Service, Chelan Ranger District. Mayfield has a master's degree from Montana State University in Bozeman, Montana. While with the U.S. Forest Service, Mayfield worked with the same stakeholders and agencies represented here on the Aquatic SWG. Douglas PUD is happy to have Mayfield here for both her technical expertise and experience with working collaboratively with the same agencies and tribes as the Aquatic SWG.

John Ferguson said Ralph Lampman noted in the chat that he and Mayfield are also both Oregon State University graduates. Mayfield clarified that she conducted her post-master's work in the Oregon State University laboratory when Lampman was in graduate school there. Mayfield said that she has already worked with several Aquatic SWG members and is excited to work with everyone here.

Ferguson welcomed Mayfield to the Aquatic SWG.

B. Upcoming Meetings (John Ferguson)

The Aquatic SWG meeting on August 9, 2023, will be held by conference call.

Other upcoming meetings include September 13 and October 11, 2023 (conference call).

List of Attachments

Attachment A List of Attendees

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
Breean Zimmerman	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
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 5, 2023

From: John Ferguson, Chair, Anchor QEA, LLC

Re: Final Minutes of the August 9, 2023, Aquatic SWG Conference Call

The Aquatic Settlement Work Group (SWG) met by conference call on Wednesday, August 9, 2023, from 10:00 a.m. to 10:45 a.m. Attendees are listed in Attachment A of these conference call minutes.

Summary of Action Items

1. Douglas PUD will develop a draft work plan for addressing Section 4.4 of the White Sturgeon Management Plan (WSMP), "Evaluation and Implementation of Adult Passage Measures (Objective 5)," including actions and a timeline for completion, for Aquatic SWG review and consideration (Item II-C).
2. The Aquatic SWG meeting on September 13, 2023, will be held by conference call (Item III-A).

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. There are no items that are currently available for review.

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 July 12, 2023, conference call minutes were reviewed. Kristi Geris said that all edits received from Aquatic SWG members were minor clarifying edits and were incorporated into the revised minutes. Geris noted that Ralph Lampman provided Yakama Nation approval of the revised minutes via email on August 8, 2023. The Aquatic SWG members present approved the July 12, 2023, conference call minutes, as revised.

C. Review of Action Items (John Ferguson)

Action items from the Aquatic SWG conference call on July 12, 2023, are as follows *(Note: The following italicized item numbers correspond to agenda items from the July 12, 2023, meeting)*:

1. *Douglas PUD will provide weekly updates throughout the 2023 adult Pacific Lamprey translocation effort (Item II-B).*
   Douglas PUD has been providing weekly updates since July 14, 2023.

II. Summary of Discussions

A. Adult Pacific Lamprey Translocation Update (Mariah Mayfield)

Mariah Mayfield said that Douglas PUD has completed the 4-week period of transporting adult Pacific Lamprey from Priest Rapids Dam to Wells Dam for tagging and release into the Wells Reservoir. This effort resulted in 605 individuals tagged and released into the Wells Reservoir. Tomorrow will be the fifth week of releases, or first week of collecting fish from Grant PUD at Kirby Billingsley Hydro Park. A total of 96 individuals were collected yesterday, so Douglas PUD anticipates another 200-fish release tomorrow. There was one mortality during transit last week, but other than this, fish have been handling transport and tagging very well.

RD Nelle asked whether the plan is to continue translocating fish above Wells Dam for the next 4 weeks (including this week). Mayfield said yes, unless release numbers reach 1,000 individuals, whichever occurs first. Including expected totals from tomorrow, numbers translocated to date this year will likely reach 800 individuals, but there is no telling what the run may do.

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 on August 8, 2023. Chas Kyger said that there are more than 5,500 BY 2023 White Sturgeon on station at Wells Fish Hatchery. Fish are already averaging approximately 3 grams each and are growing quickly. There is an every-other-day grading operation to keep fish separated by size and to keep fish healthy. Fish have not yet been split by program and are doing well for this stage. Hopefully, there will be no issues meeting targets for both the Chelan PUD and Douglas PUD programs.

C. Section 4.4: White Sturgeon Adult Passage (Andrew Gingerich)

Andrew Gingerich shared Section 4.4 of the WSMP on WebEx. He recalled that he introduced this topic last February 2023, while reviewing the 2023 Aquatic Settlement Agreement Action Plan. He has also reached out to Aquatic SWG members over the past 4 weeks in preparation for these initial discussions, which must take place in Year 11 of the Federal Energy Regulatory Committee license. In Douglas PUD's view, having something in the next several months culminate with a statement of agreement (SOA) or work plan, or something to codify these efforts, seems like a reasonable outcome—something that shows this effort and path forward for the next several years.

Gingerich read the requirement, as stated in Section 4.4 of the WSMP, "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[1]. If all three criteria above are met, Douglas, in consultation with the Aquatic SWG shall develop adult passage measures that are consistent with measures being implemented by other mid-Columbia project operators.

Gingerich said that he thinks Criterion "i" is the least data deficient, Criterion "ii" has more information but may still be light, and Criterion "iii" may be the toughest uphill climb. When the WSMP was written and the Aquatic Settlement Agreement was signed, the intent was not to have passage only at Wells Dam, but rather to have connectivity with the Hanford Reach population and provide genetic

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

connectivity with a stronger population (that being the Hanford Reach population) should it be determined that passage was necessary. Gingerich asked Aquatic SWG members for comments or questions about the requirement or thoughts on a path forward.

Laura Heironimus said that she spoke with Douglas PUD on this topic and shared ideas on how to research these questions in a reasonable way. She suggested evaluating the existing data, such as reviewing passive integrated transponder (PIT) detections and conducting a literature review. For Criterion i, she thinks this is well-documented in the literature for sturgeon. For Criterion ii, she suggested reviewing the existing data to identify what is already known about fish passage. She thinks that addressing these criteria can be captured in an SOA for the Aquatic SWG to work towards. The challenging piece for these is defining what upstream passage in the mainstem Columbia River mean. She thinks that it would be helpful to include this in the SOA. She thinks Criterion iii will be challenging, but addressing Criteria i and ii are a good starting point. For process, it seems having this discussion about what can be done now and what will be addressed in the next couple of years captured in an SOA is a reasonable approach for Douglas PUD.

Gingerich agreed with these suggestions and approach. Heironimus said that this is an important objective, but it comes with challenges. She thinks that it makes sense to take the time to be thorough and thoughtful about how to address the objective.

John Ferguson asked whether this SOA should focus on what to accomplish this year or whether it lays out a multiyear plan. Also, what does biological merit mean? The meaning might be different for different people, which might warrant a discussion on how to define it.

Heironimus said that conducting a literature review and a review of existing data can be outlined in the SOA. She suggested taking time on these items. The review would address what is known about White Sturgeon passage in this system but also look at sturgeon outside this system; evaluate existing data that Douglas PUD has collected but also look at data collected by other PUDs; evaluate passage, PIT recovery, and acoustic data; and evaluate what data are in-hand and what is known about how sturgeon use these structures and their ability to pass Wells Dam. Regarding biological benefit, she views this as not the economic and social benefit but as just the biological benefit. This means the genetic component, connecting populations, spawning recruitment, and feeding. What benefits does this species need to be able to pass upstream, and what is their need to pass upstream? She thinks these questions can be addressed with the literature review, which can then identify data gaps.

Ferguson said that this makes sense. The literature review and review of data are much more than what can be accomplished this year, so the SOA would layout a multiyear process.

Ferguson recalled that Washington State Department of Fish and Wildlife is working on a statewide WSMP, and he asked whether components to the statewide plan might help address the Section 4.4 objective. Heironimus said that this plan is still in the first phase of development, including collecting data on White Sturgeon status across all regions. The data collection due date is November 30, 2023, and by spring 2024, she hopes to have a draft document and data gaps identified. She noted that this plan is not specific to the Mid-Columbia River, but there is information pertaining to the Mid-Columbia River. It also may be a while before she has anything final to share.

Gingerich suggested that Douglas PUD develop a draft work plan, based on what was discussed today, for Aquatic SWG review in the next month or two. Ferguson, Patrick Verhey, and RD Nelle agreed that this is a good approach. Douglas PUD will develop a draft work plan for addressing Section 4.4 of the WSMP, "Evaluation and Implementation of Adult Passage Measures (Objective 5)," including actions and a timeline for completion, for Aquatic SWG review and consideration.

Gingerich noted that he expects the need to do a literature review and provide some information within the Aquatic SWG to have very little debate, but the biological merit piece or definition that Ferguson asked about would perhaps be more of a lengthy conversation. He understands the point and would not debate that before hydroelectric development, White Sturgeon had the ability to move freely throughout the Columbia River basin. However, the biological merit and need today may be different than it was when the WSMP was written. For example, when the WSMP was agreed to by the signatories, there were no tools like larvae repatriation, and as such, things like genetic diversity needs may be being met through the program. This hypothesis has not been tested, but it could be, showing that allelic diversity of White Sturgeon now in the Wells Project is strong and perhaps makes up most of the diversity found in Lake Roosevelt, for example. He also understands that passage could be beneficial not simply for reproductive reasons but for rearing and foraging reasons too. However, while biological merit alone would suggest passage is good, it is difficult to separate the biology alone from other economic and cultural pieces, like interests to have harvest fisheries from state and Tribal agencies. The program, for example, is not exclusively a conservation program. As such, this makes the biological merit and need component, perhaps, less clear and is where some debate could occur. Heironimus agreed that these are good points.

Ferguson noted that Gingerich suggested that it would up to 60 days before a draft SOA is ready, and he asked if this may be too late, considering that the Aquatic SWG may need some time to discuss the SOA. Gingerich said that he will do what he can to get the SOA out early.

III. Administration

A. Upcoming Meetings (John Ferguson)

John Ferguson reminded the Aquatic SWG that on Monday, August 21, 2023, Aquatic SWG representatives are invited to join a virtual meeting, hosted by the Priest Rapids Fish Forum, to discuss models and assumptions of models used to estimate juvenile survival and behavior. This will also include a discussion about juvenile studies to be conducted in the lower Columbia River. Kristi Geris said that Tracy Hillman has not yet distributed the WebEx meeting or call-in information.

The Aquatic SWG meeting on September 13, 2023, will be held by conference call.

Other upcoming meetings include October 11 and November 8, 2023 (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, 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
Mariah Mayfield	Aquatic SWG Technical Support	Douglas PUD
RD Nelle	Aquatic SWG Technical Representative	U.S. Fish and Wildlife Service
Breean Zimmerman	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

	1-Aug	
Tank	Population	Grams
1	897	2.06
2	861	2.59
3	838	1.76
4	365	1.13
5	660	3.03
6	--	--
7	529	5.04
8	445	5.60
9	582	2.97
10	361	4.02
11	--	--
12	--	--
Mag 1	--	--
Mag 2	--	--
Total	5,538	2.9

FINAL

Conference Call Minutes

Aquatic Settlement Work Group

To: Aquatic SWG Parties Date: October 11, 2023

From: John Ferguson, Chair, Anchor QEA, LLC

Re: Final Minutes of the September 13, 2023, Aquatic SWG Conference Call

The Aquatic Settlement Work Group (SWG) met by conference call on Wednesday, September 13, 2023, 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 compile the past 5 to 10 years of data (whatever is available) for Pacific Lamprey collected at the rotary screw traps (RSTs) in the Methow and Okanogan rivers, including numbers collected and life stage (Item II-C). *(Note: Douglas PUD compiled these data, which were distributed to the Aquatic SWG by Kristi Geris on October 9, 2023.)*
2. The Yakama Nation (YN) will distribute the document titled "Framework and Implementation Plan for the Upper Columbia Juvenile Pacific Lamprey Passage Acoustic Telemetry Study" that was shared on WebEx during today's conference call, and the Aquatic SWG will come prepared to discuss the questions within this document during next month's Aquatic SWG conference call on October 11, 2023 (Item II-C). *(Note: Ralph Lampman provided this document, which Geris distributed to the Aquatic SWG on September 16, 2023. Douglas PUD provided responses to this document, which were distributed on October 9, 2023.)*
3. Douglas PUD will distribute a draft Statement of Agreement (SOA) for addressing Section 4.4 of the White Sturgeon Management Plan (WSMP), *Evaluation and Implementation of Adult Passage Measures (Objective 5)*, including actions and a timeline for completion, for Aquatic SWG review and consideration (Item II-E). *(Note: this SOA was distributed to the Aquatic SWG by Geris on October 9, 2023.)*
4. The Aquatic SWG meeting on October 11, 2023, will be held by conference call (Item III-A).

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. A document titled "Framework and Implementation Plan for the Upper Columbia Juvenile Pacific Lamprey Passage Acoustic Telemetry Study" was distributed to the Aquatic SWG by Kristi Geris on September 16, 2023. Douglas PUD provided responses to this document, which were distributed on October 9, 2023 (Item II-C).

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.

RD Nelle asked whether there were any Bull Trout updates. Chas Kyger said that there are no new updates since the last update. Douglas PUD still plans to draft a report for Aquatic SWG review in time to finalize by the end of 2023.

B. Meeting Minutes Approval (John Ferguson)

The revised draft August 9, 2023, conference call minutes were reviewed. Kristi Geris said that the only edits received were from Douglas PUD and those were minor clarifying edits and were incorporated into the revised minutes. Breean Zimmerman provided Washington State Department of Ecology approval of the revised minutes via email before the Aquatic SWG conference call on September 13, 2023. The Aquatic SWG members present approved the August 9, 2023, conference call minutes, as revised. The YN and the Confederated Tribes of the Colville Reservation (CTCR) abstained because representatives did not participate in the August 9, 2023, conference call.

C. Review of Action Items (John Ferguson)

Action items from the Aquatic SWG conference call on August 9, 2023, are as follows *(Note: The following italicized item numbers correspond to agenda items from the August 9, 2023, meeting)*:

1. *Douglas PUD will develop a draft work plan for addressing Section 4.4 of the WSMP, "Evaluation and Implementation of Adult Passage Measures (Objective 5)," including actions and a timeline for completion, for Aquatic SWG review and consideration (Item II-C).*
   This will be discussed during today's conference call.

II. Summary of Discussions

A. Adult Pacific Lamprey Translocation Update (Mariah Mayfield)

A Pacific Lamprey Update (Attachment B) was distributed to the Aquatic SWG by Kristi Geris prior to the Aquatic SWG conference call on September 13, 2023. Mariah Mayfield said Slides 1 to 2 of Attachment B summarize Douglas PUD's adult Pacific Lamprey translocation effort this year. In total, 1,007 Pacific Lamprey received passive integrated transponder (PIT) tags and were translocated upstream of Wells Dam. There was a fairly large range in average lengths and weights. Of those translocated this year, 956 fish were released at Starr Boat Launch just above Wells Dam, and 51 fish were picked up by the CTCR to translocate farther upstream into the Similkameen River. Of note, among the 383 fish detected in the Methow River Basin, 101 fish were detected in the Chewuch River, 2 fish were detected in the lower Twisp River, and 1 fish was detected in Libby Creek. Among the 98 fish detected in the Okanogan River Basin, 1 fish was detected at Zosel Dam. Weekly updates were distributed throughout the season. Only one mortality occurred during transportation, as reported in August 2023. All other Pacific Lamprey appeared to handle transport, tagging, and release well.

John Ferguson said that currently, the Columbia River Data Access in Real Time database (Program Real Time, or DART) shows 629 Pacific Lamprey counted at Wells Dam, which is a good year. Mayfield agreed.

Ralph Lampman asked about the rest of the detections in the Methow River Basin (Slide 2). Mayfield explained that those detected in a tributary in the Methow River Basin are bulleted on Slide 2; the rest are somewhere in the Methow but have not been detected in a tributary. This applies to the Okanogan River Basin, as well. Lampman asked where Zosel Dam is located and whether it has fish passage. John Rohrback said that yes, Zosel Dam has fish passage, and it is located where Osoyoos Lake feeds into the Okanogan River, south of the U.S./Canada border. Lampman said that this fish likely went upstream then. Andrew Gingerich agreed that this fish might now be in Canada.

B. Adult Pacific Lamprey Trapping at Wells Dam (Mariah Mayfield)

Mariah Mayfield said that Slide 3 of Attachment B shows the results to date for the lamprey trap testing being performed within the Wells Dam east fish ladder. Recall, that this is pilot testing to see whether these traps can collect Pacific Lamprey migrating through the fishways. To date, this has not been too successful. There has been only 1 day where tapping was successful (August 29, 2023), when a total of 4 fish were collected. There were 17 fish counted through the fishway that day. In the future, traps can be operated in both the east and west fish ladders.

Ralph Lampman said that a key difference between the traps at Priest Rapids Dam and Wells Dam is that Grant PUD closes the orifices (at the bottom of the weir) during nighttime hours, which forces all

fish to pass over the weir (and into the traps). This might explain the lower numbers. Mayfield said that another difference is that Wells Dam has different screening/metal plates on the cone opening of the trap compared to Priest Rapids Dam, and Douglas PUD might consider changing the perforation to create a more laminar surface. Lampman said that he is interested in seeing more details about the trapping operations at Wells Dam, and Mayfield that said she will share more photos of the traps. *(Note: Mayfield provided additional photos of the traps on September 15, 2023, that Geris distributed to the Aquatic SWG that same day.)*

John Ferguson asked whether, following this pilot effort, Douglas PUD feels confident about collecting adequate fish for a study. Mayfield said yes, with the caveat that this was a really big return year. In a lower return year, there might be a lower trapping rate. Ferguson said that this also depends on the sample size needed.

Lampman asked how many nights the traps were operated. Rohrback said that the traps have been operating for 3 weeks, not counting the weekends or Labor Day, so a total of 14 trapping nights. Mayfield noted that trapping did not start until August 28, 2023, because Douglas PUD needed to obtain permission from the Wells Habitat Conservation Plan (HCP) Coordinating Committee regarding impacts to salmonid passage. August was a big month for counts (Slide 3), and the traps probably would have collected more fish if they were in operation earlier. Also of note, there has been no bycatch to date. Lampman asked whether trapping operations are still ongoing. Mayfield said yes. This year, trapping partly relied on calling in favors from the dam operators. If this is done in the future, arrangements will likely be in place to conduct more trapping, depending on how many fish are needed.

Ferguson asked whether trapping only occurred in the east fish ladder and whether there were two traps at one weir. Mayfield said that this is correct. Each trap covers approximately 30% to 40% of the flow going over the weir next to each wall of the fishway. If a fish passes straight up the middle of the flow over a weir, it might avoid the trap. Rohrback added that each overflow weir has a trap in it that is flush to the fishway wall and covers a portion of the overflow weir. There is nothing installed to block the orifices at the base of the weirs and configured such that the openings are flush to the floor. In the past, perforated plates have been installed on the floor of the fishway to prevent Pacific Lamprey from attaching and passing through the orifices, and these plates can be installed in future years. This year, these were not in place because this was a last-minute, opportunistic pilot study conducted to take advantage of the large run.

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

Ralph Lampman said that last month, the Rocky Reach Fish Forum (RRFF) convened a Pacific Lamprey Subgroup meeting with a goal of looking at the different models used to measure juvenile Pacific Lamprey survival to determine which is best for a study in the Upper Columbia River.

Lampman believes that, while there are pros and cons for each, it seems the Virtual Release/Dead-Fish Correction (ViRDCt) model is the best option (compared to the Virtual/Paired Release [ViPRe] model) because there are fewer assumptions to satisfy, and Pacific Northwest National Laboratory (PNNL) and the U.S. Army Corps of Engineers seem to prefer this model, given that the study design requires fewer fish for the same precision. The RRFF has not yet reached agreement on which model to use.

Lampman shared on WebEx a document titled "Framework and Implementation Plan for the Upper Columbia Juvenile Pacific Lamprey Passage Acoustic Telemetry Study" (Attachment C). He also shared this document with the RRFF during their last meeting. As bulleted on Page 1 of Attachment C, this framework suggests a collaborative approach, where all three PUDs contribute 200 to 300 tags at each dam, resulting in a 1,000- to 1,500-tag study. This design may also benefit from fish coming from upstream and downstream. As presented during the RRFF Pacific Lamprey Subgroup meeting, recent results from the Snake River show that a survival study can be accomplished using the latest tags by PNNL. Soon, these tags will become commercialized and available through other vendors. As outlined in the respective Pacific Lamprey Management Plans (PLMPs), each PUD is responsible for securing study fish. If there are limitations, the PUDs need to explore how to collect enough fish. Some regions have more fish than others, which is why a collaborative effort is important.

Note: Pages 2 to 4 of Attachment C were added after the meeting and were not presented during the Aquatic SWG conference call on September 13, 2023.

Page 5 of Attachment C shows a map of the five Upper Columbia River dams (yellow arrows) and potential sources of fish (white arrows). To note, the Methow River Basin has quite a few potential source locations. The Entiat and Wenatchee river basins also have sources.

Page 6 of Attachment C shows a juvenile trap design being developed by PNNL and the Columbia River Inter-Tribal Fish Commission. This trap can be deployed in a bypass system or raceway to collect juvenile Pacific Lamprey but will allow other fish, like salmonids, to bypass the trap. PNNL is currently testing and fine-tuning this design. Lampman believes this type of thing can be used to enhance numbers of fish collected at each dam.

Pages 7 to 12 of Attachment C outline key questions raised during the RRFF Pacific Lamprey Subgroup meeting that need to be resolved.

Question No. 1: What is the project scope? What is the focus—reservoir and dam, or just at dam (immediate area above and below dam, including the dam)? Lampman recalled that initially, the focus was on just dam passage survival. Reservoir survival is good to know, but to be practical and logistically feasible, it might be best to study this piecemeal, with the focus first on dam passage

survival. The collaborative approach will help attain reservoir survival for downstream dams. For Wells Dam, a separate upstream release would be needed to address reservoir survival.

Question No. 2: Which survival model should be used—the ViRDCt model or the ViPRe model? There seemed to be advantages for using the ViRDCt model, including fewer assumptions to meet and fewer fish needed for the same degree of precision. A list of assumptions for the ViRDCt model is shown on Page 8 of Attachment C.

Question No. 3: What is the acceptable precision level? Lampman reviewed a table showing the confidence intervals for different precision levels (Page 10 of Attachment C). For the Snake River study, the goal was to achieve a standard error (SE) of 0.050. Ultimately, a SE of 0.030 was achieved. That is, with the ViRDCt model, a study can achieve a 0.030 precision level using approximately 300 tagged fish, but this includes meeting certain assumptions (see the Ryan Harnish [PNNL] quote on Page 11 of Attachment C). Lampman said that the PLMPs do not stipulate a standard for juvenile and adult Pacific Lamprey passage rates, unlike salmonids, for which the HCPs establish clear survival rate thresholds. He believes precision levels can be relaxed for Pacific Lamprey because the goal now is to get a big-picture idea about where the low survival areas are located. After this, the focus can move towards how to increase survival.

Question No. 4: Which source of lamprey should be used? Lampman reviewed just a few options, as outlined on Page 12 of Attachment C. He said that lamprey are different than salmonids in that, genetically, lamprey are fairly homologous and can more easily adapt to different conditions and watersheds. That said, he suggested prioritizing and reducing sources where possible. If different sources are used, these can be analyzed separately to see any differences.

John Ferguson asked Lampman to remind him, is the impetus for scheduling this work next year to coincide with the study in the Lower Columbia River planned for 2024 to 2025? Lampman said that yes, a study is planned for McNary and John Day dams in 2024 and for The Dalles and Bonneville dams in 2025. If the studies can be conducted together, this will provide additional data. However, it is more important that the PUDs to collaborate and synchronize a study in the Upper Columbia River.

Ferguson said that there were a few things to note, per Section 4.2.4 of Douglas PUD's PLMP. Regarding at-dam survival versus reservoir survival, the wording says "project," and the Aquatic SWG needs to determine what this entails. Regarding one or more years of study, the PLMP calls for a 1-year study. Regarding no specified precision level for Pacific Lamprey, the PLMP says, "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…" This is the language of the PLMP to keep in mind.

Mariah Mayfield said that, regarding acquiring juvenile Pacific Lamprey from above the Wells Project, last year the Methow River RST collected 125 macrophthalmia, and this year, only 11 fish large enough to tag were collected. At this point, there is no upstream source of fish to confidently rely upon for a study. Regarding coordination with other dams, the current tag technology only has a 30--day tag life. In terms of looking at project impacts, the technology is not there yet.

Lampman said that, regarding tag life, a YN study found that study fish migrated quickly when river flow was high. As long as the study uses actively migrating fish, he believes 30 days will be enough time to look at the reach from Wells Dam to Wanapum Dam. It just depends on the conditions. Regarding RSTs, it would be helpful if each PUD could provide data from past years for Pacific Lamprey collected at RSTs upstream of their respective dams. Mayfield said that Douglas PUD can compile the past 5 to 10 years of data (whatever is available) for Pacific Lamprey collected at the RSTs in the Methow and Okanogan rivers, including numbers collected and life stage.

Chas Kyger agreed that numbers collected at RSTs vary year to year. That said, Douglas PUD plans to continue tagging juvenile Pacific Lamprey encountered at the Methow River RST, including recording life stage. Mayfield said that the Washington Department of Fish and Wildlife (WDFW) operators at the Methow River RST said a large component of the Pacific Lamprey run arrives when there is a lot of debris, and the trap is pulled for safety reasons. John Rohrback also noted that the primary purpose of the Methow River RST is to monitor the salmonid programs in the Methow River. Mayfield agreed and said that RST operations cannot be modified just to collect more juvenile Pacific Lamprey. Andrew Gingerich suggested that the next steps include Lampman sharing Attachment C, so Aquatic SWG members can discuss this internally, and bring back questions more formally.

Laura Heironimus said that WDFW appreciates the work put into this by Lampman. She is hearing a lot of reasons why this might be challenging to pull off, but getting a study like this off the ground will improve what is currently known about juvenile Pacific Lamprey survival, which is nothing. WDFW supports collecting study fish from RSTs.

RD Nelle cautioned about relying on RSTs, and he agreed with Mayfield that this can be hit or miss. When the U.S. Fish and Wildlife Service operated the Methow River RST, most Pacific Lamprey were collected during periods of higher discharge and higher turbidity, when operators expected the trap to shut down at any moment. If this study is implemented, he suggested having other methods in place to supplement collection of study fish at RSTs, as Lampman outlined in Attachment C. Lampman agreed regarding considering multiple methods but also does not want to exclude use of RSTs, which he believes is currently one of the best methods. Study fish can also be acquired from fish salvages at the dams. The YN can use Pacific Lamprey salvaged from irrigation canals to rear juveniles in hatchery.

Lampman said that, if the target is a 0.030 precision level, this requires 300 fish per dam. If 50 fish trickle down from upstream, this is now only 250 fish per dam. Based on the Snake River study, this seems doable. Approximately 50% of the study fish were detected at the mouth of the Snake River from Lower Granite Dam (passing four dams). He expects a similar percentage to trickle down in the Upper Columbia River. Wells Dam will still need 300 fish if the study looks at reservoir survival (another upstream release). The total would be 1,300 tags, which is in line with the number of tags that PNNL produced. Once a commercial vendor is available, it should be easy to get these tags.

Lampman asked whether Douglas PUD's PLMP stipulates that a year a study must occur. Mayfield said that no, at the time the PLMP was written, it was unknown when the technology would be available, so the date was left open. Lampman said that he believes that a minimum of a 1-year study needs to occur because there is no way to learn everything in just 1 year. Ferguson said that this is up for discussion. Lampman said that he would like to establish a timeline to answer the questions in Attachment C. Ferguson suggested that the YN distribute the document titled "Framework for the Upper Columbia Juvenile Pacific Lamprey Passage Acoustic Telemetry Study" that was shared on WebEx during today's conference call, and the Aquatic SWG will come prepared to discuss the questions within this document during next month's Aquatic SWG conference call on October 11, 2023. *(Note: Lampman provided this document, which Kristi Geris distributed to the Aquatic SWG on September 16, 2023. Douglas PUD provided responses to this document, which were distributed on October 9, 2023.)*

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

A brood year (BY) 2023 White Sturgeon Rearing Update (Attachment D) was distributed to the Aquatic SWG by Kristi Geris on September 12, 2023. Chas Kyger said that last month was a bad month for survival in the hatchery. A couple tanks of small fish failed to grow resulting in sustained mortality throughout the month. This week, it appears mortalities have leveled off in 8 of 10 tanks, with 0 to 1 mortalities occurring per tank. These fish are reaching the size where mortality typically stops. Two tanks continue to have losses. Douglas PUD's in-house fish veterinarian (Betsy Bamberger) has not been able to determine the cause of the mortalities. Samples have been sent to a lab, but the results are not yet available. If the mortality continues, stocking numbers might come in under goal for the Chelan PUD program.

Ralph Lampman asked whether this only impacts the Chelan PUD program. Kyger said that the Interlocal Agreement with Chelan PUD prioritizes Douglas PUD's 325-fish program over Chelan PUD's 2,250-fish program. Currently, there are approximately 3,000 fish on-station, and mortalities are ongoing, which may impact reaching the Chelan PUD program target.

Jason McLellan said that Chelan PUD's stocking target for BY 2023 has been reduced to 2,000 fish based on a SOA approved during the last RRFF meeting. Kyger said that this will provide a little wiggle room in case mortalities continue in the two small tanks.

McLellan said that additionally, Sherman Creek Hatchery is projecting to have surplus fish, so there is the potential that these fish might be available to make up for any shortfalls. Kyger said that this is good to know. He has also been in touch with Lance Keller (Chelan PUD) and plans to keep him updated on numbers. McLellan said that Sherman Creek Hatchery plans to revisit surplus discussions in mid- to late-October 2023. Laura Heironimus also noted that the Chelan PUD SOA stipulates that surplus fish from Sherman Creek Hatchery would be acceptable to make up any shortfalls to program.

E. Section 4.4: White Sturgeon Adult Passage (Andrew Gingerich)

Andrew Gingerich recalled that last month, after a good discussion, Douglas PUD was left with an action item to develop a draft outline. A draft SOA is being reviewed by Douglas PUD's general management. Everything discussed by the Aquatic SWG is included in the draft SOA (conducting a literature review, review of existing PIT and acoustic data, and an effort to possibly look at allelic diversity in the Wells Project). He hopes to distribute the draft SOA for Aquatic SWG review in the next couple of weeks. Gingerich said Jason McLellan was not on the call last month, but this SOA reflects discussions he has previously had with McLellan, as well as discussions from last meeting.

Douglas PUD will distribute a draft SOA for addressing Section 4.4 of the WSMP, "Evaluation and Implementation of Adult Passage Measures (Objective 5)," including actions and a timeline for completion, for Aquatic SWG review and consideration.

III. Administration

A. Upcoming Meetings (John Ferguson)

The Aquatic SWG meeting on October 11, 2023, will be held by conference call.

Other upcoming meetings include November 8 and December 13, 2023 (conference call).

List of Attachments

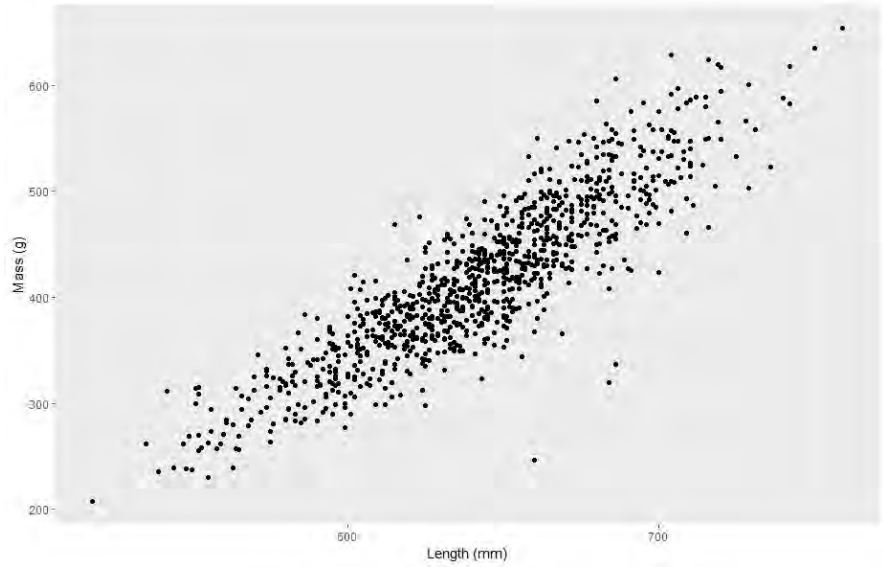
Attachment A List of Attendees
Attachment B Pacific Lamprey Update
Attachment C Framework and Implementation Plan for the Upper Columbia Juvenile Pacific Lamprey Passage Acoustic Telemetry Study
Attachment D BY 2023 White Sturgeon Rearing Update

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
Laura Heironimus	Aquatic SWG Technical Alternate	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

2023 Tagged Lamprey Summary

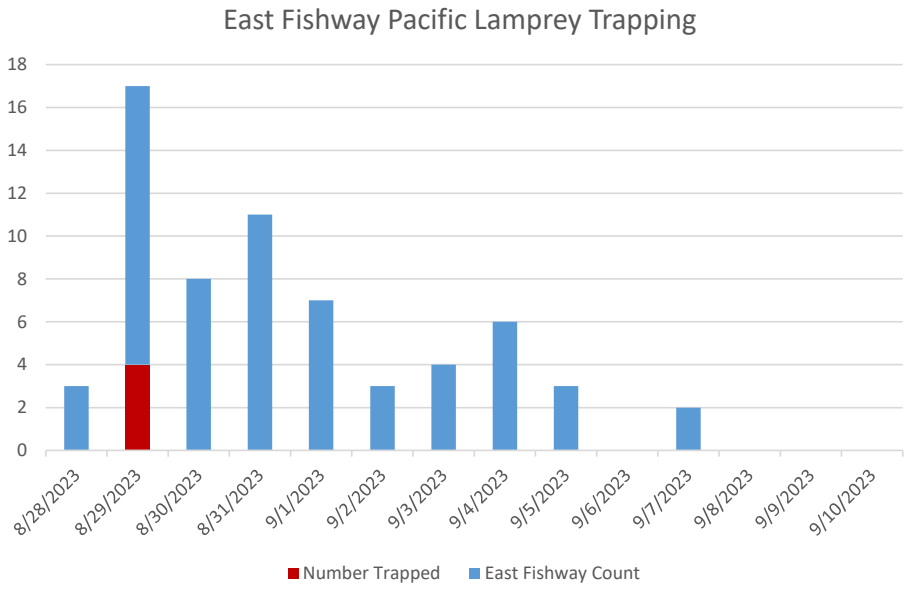
- Total: 1007 fish tagged
- Length: 518 mm – 759 mm (mean = 641.8 mm)
- Weight: 207.6 g – 653.6 g (mean = 416.6 g)

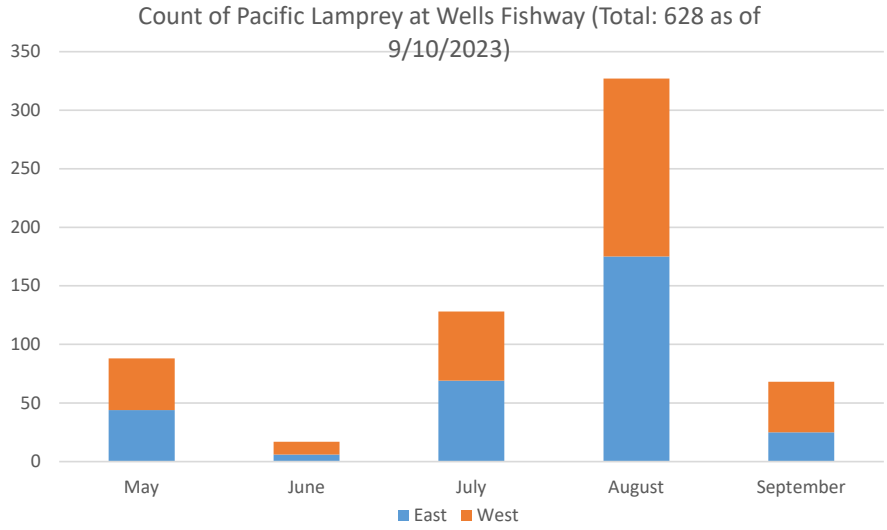


2023 Tag Year PIT Data (as of 9/8/2023)

- 956 Pacific Lamprey released at Starr Ranch; 51 in Similkameen
- 573: No Detection
- 1 fallback (detected at Wells Fishway, then Methow)
- 383: Methow Basin
  - Chewuch: 101
  - Lower Twisp: 2
  - Libby: 1
- 98: Okanogan Basin
  - Zoesel Dam: 1

2023 Wells Fishway Trapping





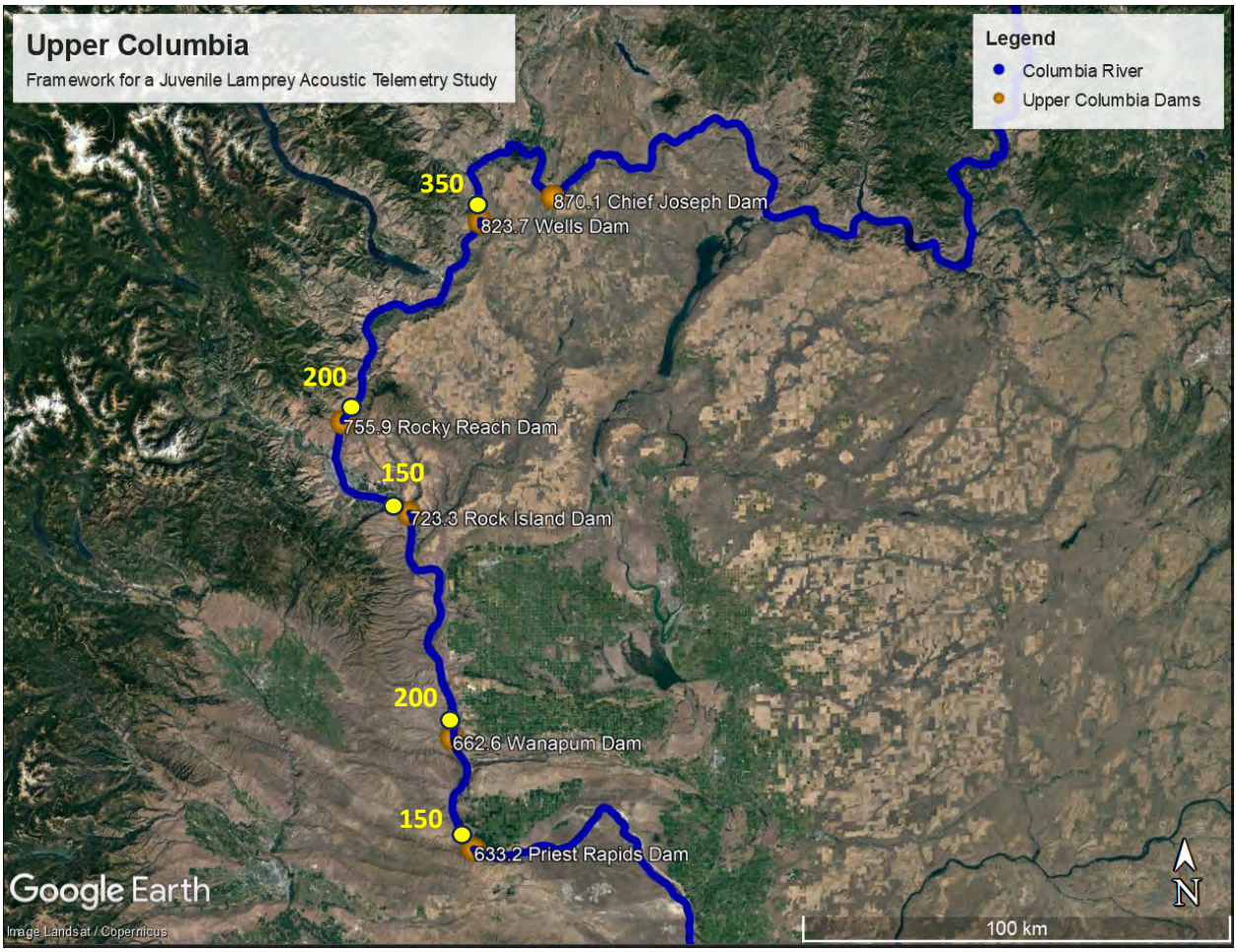
Framework and Implementation Plan for the Upper Columbia Juvenile Pacific Lamprey Passage Acoustic Telemetry Study

Ralph T. Lampman

Yakama Nation Fisheries

- With the ACOE/PNNL embarking on passage survival studies in the Snake River dams (2023 being the second year of study following 2022), there is overwhelming evidence that a passage study for the Upper Columbia River reach is possible (the lamprey subgroup meeting on August 21, 2023, helped all participants to get up to speed on the current studies).
- Each of the PUDs Pacific Lamprey Management Plan specify a requirement to implement a juvenile lamprey survival study within the license period (as soon as it is feasible).
- There is a strong benefit in all PUDs contributing to make it a region-wide collaborative project.
- Even with 150-350 tags provided at each dam (or 350 tags provided by each PUD as shown in the next page map), it will contribute to a 1,000-1,500 tag study cumulatively for the Upper Columbia - the collaboration is key here to make this successful.
- It needs to be reminded that it is each PUDs responsibility to secure source lamprey (using all means possible). Funding needs to be devoted to this task (fish will not fly from the sky as we know it).
- Certainly some region will have more sources of lamprey, while others have less. There are also uncertainties related to which source may provide the highest number of lamprey each year and when this may happen.
- By working collaboratively, we can offset the risks and disadvantages that each PUD holds (extra source fish either released for the target dam to help more to trickle downstream or shared with other target dams to minimize the risk of not having sufficient numbers of lamprey for the overall study).

Overall Map: Example of what a juvenile lamprey study framework may look like using the ViRDCt survival modal (total live tagged fish sample size = 1,050). In addition, at least 50 dead tagged fish will also need to be released at each dam and at least 60 tags will need to be devoted to a tag life study, making the combined total number of tags 1,360. Given this, each PUD will need to provide approximately 500 tags total for this study.



Background:

For the 2022 Snake River juvenile lamprey acoustic telemetry study (which used the ViRDCt model), 270 juvenile lamprey were detected at the virtual release site 1 (V1) and this resulted in a standard error rate of 0.029 for the survival estimate of 91.1% (for this study, 319 live tagged juvenile lamprey were released approximately 20 river km upstream). If lamprey behavior, migration and survival rates are anything similar to this study, provided 300-400 tagged juvenile lamprey approach their respective V1 location, we should expect a standard error rate of < 0.03 (using the assumptions outlined in more details in page 8). For the 2022 Snake River study, the survival rate per river km (rkm) was 99.48% and per dam was 79.89% (Table 1); these estimates were applied to the Upper Columbia River reach (Table 2). If we use these estimates and combine them with the probability of having active tag at each respective dam (based on the 2022 Snake River study tag loss rate), we can estimate the number of live and active tags that will be available at each dam within the Upper Columbia. For example, for Wells Dam, we assume ~36% and ~32% of the tags to be available at Priest Rapids Dam using the rkm survival method and dam survival

method, respectively (Table 3). Using this method, all of the available tags from each dam to each dam can be effectively estimated (Table 4).

Table 1. Summary of key juvenile lamprey acoustic telemetry statistics from the 2022 Snake River study. Key statistics used for Table 2, 3, and 4 are underlined and in bold.

Dam	RKM	Reach RKM Distance	Cum. RKM Distance	Est. Survival via RKM	Est. Survival via Dam	Cum. Survival via RKM	Cum. Survival via Dam	Prob of Active Tag	Cum. Days	Cum. Migration Speed (rkm/Day)	Days per Reach	Reach Migration Speed (rkm/Day)
Release	193	0	0	99.59%	92.10%	92.11%	92.11%	100.00%	0.0	-	0.0	-
LGR	173	20	20	99.57%	74.18%	84.42%	68.33%	98.50%	1.8	11.1	1.8	11.1
LGS	114	59	79	99.47%	78.80%	61.70%	53.84%	94.80%	4.2	18.8	2.4	24.6
LMN	68	46	125	99.72%	86.70%	54.23%	46.68%	92.00%	6.2	20.2	2.0	23.0
IHR	17	51	176	-	-	-	-	88.00%	8.1	21.7	1.9	26.8
SR Mouth	3	14	190	-	-	-	-	87.00%	8.2	23.2	*0.1*	*14.0*
Ave	-	-	-	**99.59%**	**79.89%**	-	-	-	-	-	-	**19.9**

Table 2. Estimated cumulative and reach survival and cumulative number of days for arrival based on the 2022 Snake River juvenile lamprey study (using the river km and dam survival method).

Dam	RKM	Reach RKM Distance	Cum. RKM Distance	Est. Cum. Survival via RKM	Est. Cum. Survival via Dam	Est. Reach Survival via RKM	Est. Cum. # of Days for Arrival
Release	843.7	0	0	-	-	-	0.0
Wells	823.7	20	20	92.0%	92.1%	92.0%	1.0
Rocky Reach	755.9	67.8	87.8	69.5%	73.6%	75.5%	4.4
Rock Island	723.3	32.6	120.4	60.7%	58.8%	87.4%	6.0
Wanapum	662.6	60.7	181.1	47.2%	47.0%	77.8%	9.1
Priest Rapids	633.2	29.4	210.5	41.8%	37.5%	88.5%	10.5

Table 3. Estimated cumulative probability of active tag and estimated percent remaining tags from each dam forebay based on the 2022 Snake River juvenile lamprey study (using the river km and dam survival method).

Dam	Cum. Prob of Active Tag via RKM	Reach Prob of Active Tag via RKM	% Est. Remaining Tags via RKM from WEL	% Est. Remaining Tags via Dam from WEL	% Est. Remaining Tags via RKM from RRE	% Est. Remaining Tags via RKM from RIS	% Est. Remaining Tags via RKM from WAN	% Est. Remaining Tags via RKM from PRI
Release	100.0%	100.0%	100%	100%	-	-	-	-
Wells	98.6%	98.6%	91%	91%	-	-	-	-
Rocky Reach	93.9%	95.3%	65%	69%	91%	-	-	-
Rock Island	91.6%	97.7%	56%	54%	78%	91%	-	-
Wanapum	87.4%	95.8%	41%	41%	58%	68%	91%	-
Priest Rapids	85.3%	98.0%	36%	32%	50%	59%	79%	89%

Table 4. The number of ELAT acoustic tags released at each dam forebay (V1), the respective estimated number of live and active tags from each dam, and the estimated cumulative number of live and active tags from all release sources. The total of 2,360 tags listed in the last row is an indicator for how many times the 1,050 tags will be estimated to be reused throughout the Upper Columbia reach-wide study.

Dam	# of Tagged Lamprey Released	Est. # of Live and Active Tags from WEL	Est. # of Live and Active Tags from RRE	Est. # of Live and Active Tags from RIS	Est. # of Live and Active Tags from WAN	Est. # of Live and Active Tags from PRI	Est. Cum. # of Live and Active Tags from All Sources
Wells	**350**	318	0	0	0	0	**318**
Rocky Reach	**200**	228	182	0	0	0	**410**
Rock Island	**150**	195	155	136	0	0	**486**
Wanapum	**200**	144	115	101	182	0	**543**
Priest Rapids	**150**	125	100	88	157	134	**604**
Total	**1050**	-	-	-	-	-	**2360**

Figures and Tables from the 2022 Snake River Study:

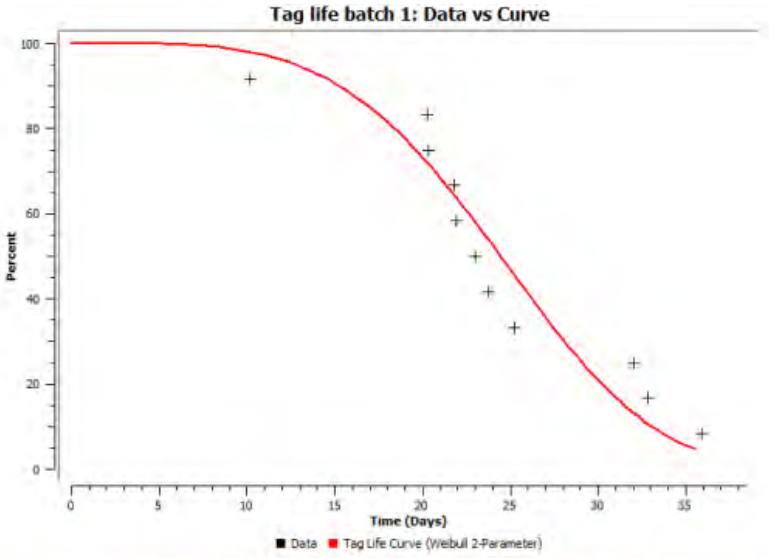


Figure 3.24. Weibull two-parameter model fit (red line) to the tag life data (crosses) from the first batch of acoustic transmitters implanted in juvenile lamprey in April 2022.

Table 3.10. Estimated probability of tags being active at each downstream detection location for acoustic tagged juvenile lamprey released 20 km upstream of LGR in 2022. Standard errors are shown in parentheses. C.F. = Central Ferry, LGS FB = Little Goose Dam forebay, LMN FB = Lower Monumental Dam forebay, IHR FB = IHR forebay, SR mouth = mouth of the Snake River, NA = not estimable due to insufficient detections.

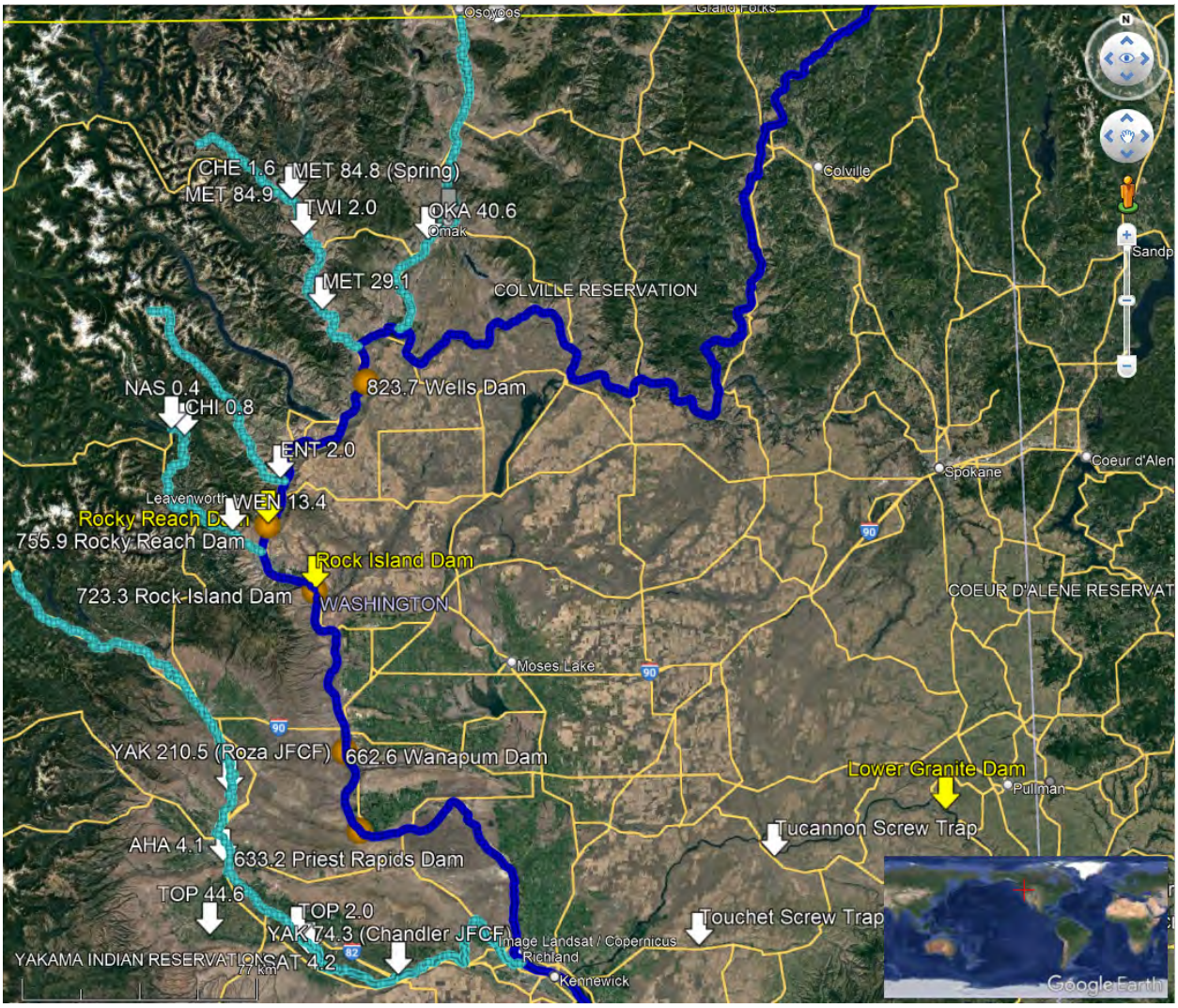
	LGR	C.F.	LGS FB	LMN FB	IHR FB	SR mouth
Full season	0.985 (0.010)	0.958 (0.012)	0.949 (0.015)	0.920 (0.020)	0.880 (0.028)	0.870 (0.030)
April	0.997 (0.005)	0.988 (NA)	0.956 (NA)	0.928 (NA)	NA (NA)	NA (NA)
May and June	0.985 (0.010)	0.957 (0.014)	0.948 (0.017)	0.920 (0.022)	0.880 (0.031)	0.870 (0.033)

Source Map:

-5 dams (orange circles)

-Examples of source locations (white & yellow arrows - should not be considered a comprehensive list)

-Artificially propagated and hatchery reared lamprey should be considered as well



An Example of Lamprey Sources by Dam:

Wells Dam = 350 tagged lamprey from Methow and Okanogan subbasin screw traps (+ others)

Rocky Reach Dam = 200 tagged lamprey from Rocky Reach Dam and Entiat screw trap (+ others)

Rock Island Dam = 150 tagged lamprey from Rock Island Dam and Wenatchee screw traps (+ others)

Wanapum Dam = 200 tagged lamprey from above sites with priority to the closest location (+ others)

Wanapum Dam = 150 tagged lamprey from above sites with priority to the closest location (+ others)

PNNL / Tribal Juvenile Trap (under development):

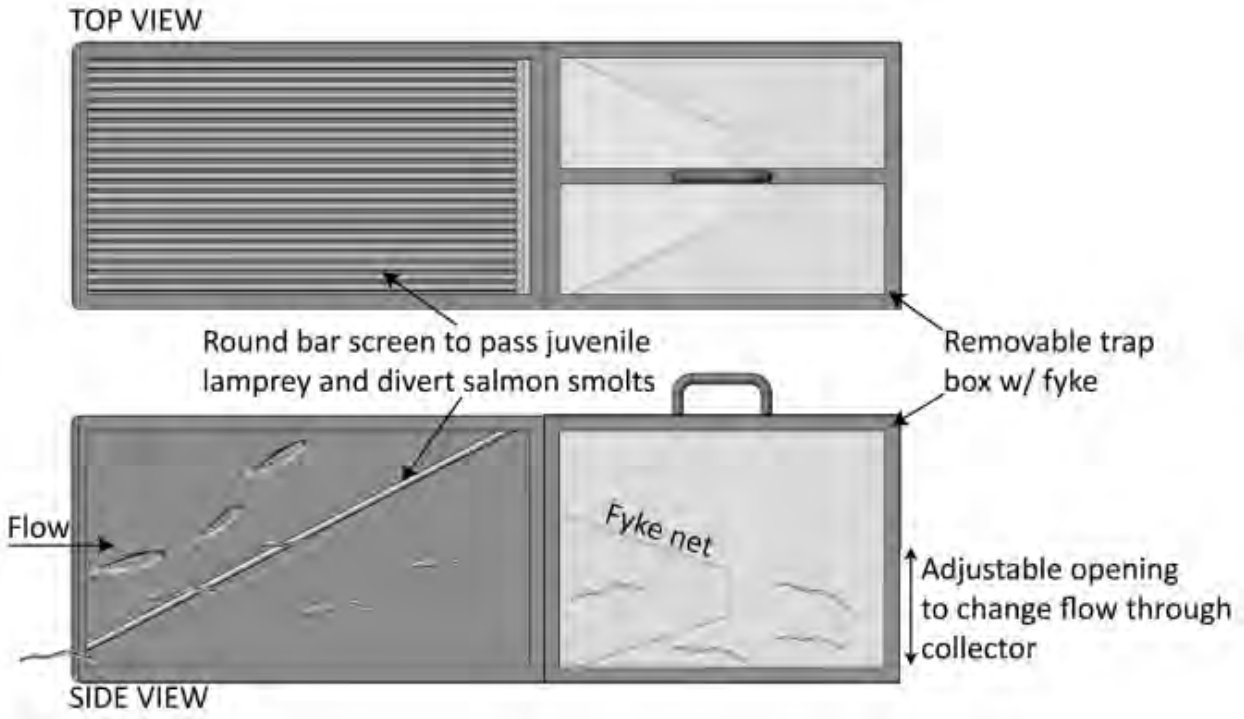


Figure 1. Conceptual image of the proposed lamprey collector.

Key Questions:

1. **Project Scope? (focus)**
    a. Reservoir and dam
    b. Dam (immediate area above and below the dam, including the dam)

I advocate that dam passage ("b") is the most important goal of the two, but we should certainly try to learn about the reservoir survival ("a") as well where feasible. However, we should not postpone the study simply based on whether or not we can attain reservoir survival with 100% certainty (we need to accept higher level of standard error and precision, if needed). First and foremost, the study design should ensure that dam passage survival will be attained. If the study is conducted collaboratively with multiple PUDs in the same year, as outlined in this framework, this will also help boost the overall study fish numbers available and will help all PUDs to attain reservoir survival estimates in addition to dam passage survival estimates, so a collaborative approach will greatly improve this study (in terms of scope and data attained).

2. **What survival model to use?**
    a. ViRDCt survival model ("death fish" model)
    b. ViPRe survival model ("triple release" model)

As discussed during the August 21, 2023, Lamprey Subgroup meeting, ViRDCt has many advantages (excerpt from the Lamprey Subgroup Meeting on August 21, 2023):

"Tracy Hillman said that one question from the RRFF is, why use the ViRDCt model instead of the Virtual/Paired Release (ViPRe) model? Harnish said that he used the ViPRe model for the 2019 Biological Opinion studies from 2010 to 2014, so he is well-versed in this model. The ViPRe model's paired release design needs to estimate six parameters to achieve the precision for the dam passage survival estimate, whereas the ViRDCt model only needs to estimate three parameters, requiring much smaller sample sizes to achieve the same precision. Additionally, the paired releases downstream need to be similar. With the ViPRe model, this requires driving the study fish around to equalize the transport times for each release, which can become complicated."

If using a multi-PUD collaborative approach, there will be additional tagged fish that can also contribute to reservoir survival assessments as well from the tags trickling down from the upstream releases.

Specifically, the ViRDCt model has the following assumptions (from Harnish et al. 2020):

1. The virtual release group is composed of fish known to have arrived alive and passed through the dam.

2. The virtual release group has a dam passage distribution representative of run-of-river fish.

3. The tagged fish are representative of the population of inference.

4. All tagged fish act independently.

5. Fish within a release have homogenous survival and detection processes.

6. No tag loss or failure.

7. The probabilities of dead-released fish arriving at the tailrace array () and being detected () is representative of the probabilities of arrival and detection of fish from the virtual release group that die during dam passage.

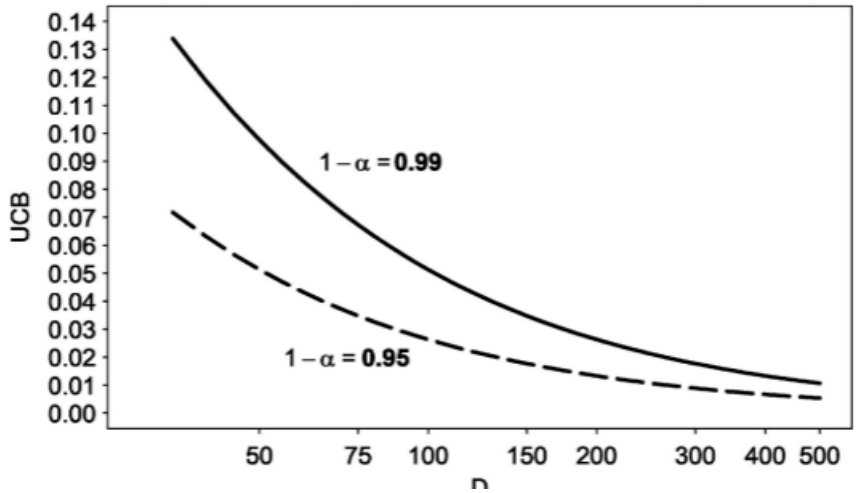


Figure 10. Upper one-tailed confidence bound (UCB) on the actual probability of a dead tagged fish drifting downstream () when using a dead-fish release size of D and zero fish are detected at a detection array with detection probability (p D) of 1.0.

3. **What is the acceptable precision level?**
    a. 10%
    b. 5%
    c. 3%
    d. 2.5%

SE	Half of 95% C.I.	Full 95% C.I.	Min of 50% Survival Rate	Max of 50% Survival Rate	Min of 90% Survival Rate	Max of 50% Survival Rate
0.100	0.196	0.392	30.4%	69.6%	70.4%	109.6%
0.050	0.098	0.196	40.2%	59.8%	80.2%	99.8%
0.030	0.059	0.118	44.1%	55.9%	84.1%	95.9%
0.025	0.049	0.098	45.1%	54.9%	85.1%	94.9%
0.015	0.029	0.059	47.1%	52.9%	87.1%	92.9%

Below is a graph shared by PNNL in their Snake River acoustic telemetry study proposal.

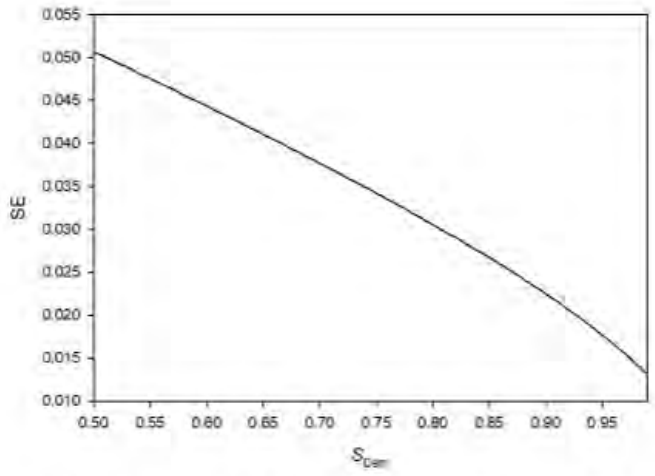


Figure 1. Estimated precision (standard error [SE]) of the juvenile lamprey LGR passage survival estimate (S_{Dam}) displayed as a function of S_{Dam}. The relationship assumes the reduced ViRDCt model is used to estimate S_{Dam}, 450 juvenile lamprey are tagged and released alive 20 km upstream of LGR, 80% of live-released lamprey pass LGR and are included in V_1, 67% of live-released lamprey survive from the LGR tailrace to the detection array located 40 km downstream of LGR, 50 juvenile lamprey are tagged and released dead at LGR, 20% of dead-released lamprey are detected on the tailrace array, and the detection probability of tailrace and tailwater arrays is 0.95.

Sample sizes changes the precision we can expect at a given survival level (above graph is using 450 live tagged lamprey).

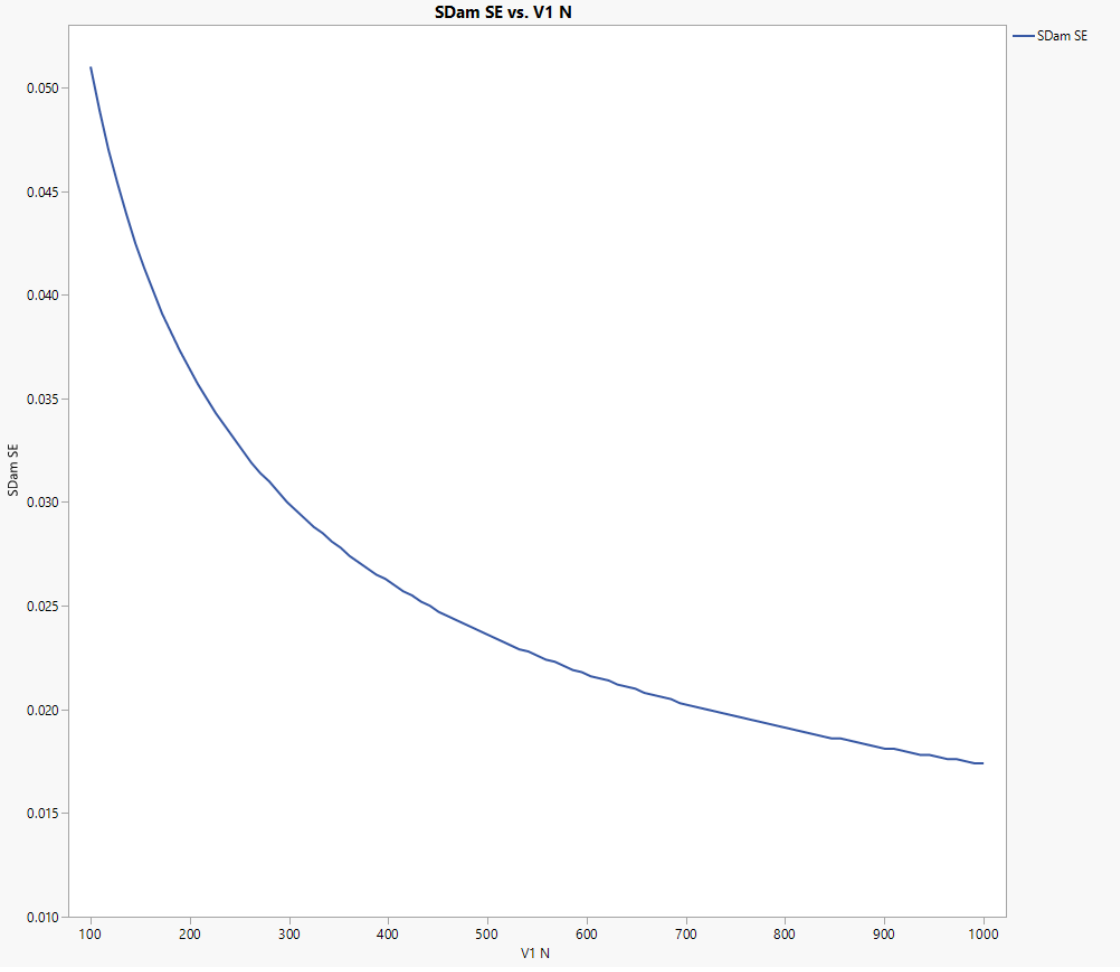
For the 450 live tags we get a Standard error of 0.05 at 50% survival. Standard error at 0.025 is a survival of 87.24% and a standard error of 0.015 is a survival of 97.53% (Figure 1 of the proposal).

If we increase the tag number we can expect the precision levels at given estimated survival levels:
-For the 675 live tags; Standard error at 0.025 is a survival of 81.85% and a standard error of 0.015 is a survival of 94.59%
-For the 900 live tags; Standard error at 0.025 is a survival of 78.91% and a standard error of 0.015 is a survival of 92.14%

Also, Ryan Harnish (PNNL) shared this figure below:

“Below is an example of how precision of the ViRDCt dam passage survival estimate (SDam SE) changes with the virtual release group sample size (V1 N). The assumptions for this curve include: 100 dead tagged fish released, 30% dead fish detection rate on the tailrace array, 91% dam passage survival, 91% detection probability at the tailrace array, and 62% joint probability of survival to and detection at the Crow Butte array. All of these assumptions affect the SE vs. N relationship. Also, it’s important to note that this is the V1 sample size – additional fish need to be released to account for the mortality that occurs between the release location and the dam.”

In summary, using the ViRDCt survival model, you can achieve a SE of < 0.03 in survival estimates using approximately 300 tagged fish (given the assumptions outlined above).



4. **What source of lamprey to use?**
    a. Only from the target dam
    b. From the dam as well as screw traps upstream of the dam (with priority based on distance from the target dam)
    c. From the dam as well as screw traps and hatchery (with priority based on distance from the target dam, if sources upstream from the dam is not available, use downstream source)

I advocate for "c." Given that Pacific Lamprey are genetically largely homologous and do not home to their natal streams to the extent that salmonids display, we do not have enough evidence to show that lamprey from these different sources will behave differently than those that were captured at the dam. The assumptions suggested related to the source of fish are really an artifact of salmonids studies and we simply cannot expect those same assumptions will apply to Pacific Lamprey (in essence we are trying to see Pacific Lamprey using "salmon glasses"). Pacific Lamprey mixes considerably across their species range; subpopulations from the Columbia River Basin are not that different genetically from the subpopulations from Japan, for example. In the case of salmonid species that home to watersheds and sometimes even specific stream reaches, it is understandable that salmonids have developed genes and alleles that allow them to perform better in each of their respective watersheds. It is very likely that they have developed adaptation specific to their watersheds as well as the migratory routes that they are required to travel. However, in the case of Pacific Lamprey that will mix and stray into different watersheds, basins, and even continents, the role of local adaptation has to be considerably less important (they will need to be a generalist that can adapt to various river / stream environments). How they do this, God only knows…. Whether the source of lamprey are from downstream of the target study area may not even matter, either. It is still a good measure and important to prioritize lamprey that are closer to the source and use as many as possible from those sources to be safe; however, when there is a shortage of lamprey (due to various logistical reasons), it is very important that we keep the options open to use other sources of lamprey (and certainly we can monitor them separately to see if they show different behavior so that we do not arrive at invalid conclusions). Salmon survival studies have made a compromise by using hatchery salmon as a surrogate for wild salmon survival (primarily due to ESA listing status, logistics, and all practicality). It is important that we conduct the study to the best of our ability, similar to the example of salmon survival studies here. There is an inherent need to conduct the juvenile lamprey survival study, similar to the salmon studies, to understand the big picture issues and bottlenecks within the entire Upper Columbia River reach. Not conducting the study at all or postponing the study indefinitely is just not a viable alternative for improving the management of Pacific Lamprey populations here locally as well as regionally and range-wide.

	1-Aug		11-Sep	
Tank	Population	Grams	Population	Grams
1	897	2.06	420	3.3
2	861	2.59	216	9.1
3	838	1.76	303	4.6
4	365	1.13	496	3.0
5	660	3.03	--	--
6	--	--	112	23.3
7	529	5.04	273	5.1
8	445	5.60	218	20.0
9	582	2.97	307	6.6
10	361	4.02	252	11.1
11	--	--	363	5.9
12	--	--	65	39.5
Mag 1	--	--	--	--
Mag 2	--	--	--	--
Total	5,538	2.9	3,025	8.0

FINAL

Conference Call Minutes

Aquatic Settlement Work Group

To: Aquatic SWG Parties Date: November 8, 2023

From: John Ferguson, Chair, Anchor QEA, LLC

Re: Final Minutes of the October 11, 2023, Aquatic SWG Conference Call

The Aquatic Settlement Work Group (SWG) met by conference call on Wednesday, October 11, 2023, 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. Douglas PUD will populate the Microsoft Excel file titled "Upper Columbia Juvenile Lamprey Source Datasheet" with Pacific Lamprey count data for their respective locations identified in the "PUD table" tab (Item II-D). *(Note: Mariah Mayfield provided these data to Ralph Lampman following the Aquatic SWG conference call on October 11, 2023.)*
2. Washington State Department of Ecology (Ecology) will ask internally about possible causes for isolated exceedances of the 110% total dissolved gas (TDG) tailrace water quality standard during non-spill and low-flow conditions (Item II-F).
3. The Aquatic SWG meeting on November 8, 2023, will be held by conference call (Item III-A).

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. A document titled *Framework and Implementation Plan for the Upper Columbia Juvenile Pacific Lamprey Passage Acoustic Telemetry Study* was distributed to the Aquatic SWG by Kristi Geris on September 16, 2023. Douglas PUD provided responses to this document, which were distributed on October 9, 2023 (Item II-D).
2. The draft *Statement of Agreement Regarding Evaluation and Implementation of White Sturgeon Adult Passage Measures (WSMP Objective 5; Section 4.4)* was distributed to the Aquatic SWG by Kristi Geris on October 9, 2023, and is available for review with edits and

comments due to Douglas PUD by November 3, 2023. Douglas PUD will request approval of the statement of agreement (SOA) during the Aquatic SWG conference call on November 8, 2023 (Item II-A).

Documents Finalized

1. The final Rocky Reach Fish Forum (RRFF) Pacific Lamprey Subgroup meeting notes and associated juvenile Pacific Lamprey survival studies documents were distributed to the Aquatic SWG by Kristi Geris on October 6, 2023 (Item II-D).

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.

Stuart Fety introduced himself. He is new to U.S. Fish and Wildlife Service (USFWS) Division of Ecological Services in the Wenatchee, Washington office. *(Note: Fety will serve as RD Nelle's USFWS Aquatic SWG Technical Alternate. A representation designation letter is forthcoming.)*

B. Meeting Minutes Approval (John Ferguson)

The revised draft September 13, 2023, conference call minutes were reviewed. Kristi Geris said that all comments and revisions received from members of the Aquatic SWG were minor, and clarifying edits were incorporated into the revised minutes. Geris also updated distribution of action items under Summary of Action Items and corrected the meeting date under Item I-C, Review of Action Items. Lastly, there is one outstanding comment to address under Item II-C, Juvenile Pacific Lamprey Downstream Passage Study. Ralph Lampman confirmed the study in the Lower Columbia River planned for 2024 to 2025 includes McNary and John Day dams in 2024 and The Dalles and Bonneville dams in 2025. Geris noted that Ecology abstained via email prior to the conference call because a representative did not participate in the September 13, 2023, conference call. Patrick Verhey said that Washington Department of Fish and Wildlife (WDFW) will also abstain because he did not participate in the September 13, 2023, conference call. The other Aquatic SWG members present approved the September 13, 2023, conference call minutes, as revised.

C. Review of Action Items (John Ferguson)

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

1. *Douglas PUD will compile the past 5 to 10 years of data (whatever is available) for Pacific Lamprey collected at the rotary screw traps (RSTs) in the Methow and Okanogan rivers, including numbers collected and life stage (Item II-C).*
   Douglas PUD compiled these data, which were distributed to the Aquatic SWG by Kristi Geris on October 9, 2023. This will be further discussed during today's conference call.
2. *The Yakama Nation (YN) will distribute the document titled* Framework and Implementation Plan for the Upper Columbia Juvenile Pacific Lamprey Passage Acoustic Telemetry Study *that was shared on WebEx during today's conference call, and the Aquatic SWG will come prepared to discuss the questions within this document during next month's Aquatic SWG conference call on October 11, 2023 (Item II-C).*
   Ralph Lampman provided this document, which Geris distributed to the Aquatic SWG on September 16, 2023. Douglas PUD provided responses to this document, which were distributed on October 9, 2023. This will be further discussed during today's conference call.
3. *Douglas PUD will distribute a draft SOA for addressing Section 4.4 of the White Sturgeon Management Plan (WSMP), Evaluation and Implementation of Adult Passage Measures (Objective 5), including actions and a timeline for completion, for Aquatic SWG review and consideration (Item II-E).*
   This SOA was distributed to the Aquatic SWG by Geris on October 9, 2023. This will be further discussed during today's conference call.

II. Summary of Discussions

A. Draft *Statement of Agreement Regarding Evaluation and Implementation of White Sturgeon Adult Passage Measures (WSMP Objective 5; Section 4.4)* (Chas Kyger)

The draft *Statement of Agreement Regarding Evaluation and Implementation of White Sturgeon Adult Passage Measures (WSMP Objective 5; Section 4.4)* was distributed to the Aquatic SWG by Kristi Geris on October 9, 2023. Chas Kyger said that, as discussed in past meetings, this draft SOA sets up the framework for a long-term plan to address Objective 5 in the WSMP. The five main points discussed to date are included in the Statement, as shown in the following.

1) Perform an assessment of the biological benefits of providing upstream passage for White Sturgeon at Wells Dam.

2) Document the status of sturgeon passage measures and plans at downstream Mid-Columbia Dams.

3) Develop a draft literature review on adult White Sturgeon passage at hydro-electric and dam facilities prior to the end of 2024.

4) Review existing White Sturgeon PIT tag and interrogation data at Mid-Columbia PUD projects. Within fishway acoustic tag detections and video count data will also be included, where available. A draft technical memorandum summarizing these data will be completed by the end of 2024.

5) Collect and catalog DNA samples of White Sturgeon encountered in the Wells Project during M&E activities, with an emphasis on sampling fish released from the Wells Fish Hatchery during 2014-2023. These data will be used to determine the genetic diversity (e.g. allelic diversity) of the existing White Sturgeon population in the Wells Project. Genetic samples may be analyzed at the request and approval of the Aquatic SWG no sooner than 2025 and may include up 400 unique individuals in the Wells Project area. Results of this analysis will be used to assess the biological merit of fish passage in the context of connectivity with other White Sturgeon populations in the Columbia River. This step will be completed and approved following the review and approval of steps 1 & 2 above.

Jason McLellan said that he has a couple preliminary comments. First, it is not clear how No. 1 and No. 2 will be communicated. There is specific language for No. 4, but not for No. 1 and No. 2. Kyger said that this language was left vague so the Aquatic SWG can discuss and decide how to address these and what type of deliverables are needed. For example, he is unsure what information is available on status of passage measures, and maybe this entails contacting other PUDs or the U.S. Army Corps of Engineers (USACE). McLellan said that for No. 2, he would like to see an evaluation of sturgeon passage measures, extending beyond just White Sturgeon and Mid-Columbia River dams. He suggested including the Lower Columbia River and potentially the Snake River. He believes there may also be value in evaluating what entities are doing for other sturgeon species around the world. For example, passage at facilities in Europe may have application here. Kyger agreed that it would be relevant to consider other work and other dams, and Douglas PUD envisioned including this type of evaluation under No. 3, but perhaps this can be expanded into other areas. McLellan said that he understands how this could fit under No. 3. John Ferguson added that in the Sacramento area, passage facilities have been installed at flood control weirs, so there is more work to be mindful of.

McLellan asked, secondly, whether Douglas PUD can clarify their thinking around tissue sample collection under No. 5. While he thinks tissue sample collection is important, the way he reads No. 5 is that genetics are the primary benefit when considering biological merit, and he is not sure that this

is the case. There are other benefits in the broader Columbia River population. For example, habitat availability and quality and population productivity. Kyger said that this SOA specifically calls out genetics because this is called out in the WSMP, but the evaluation does not need to be limited to this. McLellan said that it seems the language in the SOA suggests this, so he needs to think about this more. He suggested identifying all of the biological benefits and cautioned not to focus on just one. Kyger suggested perhaps including these specifics under No. 1. McLellan agreed and reiterated that he appreciates the inclusion of genetic analysis; he thinks this is key, but it is not the only thing. There are different ways to measure genetic diversity.

Ferguson suggested that Aquatic SWG members submit edits and comments on the draft SOA to Douglas PUD by November 3, 2023, which gives Douglas PUD time to address comments, before requesting approval of the SOA during the Aquatic SWG conference call on November 8, 2023.

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 conference call on October 11, 2023. Chas Kyger recalled reporting elevated mortality of BY 2023 White Sturgeon on station at Wells Fish Hatchery last month. This has since slowed down. Currently, there are 2,277 fish on station. The requirement for Douglas PUD's program is 325 fish. Jason McLellan reported last month that Chelan PUD's stocking target was reduced to 2,000 fish. Typically, when fish reach this size there are no more mortalities. Chas Kyger pointed out that with 2,277 fish currently on station, Chelan PUD's total program requirement may not be met this year. John Ferguson noted the large range in fish sizes. Kyger said that this has created a lot of work for hatchery staff who must continually grade fish to avoid larger fish injuring the smaller fish.

C. Adult Pacific Lamprey Trapping at Wells Dam (Mariah Mayfield)

Mariah Mayfield said that since the last meeting, there were a few more days of trapping, but no fish were collected. Therefore, total catch during the sampling was four fish. She recalled that August is the month with the most counts at Wells Dam; the trapping effort started at the tail end of the month, and counts decreased into September. As of today, total adult Pacific Lamprey passage at Wells Dam is 684 fish, which is lower than she expected considering counts at Bonneville Dam.[1]

John Ferguson recalled that last month Douglas PUD had a positive reaction overall about these traps as a workable option. Has this changed at all? Mayfield said that she still believes if Douglas PUD needs to collect adult Pacific Lamprey for a study, this can be accomplished in the Wells Dam fish ladders using the traps. She suggested installing smooth plating on the floor of the ladder

[1] According to the Columbia River Data Access in Real Time database, as of October 11, 2023, total adult Pacific Lamprey passage at Bonneville Dam was 63,923 fish.

downstream of each weir orifice to affect attachment and encourage fish to pass over the top of the weir and enter the traps. She also caveated that fish collection is dependent on high run numbers at Wells Dam. Mayfield said that the plating would be installed over the winter maintenance period and would be in place all season. John Rohrback clarified that this plating would not block or close the orifice; rather, it is installed below the orifice to deter Pacific Lamprey from attaching and passing through the orifice. Ferguson said that this is a good clarification, because he was thinking about Wells Habitat Conservation Plan Coordinating Committee concerns about blocking a passage route. Mayfield agreed with this clarification and said that this plating has been reviewed, approved, and used before.

Ralph Lampman recalled that for the 2022 Adult Pacific Lamprey Approach and Passage Study,[2] Douglas PUD planned to monitor these study fish into spring 2023, and he asked when the Aquatic SWG can expect a report. Kyger said that he just received the last of the acoustic data last week, which he sent to Dave Robichaud (LGL Limited) to process. Kyger hopes to have a final report by the end of this year. Lampman asked whether it is too late to start planning a study for implementation in 2024. Rohrback said that the latest SOA[3] stipulates translocation from 2023 to 2024, and at the Aquatic SWG's discretion, begin planning in 2024 or early 2025 for a study to begin in 2025.

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

John Ferguson said that the final RRFF Pacific Lamprey Subgroup meeting notes and associated juvenile Pacific Lamprey survival studies documents were distributed to the Aquatic SWG by Kristi Geris on October 6, 2023, including redistribution of the YN's document titled *Framework and Implementation Plan for the Upper Columbia Juvenile Pacific Lamprey Passage Acoustic Telemetry Study* (originally distributed on September 16, 2023.). Then, per an action item, Douglas PUD provided a document titled *Summary of Juvenile Pacific Lamprey Trapped in Methow and Okanogan Basins* and also provided responses to the YN's framework document, which were both distributed to the Aquatic SWG by Geris on October 9, 2023. Ferguson suggested that the YN share the survival study documents and then Douglas PUD review their documents.

[2] Study plan titled *Wells Dam 2022 Adult Lamprey Approach and Passage Study*, approved by the Aquatic SWG on March 9, 2022, and distributed that same day

[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

Framework and Implementation Plan for the Upper Columbia Juvenile Pacific Lamprey Passage Acoustic Telemetry Study

Ralph Lampman shared on WebEx the YN's document titled *Framework and Implementation Plan for the Upper Columbia Juvenile Pacific Lamprey Passage Acoustic Telemetry Study*. He said that this has not changed since he discussed it last month.[4]

Upper Columbia Juvenile Lamprey Source Datasheet

Lampman shared on WebEx the Microsoft Excel file titled "Upper Columbia Juvenile Lamprey Source Datasheet." He said this has not yet been shared with the Aquatic SWG and includes supporting data for the framework document. He said the "Survival" and "SE C.I." tabs show estimated survival calculations, travels times, and tag life per proposed release location. The "Key Questions" tab identifies dates to start discussing key questions within the individual forums (excerpt copied below).

#	Key Questions	Due Date
1	What is the (primary) Project Scope?	11/1/2023
2	What survival model is best to use?	11/1/2023
3	What is the acceptable precision level?	11/1/2023
4	What source of lamprey to use?	12/6/2023

Question No. 4 requires compiling data before discussion, which is why the due date is later. This leads to the "PUD table" tab, which lists potential study fish source locations by responsible party, including RSTs, dams, and monitoring and hatchery facilities. To address Question No. 4, Lampman is asking that each responsible party (i.e., Douglas PUD, Chelan PUD, Grant PUD, and the YN) populate the "PUD table" tab with Pacific Lamprey count data for their respective locations, including the mean, min, and max for all years, the last 3 years, and 2023 only, for the ratio of juveniles versus larvae, juvenile counts only, and fish lengths.

Mariah Mayfield said that Dave Grundy (WDFW) indicated that he has not yet completed quality assurance/quality control of the Methow data, but he will send this to both her and Lampman once it is available. She is unsure whether the data will be ready by the November 1 or December 6 due dates. Lampman said that any data would be helpful, and Mayfield said that Grundy has provided all other data except this year. Lampman asked whether Mayfield can populate the "PUD table" tab through 2022, and she said that she can do this. *(Note: Mayfield provided these data to Lampman following the Aquatic SWG conference call on October 11, 2023.)*

[4] Attachment C to the Aquatic SWG September 13, 2023, conference call minutes.

Final RRFF Pacific Lamprey Subgroup Meeting Notes

Lampman shared on WebEx the final RRFF Pacific Lamprey Subgroup meeting notes. RRFF members provided edits and comments on the draft notes, which were discussed and incorporated into the final notes. A key part of this review was updating the model assumptions based on discussions at the subgroup meeting. These model assumptions are summarized in a document titled *Dam Passage Survival Models and Their Assumptions*, which is Attachment 3 to the final RRFF Pacific Lamprey Subgroup meeting notes. The RRFF agreed it was best not to edit Attachment 3, because this version is what was distributed for discussion during the meeting. Rather, edits and comments were added to the source file.

2023_10_06 BioAnalysts - Survival Study Assumptions (10-04-23)

Lampman shared on WebEx the file titled, "2023_10_06 BioAnalysts - Survival Study Assumptions (10-04-23)." He said this is the *Dam Passage Survival Models and Their Assumptions* source file where edits and comments were added based on the discussions at the subgroup meeting. This is currently out for RRFF review.

Ferguson asked whether the RRFF had settled on a model. Lampman said that the YN prefers the Virtual Release/Dead-Fish Correction (ViRDCt) Model, but the RRFF has not yet voted on a preferred model.

Summary of Juvenile Pacific Lamprey Trapped in Methow and Okanogan Basins

Mayfield asked Geris to share on Webex the document titled *Summary of Juvenile Pacific Lamprey Trapped in Methow and Okanogan Basins* (Attachment C).

Mayfield said that in the Methow Basin, the Lower Methow River RST has the highest catch rate for both larval and juvenile Pacific Lamprey, but this is highly variable year-to-year (Table 1 of Attachment C). Dave Grundy indicated that most fish come through within 3 days, and it is overwhelming the crew to have to handle so many fish. His crew does the best they can to separate larvae from juveniles, keeping in mind the priority is salmonid brood collection. The Twisp River RST has never collected juvenile Pacific Lamprey (Table 2 of Attachment C). The Upper Methow and Chewuch River RSTs are primarily operated during the fall but are occasionally operated in the spring. During spring, there are issues with high river flow at both traps, but some juvenile Pacific Lamprey have been collected in the Chewuch River RST (Table 3 of Attachment C). Mayfield noted that Douglas PUD has some concerns about whether fish coming down from the Chewuch River were just washed downstream or were actually starting their downstream migration and whether these fish would be the same as fish collected farther downstream. She recalled a comment by Lampman about some juvenile Pacific Lamprey waiting before migrating downstream. Lampman said that yes, sometimes juveniles wait for about 1 year before migrating downstream.

Lampman noted the big surges of fish in Table 1. Mayfield said that because of this, Grundy is considering switching to estimating larvae counts but continuing to count individual juveniles. Lampman also said that the variability in ratios of larvae to juveniles per year is interesting.

Mayfield said that in the Okanogan Basin, the Confederated Tribes of the Colville Reservation (CTCR) operate a RST in the mainstem Okanogan River, but operating the trap is difficult due to the flow characteristics of the river. The CTCR also operate an RST in Omak Creek. No juveniles have been collected at either location (Tables 4 and 5 of Attachment C). The CTCR have observed more larval Pacific Lamprey in recent years, so there may be more downstream migrants in future years.

DCPUD Response to "Framework and Implementation Plan for the Upper Columbia Juvenile Pacific Lamprey Passage Acoustic Telemetry Study" (R. Lampman, YN Fisheries, 9/16/2023)
Geris shared on Webex the document titled *DCPUD Response to "Framework and Implementation Plan for the Upper Columbia Juvenile Pacific Lamprey Passage Acoustic Telemetry Study" (R. Lampman, YN Fisheries, 9/16/2023)* (Attachment D). Mayfield first commended Lampman for developing this framework and coordinating these discussions among the different forums. She recognized the time and effort Lampman has put into this. Mayfield then reviewed the Overall Comments and each individual comment outlined in Attachment D. Additional discussions are in the following paragraphs.

Regarding the individual comment on Page 3, Table 2, Lampman first clarified that the migration rate for the Umatilla River example is not accurate because most fish migrate immediately, but the bypass system at John Day Dam is not operational until March. Therefore, this migration rate only includes those detected. In the Yakima and Snake rivers, acoustic telemetry studies indicate that most fish migrate 40 kilometers per day. Mayfield said that this information was based on the cited memorandum. Lampman said that secondly, the dead fish releases may be complicated, but are still doable. He suggested planning for extra fish to account for this, which he did include in his framework.

Regarding the individual comment on Page 6, Figure 1, Lampman asked whether there might be potential locations in the Wells Dam bypass to install a juvenile trap. Mayfield said that at Wells Dam, fish pass via spillways. Chas Kyger further explained that bypass barriers are installed to guide fish to a spillway. Mayfield said that installing a juvenile trap in the spillway would not work due to the high water velocities. She said that a trap designed for low-flow conditions and installed upstream of Wells Dam might work. Ferguson asked where migrating juvenile Pacific Lamprey are located vertically in the water column in reservoirs. Lampman said that this depends on the time of day. Juveniles tend to migrate deeper in the water column during the day and closer to the surface during the night.

Regarding the individual comment on Page 8, Lampman suggested not basing decisions on the Haas et al. study (2023). The low tag retention was due to tagger effects. Since this study, the YN has provided tagging protocol guidance to these researchers.

Regarding sources of study fish, Lampman said that the main difference between salmon and lamprey is that lamprey are not adapted to a specific tributary. In this sense, there is no difference whether study fish come from the Upper Columbia River or somewhere else. He asked whether Douglas PUD's Pacific Lamprey Management Plan specifically says study fish must come from upstream of Wells Dam. Mayfield said that it says, "in or upstream of the project."

Lastly, Lampman said that the ViRDCt model might not be the best option for a reservoir study, but as long as there is another release location farther upstream, he thinks the ViRDCt Model will still work with a relatively low sample size and achieve the required precision levels.

Discussion

Mayfield said that Douglas PUD still feels further discussion is needed about what a statistically valid survival study entails and how to measure significant negative impact. There are still a lot of logistical issues to work out, primarily fish source. In the next 5 years, perhaps there will be more juveniles coming down from the Methow River, and the Aquatic SWG can reassess conducting a juvenile Pacific Lamprey study at that time.

Ferguson suggested that the Aquatic SWG review these documents and continue this discussion next month. The YN is interested in coordinating a joint PUD study with the upcoming USACE study as soon as 2024; however, it seems Douglas PUD is not ready for a study this soon. Ferguson asked about the path forward in the other forums. Lampman said that the RRFF mentioned that it is too late to conduct a study in 2024, and the earliest would be 2025. Ferguson asked when the Harnish et al. study results from 2023 might be available. Lampman said that Harnish plans to present preliminary results at the USACE Anadromous Fish Evaluation Program in early December 2023. The final report will be ready in spring 2024.

E. Juvenile and Adult Pacific Lamprey Literature Reviews and Document Libraries (John Rohrback)

John Rohrback said that this year Douglas PUD added four documents to the Pacific Lamprey literature review libraries, as described in the following paragraphs:

In the adult library, the publication "More Flow in a Regulated River Correlates with More and Earlier Adult Lamprey Passage, but Peak Passage Occurs at Annual Low Flows" by Clemens et al. (2023)[5] was

[5] Clemens, B.J., J.D. Romer, J.S. Ziller, and M. Jones, (2023). "More Flow in a Regulated River Correlates with More and Earlier Adult Lamprey Passage, but Peak Passage Occurs at Annual Low Flows." *Ecology of Freshwater Fish* 00:1–12.

conducted at Leaburg Dam on the McKenzie River in Oregon, where they examined flow and temperature effects.

In the juvenile library, the publication "Salvage Using Electrofishing Methods Caused Minimal Mortality of Burrowed and Emerged Larval Lampreys in Dewatered Habitats" by Harris et al. (2023)[6] looked at whether electrofishing could be used for salvage without causing harm to larval lampreys. The result was, yes, this can be done.

In the juvenile library, the publication "Survival, Healing, and Swim Performance of Juvenile Migratory Sea Lamprey (*Petromyzon marinus*) Implanted with a New Acoustic Microtransmitter Designed for Small Eel-Like Fishes" by Haas et al. (2023)[7] is a good publication while considering juvenile lamprey studies. Rohrback applauded the YN for providing guidance on how to properly tag lamprey. John Ferguson asked whether adult Sea Lamprey and adult Pacific Lamprey are similar size. Ralph Lampman said that, on average, Sea Lamprey are slightly larger. Ferguson asked about juveniles. Lampman said that he is unsure about juvenile Sea Lamprey, but juvenile Western Brook Lamprey are typically larger than juvenile Pacific Lamprey, and it is typically the inverse for adults.

In the juvenile library, the publication "Upper Temperature Limit of Larval Pacific Lamprey *Entosphenus tridentatus*: Implications for Conservation in a Warming Climate" by Whitesel and Uh (2023)[8] found that the ultimate upper lethal temperature for larval Pacific Lamprey was 29.2°C. Rohrback said that it seems larval Pacific Lamprey have a greater temperature tolerance than salmonids. Lampman said definitely, but frequently it is 4°C to 5°C cooler in the substrate habitat, so this helps. Ferguson asked about the study setting. Rohrback said that study fish were collected in Cedar Creek and moved to a laboratory setting.

Rohrback asked that Aquatic SWG members send publications to Mariah Mayfield or Kristi Geris to be uploaded to the libraries. Lampman thanked Rohrback for the update and summary, which he believes is valuable to everyone.

F. Water Quality Update (Mariah Mayfield)

The presentation, *2023 Wells Project Water Quality* (Attachment D), was distributed to the Aquatic SWG by Kristi Geris prior to the conference call on October 11, 2023.

[6] Harris, J.E., T.L. Liedtke, J. Skalicky, L.K. and Weiland. (2023), "Salvage Using Electrofishing Methods Caused Minimal Mortality of Burrowed and Emerged Larval Lampreys in Dewatered Habitats." *North American Journal of Fisheries Management* 00:1–14.

[7] Haas, T.F., T. Castro-Santos, S.M. Miehls, Z.D. Deng, Z.D., T.M. Bruning, and C.M. Wagner, (2023). "Survival, Healing, And Swim Performance of Juvenile Migratory Sea Lamprey (*Petromyzon marinus*) Implanted with a New Acoustic Microtransmitter Designed for Small Eel-Like Fishes." *Animal Biotelemetry* 11:9.

[8] Whitsel, T.A., and C.T. Uh, (2023). "Upper Temperature Limit of Larval Pacific Lamprey *Entosphenus tridentatus:* Implications for Conservation in a Warming Climate." *Environmental Biology of Fish* 106:837–852.

Mariah Mayfield said that this year was a fairly uneventful water year. The primary runoff for the Wells Project dropped quickly after the peak and never reached the 7-day, 10-year-frequency (7Q10) flood flow of 246,000 cubic feet per second (Slide 3). With these low flows, TDG is less of a concern, but water temperature becomes more of an issue. There was a period where the 7-day average daily maximum temperatures at Bridgeport, Methow, Okanogan, and Wells Dam were above 17.5°C, and there are still two locations exceeding 17.5°C (Slide 2). From April 1 to June 30, there is a TDG standard that the average of any 2 consecutive hours cannot exceed 126% TDG in the Wells Dam tailrace. There were two instances where the 2-hour mean exceeded 126%, but this still resulted in over 99% compliance for this metric (Slide 4). No signs of gas bubble trauma were observed in fish examined during this time. From April 1 to June 30, there is another TDG standard that the average of the 12 highest values within a single day cannot exceed 125% TDG in the Wells Dam tailrace, the measurements for which stayed well below this standard (Slide 5). From July 1 to August 31, the average of the two highest hourly readings within a single day cannot exceed 125% TDG in the Wells Dam tailrace. This year, with low levels of spill, this standard was easily met (Slide 6). From July 1 to August 31, the average of the 12 highest values within a single day cannot exceed 120% TDG in Wells Dam tailrace. This standard was also easily met (Slide 7). From July 1 to August 31, the average of the 12 highest values within a single day cannot exceed 115% TDG in the Rocky Reach forebay, which can be challenging with higher flows. This year, measurements stayed below this standard (Slide 8).

Mayfield said that during the non-spill season (September 1 to March 31), any hourly reading must stay below 110% TDG in the Wells Dam tailrace. This standard was met, except in mid-September, where there were three hourly measurements which exceeded the 110% threshold (Slide 9). There was no spill and low flow in the tailrace, and it is unclear what caused the exceedances. Mayfield guessed that the low flows and higher water temperatures might have caused changes in the respiration of aquatic vegetation in the tailrace resulting in off-gassing. Breean Zimmerman asked how far apart the readings were taken. Mayfield said that they were taken same day, all in a row. A calibration specialist also checked the equipment the next day and verified that it was operating correctly. John Ferguson asked what day this occurred and whether it was hot outside. Mayfield said that this occurred on the last Aquatic SWG meeting (September 13, 2023), and it was not hot outside. Her guess about off-gassing was because, while conducting eDNA sampling, she observed a lot of bubbles on the rocks, which is not typical. The next day, the exceedances occurred. Zimmerman said that she will ask internally about possible causes for isolated exceedances of the 110% TDG tailrace water quality standard during non-spill and low-flow conditions.

Mayfield said that the Wells Project consistently receives water from Chief Joseph Dam that is already above 110% TDG. To date, this has occurred 15% of the time, often times during high river flows (Slide 10). There is some leeway in the spill requirements, but even from September to October, the

Wells Dam forebay is receiving water above 107% TDG, so care needs to be taken to stay below 110% TDG in the tailrace.

Zimmerman thanked Mayfield for the presentation and asked whether Douglas PUD uses the revised TDG numbers provided to project operators during summer spill. Mayfield said yes. She added that Douglas PUD is currently drafting the 10-Year Water Quality Attainment Plan Report, which will include the last 10 years of TDG patterns in the Wells Project. Zimmerman encouraged Douglas PUD to contact her while drafting the report to chat or ask questions, which can help towards review of the report.

Jason McLellan said that the reason for the higher river flow from Lake Roosevelt during the late summer and early fall is for multiple downstream uses. Ferguson asked whether another reason is for Chum Salmon spawning near Bonneville Dam. McLellan said that he believes that comes later. He is referring to the 12-foot drawdown starting in August into September, resulting in higher river flow.

III. Administration

A. Upcoming Meetings (John Ferguson)

The Aquatic SWG meeting on November 8, 2023, will be held by conference call.

Other upcoming meetings include December 13, 2023, and January 10, 2024 (conference call).

List of Attachments

Attachment A	List of Attendees
Attachment B	BY 2023 White Sturgeon Rearing Update
Attachment C	Summary of Juvenile Pacific Lamprey Trapped in Methow and Okanogan Basins
Attachment D	DCPUD Response to "Framework and Implementation Plan for the Upper Columbia Juvenile Pacific Lamprey Passage Acoustic Telemetry Study" (R. Lampman, YN Fisheries, 9/16/2023)
Attachment E	2023 Wells Project Water Quality

Attachment A – 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 Support	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
Ralph Lampman	Aquatic SWG Technical Representative	Yakama Nation
Jason McLellan	Aquatic SWG Technical Representative	Confederated Tribes of the Colville Reservation

Notes:
* Joined the meeting before Item II-D.

	11-Sep		11-Oct	
Tank	Population	Grams	Population	Grams
1	420	3.3	237	6.1
2	216	9.1	210	32.4
3	303	4.6	223	8.4
4	496	3.0	78	3.4
5	--	--	193	37.8
6	112	23.3	155	17.5
7	273	5.1	205	9.5
8	218	20.0	245	64.9
9	307	6.6	58	90.8
10	252	11.1	214	8.0
11	363	5.9	232	18.2
12	65	39.5	227	11.6
Mag 1	--	--	--	--
Mag 2	--	--	--	--
Total	3,025	8.0	2,277	22.9

SUMMARY OF JUVENILE PACIFIC LAMPREY TRAPPED IN METHOW AND OKANOGAN BASINS

Prepared by Douglas County PUD
October 2023

1.0 METHOW BASIN SUMMARY

WDFW consistently operates two rotary screw traps (RST) in the Methow basin: the lower Methow River RST and the Twisp River RST. The lower Methow River RST, located at McFarland Creek Bridge, has the highest catch rate of both larval and juvenile Pacific Lamprey, although catch numbers are highly variable among year (Table 1). In the last 20 years, only five have had annual catches of over 200 juveniles.

The Twisp River RST has been operated consistently since 2018 and has never observed a juvenile Pacific Lamprey (Table 2).

Additional screw traps in the Methow basin, the Upper Methow and Chewuch River RSTs, have been operated primarily during fall to research over-winter survival of spring Chinook. They are occasionally operated in the spring, but both have permit limitations to spring trapping and potential issues with high flows and safety/damage. Despite this, there have been some juvenile lamprey observed in the Chewuch River RST (Table 3).

Table 1. Summary of Pacific Lamprey observed in the Methow River RST (at McFarland Creek Bridge). 2023 totals still under QA/QC.

Lower Methow Trap Annual Catch Totals		
Year	**Larvae**	**Juveniles**
2004	1657	89
2005	754	84
2006	2671	831
2007	2144	37
2008	6806	231
2009	4262	201
2010	5423	1096
2011	2815	60
2012	2299	14
2013	655	18
2014	312	97
2015	215	26
2016	127	216
2017	131	45
2018	423	14
2019	503	28

2020	1509	30
2021	5405	68
2022	10094	189
2023	16000 estimated	11 (tagged; total TBD)

Table 2. Summary of Pacific Lamprey observed in the Twisp River RST. 2023 totals still under QA/QC.

Twisp Trap Annual Catch Totals		
Year	**Larvae**	**Juveniles**
2018	4	0
2019	21	0
2020	72	0
2021	102	0
2022	32	0
2023	TBD	0

Table 3. Summary of Pacific Lamprey counts at the Chewuch and Upper Methow River RSTs.

	Chewuch River		Upper Methow	
Year	**Larvae**	**Juveniles**	**Larvae**	**Juveniles**
2020	914	9	5	0
2021	1198	9	16	0
2022	490	30	61	0
2023	273	0	99	0

2.0 OKANOGAN BASIN SUMMARY

The Confederated Tribes of the Colville Reservation (CCT) operates two RSTs in the Okanogan Basin: the mainstem Okanogan River and on Omak Creek. While the number of larvae observed in the RTSs has been increasing, there have not been any juveniles caught in either RTS (Table 4, Table 5).

Table 4. Summary of Pacific Lamprey observed in the Okanogan River RTS.

Okanogan River Trap Annual Catch Totals		
Year	**Larvae**	**Juveniles**
2014	0	0
2015	0	0
2016	0	0
2017	0	0

2018	0	0
2019	0	0
2020	--	--
2021	16	0
2022	4	0
2023	13	0

Table 5. Summary of Pacific Lamprey observed in the Omak Creek RTS.

Omak Creek Trap Annual Catch Totals		
Year	**Larvae**	**Juveniles**
2020	3	0
2021	3	0
2022	375	0
2023	TBD	0

3.0 DISCUSSION

In both basins, the majority of larval and juvenile Pacific Lamprey are found in the RTSs during periods of high flows (personal communications with A. Pearl and D. Grundy; data not shown). This is also the time period when RSTs may have to be temporarily removed from the river for safety reasons. It is unknown how efficient RSTs are and how many are being missed when the RTD is not in operation.

In the mainstem Okanogan River, the RTS has very low catch rates in general due to the wide, laminar flow characteristics of the Okanogan River. The CTCR has been finding more larval lamprey in their electrofishing surveys in recent years and, as such, there may be more downstream migrants caught in the screw traps in future years.

At this point, the current trapping methods in the basins would not be sufficient to obtain enough juvenile, and presumably migrating lamprey to conduct a downstream survival study at Wells Dam. Additional screw traps may help but, with the issues of running the traps during high flow, it may not be the best solution especially if the majority of the migration is occurring during these freshet events. Additional trapping methods may be under development and may provide more successful trapping of migrating fish. We would be hesitant to use electrofishing as a method of capture because it is unknown if juveniles found burrowing in Type 1 habitat are ready to migrate or would exhibit “typical” downstream migratory behavior needed for the study.

Translocation of adult Pacific Lamprey above Wells Dam has been occurring since 2018. As larval lamprey can take ten or more years to transform into juveniles, the Aquatic SWG might expect to see more larvae and juveniles migrating downstream in the next five or more years. Table 1 shows that 2022 and 2023 have produced record numbers of ammocoetes compared to the last 20 years of data collection and therefore macropthalmia might follow.

Table 6. Summary of translocation efforts by DCPUD.

Year	Mainstem Columbia	Methow	Okanogan	Total
2018	70	507	92	*669*
2019	102	--	48	*150*
2020	266	--	89	*355*
2021	345	--	116	*461*
2022*	--	--	--	--
2023	956	--	51	*1007*
Total	*1739*	*507*	*396*	**2642**

**In 2022, DCPUD conducted an adult passage study and all translocated fish were released downstream of Wells Dam.*

4.0 REFERENCES

Methow Basin: David Grundy, WDFW

Okanogan Basin: Andrea Pearl, CTCR
Wesley Tibbits, CTCR
Brian Miller, CTCR

DCPUD Response to "Framework and Implementation Plan for the Upper Columbia Juvenile Pacific Lamprey Passage Acoustic Telemetry Study" (R. Lampman, YN Fisheries, 9/16/2023)

Page #	Paragraph #	Comment
3	Table 2	One of the issues with attempting to use fish as they move downstream is that with the ViRDCt model (which seems to be the preference of the ASWG/FF members) is researchers must time dead fish releases when upstream treatment and tagged fish are moving through the study area. Harnish discussed how this can be difficult at just one dam and we really do not know if it would be feasible when looking at movement through multiple dams. Researchers may get lucky and have a few fish from upstream going through a project at the same time as the tagged/fresh released fish but those would be "bonus" fish and we don't think you could count of them to be part of the study numbers. Migration times may also be different for the upper Columbia than the lower Snake. Juvenile lamprey seemed to have a much longer and more variable downstream migration in data from the Umatilla to John Day Dam (median of only 1.8 km/day with the fastest fish only travelling 8.8 km/day; *Fish Passage Center. 2014. Review of PIT-tag data for juvenile lamprey in the Columbia River Basin. Memorandum from Michele DeHart to Joe Skalicky, USFWS. November 2014*). If juveniles move more slowly than expected, the tag life, e.g. ~20 days and presented in figure 3.24 and the tag life study completed during the 2022 Snake River Study may not be sufficient to capture travel periods through more than one dam. This is just another unknown that would make coordination between the projects incredibly difficult.
3	Table 3	We agree that it would be interesting to be able to use these fish as they move downstream but it may be difficult, depending on the model type (see above).
4	Table 4	Same comment as above. We do not think that the fish released upstream can be guaranteed for use in downstream studies due to model constraints, tag life, and dead release timing. While this issue does not matter for any studies that occur in the Wells Project (as the most upstream project), we do not think that there is enough of a benefit of the potential for using upstream fish to necessitate coordination among the dams for this study. To ensure that model assumptions are met, we think that each dam/project should plan their own study based on their own settlement agreements, management plans, and/or license requirements. If the timing works out that these studies are coordinated, then potentially a few upstream fish support sample sizes and increase precision, but they should not be counted on in the study design.
5	1 (Map)	Wells Dam currently has no ability to collect downstream migrating juvenile lamprey. See memo from Douglas PUD regarding numbers/potential issues with collecting at Methow and OKA screw traps.

		Additionally, The Wells Project Pacific Lamprey Management Plan (PLMP) states that a juvenile downstream passage will be completed when there is "a sufficient source of macrophthalmia in or upstream of the Project" (D-16) Indeed from page 12, "we do not have enough evidence to show that lamprey from these different sources will behave differently than those that were captured at the dam" DCPUD would clarify researchers have no information of whether differences do or don't exist and as such we must support the management plan language requiring an upstream source.
6	1 (figure of juvenile trap)	This trap is interesting, and we look forward to seeing how it may work. For the Wells Project, it may be difficult to determine the best place to use traps like these.
7	1 (Project Scope)	The PLMP states that the downstream passage study shall look at whether "Project operations" have a significant negative impact (D-16). This leaves it up to interpretation as to whether this study would focus on the dam or would attempt to determine reservoir survival as well. We agree that the dam survival would be the most useful and would be the easiest study to conduct given tag life constraints, but this may require discussion and consensus with the ASWG. Importantly, the workgroup must determine what "significant negative impact" is or how it is defined. This must be determined in advance of any study and not after the study is complete.
8	1 (Model selection)	If we are looking solely at dam survival, the ViRDCt model appears to balance assumption risk and sample size constraints most appropriately among available survival models used in the basin. Importantly however, the ViRDCt model assumed no tag loss or failure. We must determine how to correct for and test these assumptions. Recent research indicates impairments to survival and swim performance in juvenile sea lamprey fitted with ELAT acoustic tags (*Haas,T. F. et al. 2023. Survival, healing, and swim performance of juvenile migratory sea lamprey (Petromyzon marinus) implanted with a new acoustic microtransmitter designed for small eel-like fishes. Animal Biotelemetry 11:9*), which would affect a juvenile lamprey study.
10	1 (desired precision)	Since our Aquatic Settlement Agreement calls for this to be a one year study, we would advocate for high levels of precision like those found in the Wells HCP possible while also understanding the constraints of the study (sample size, tag life, detection rates). But the Wells Project does not have a NNI requirement for Pacific Lamprey and therefore the survival estimates may not need to be as precise as for salmon studies provided the Aquatic SWG could agree what significant negative effect looks like. This would need to be a discussion with the ASWG.
11	4 (sample size vs SE figure)	This is some great information from Harnish. It seems like this would be a good starting place for discussions on study design when the time comes (~300 fish, SE of <0.03). But, at this point, obtaining 300+ live fish upstream of the dam that can be confirmed to be in a migratory phase at the point of collection and immediately following release may be a bit of a challenge (see memo on trapping).
12	1 (source of study fish)	See comment referring to Page 5 on the PLMP language. For Wells, we would use sites upstream or in the project area.

12	2 (source of study fish)	Our concern with using fish that are not located above the Project area does not have to do with genetics or specific stocks but rather that fish collected from elsewhere or raised in a hatchery may not have the same migration patterns or behavior as fish transforming and migrating naturally. For the goals of this downstream survival study, we want to have fish that are actively moving downstream and that "want" to move, not fish that were placed in a new environment and expected to act the same as wild fish, especially considering that transformed fish may not actively migrate immediately. We believe there is not enough evidence to show that lamprey from different sources are the same and therefore, until more evidence is presented, we should err on the side of using fish collected from upstream.

Overall Comments:

The Pacific Lamprey Management Plan has clear language about when a juvenile downstream passage and survival study can be conducted. While appropriate technology has improved dramatically since the inception of the Aquatic SWG, we disagree that, "there is overwhelming evidence that a passage study for the Upper Columbia River reach is possible" without placing future studies in the context PLMP 4.2.4. Specifically, the Aquatic SWG needs to know what survival at Wells Dam is being compared to (control or benchmark). Further the Aquatic SWG needs to determine what is a) statistically valid study and b) what measure or value would be used to determine if Project operations have a "significant negative impact on the Pacific Lamprey population above Wells Dam" prior to a study being completed. Would the Project survival rate be compared to other impounded river studies (like the Snake)? Or would the survival be compared to a free-flowing system? Or perhaps we come up with a number based on the professional judgement of the ASWG?

Importantly, there is not reliable availability of juveniles from in or upstream of the Project area (see DCPUD memo *Summary of Juvenile Pacific Lamprey Trapped in Okanogan and Methow Basin, October 2023* regarding trapping numbers). We believe it is important to use fish from above the Wells Dam to fully capture the natural migration and survival patterns while also remaining consistent with language regarding source of fish found in the PLMP. As such, hatchery fish are not a suitable source of fish at this time. Douglas PUD recommends that the Aquatic SWG monitor juvenile lamprey availability and the development of pilot studies currently being conducted by PNNL in the lower Columbia and Snake River Dam. Until we are obtaining reliable juvenile numbers in existing screw traps or when we have a different method to trap sufficient numbers above the Project area the Aquatic SWG cannot fully satisfy section 4.2.4 of the PLMP.

In an ideal world, it would be incredibly interesting and valuable to coordinate a large-scale juvenile Pacific Lamprey downstream survival study. But, with the limitations of tag life, the unknowns of migration speed/timing, and the need to release dead fish as live fish are moving through the project (for the ViRDCt model), it seems as though it would be difficult and potentially not feasible to do this coordination.

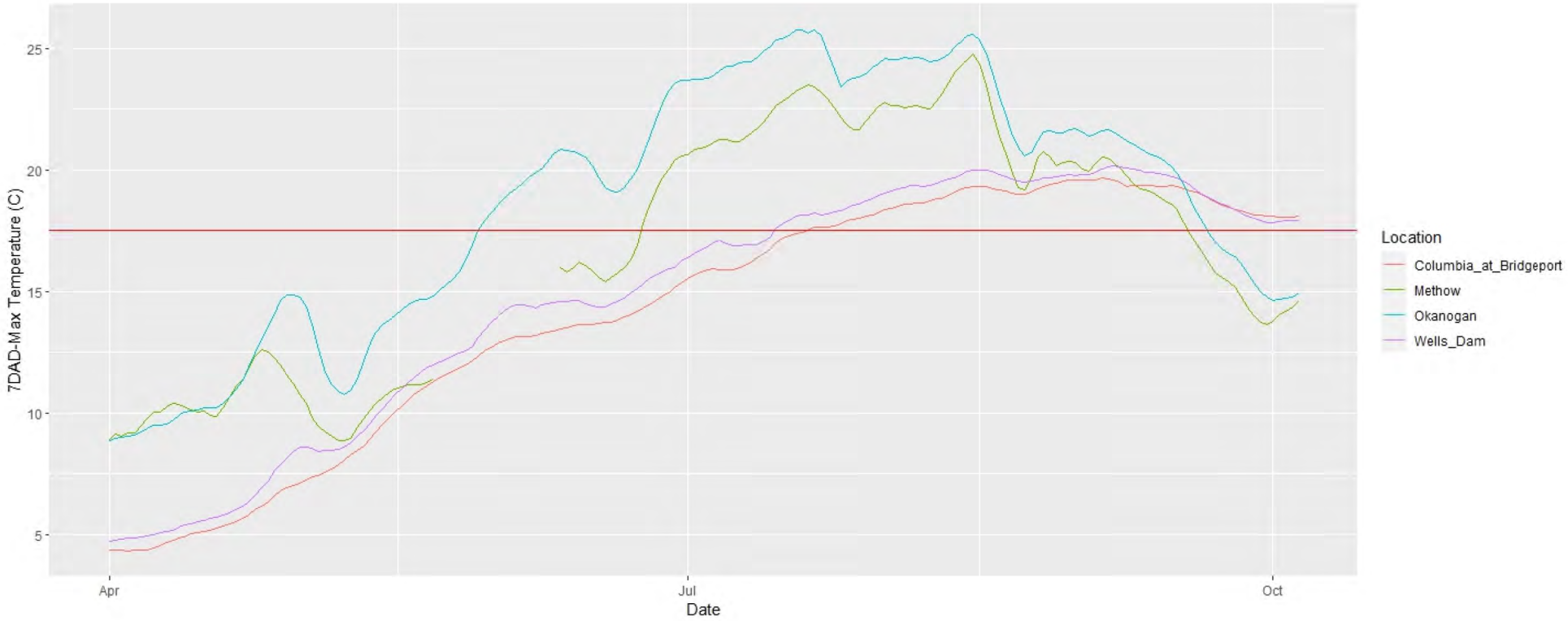
2023 Wells Project Water Quality

Prepared by Mariah Mayfield

DCPUD

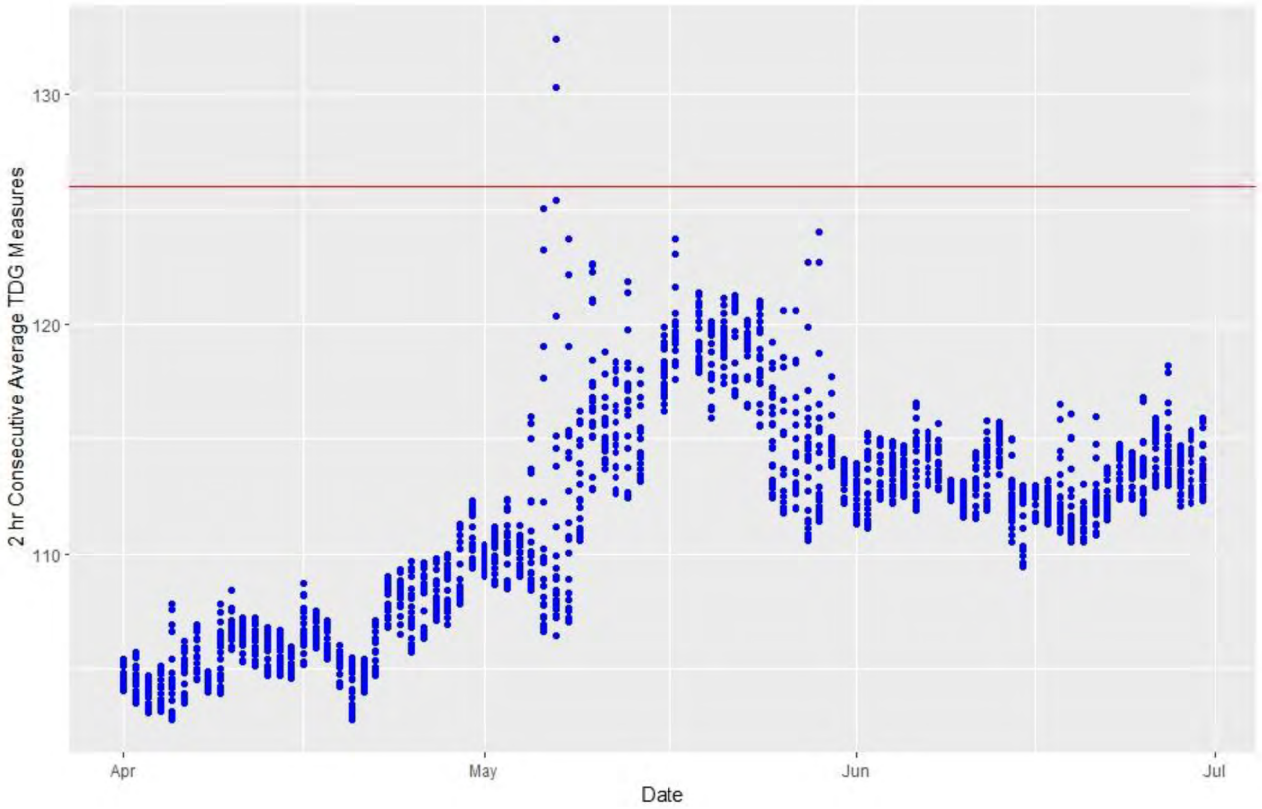
10/11/2023

Temperature



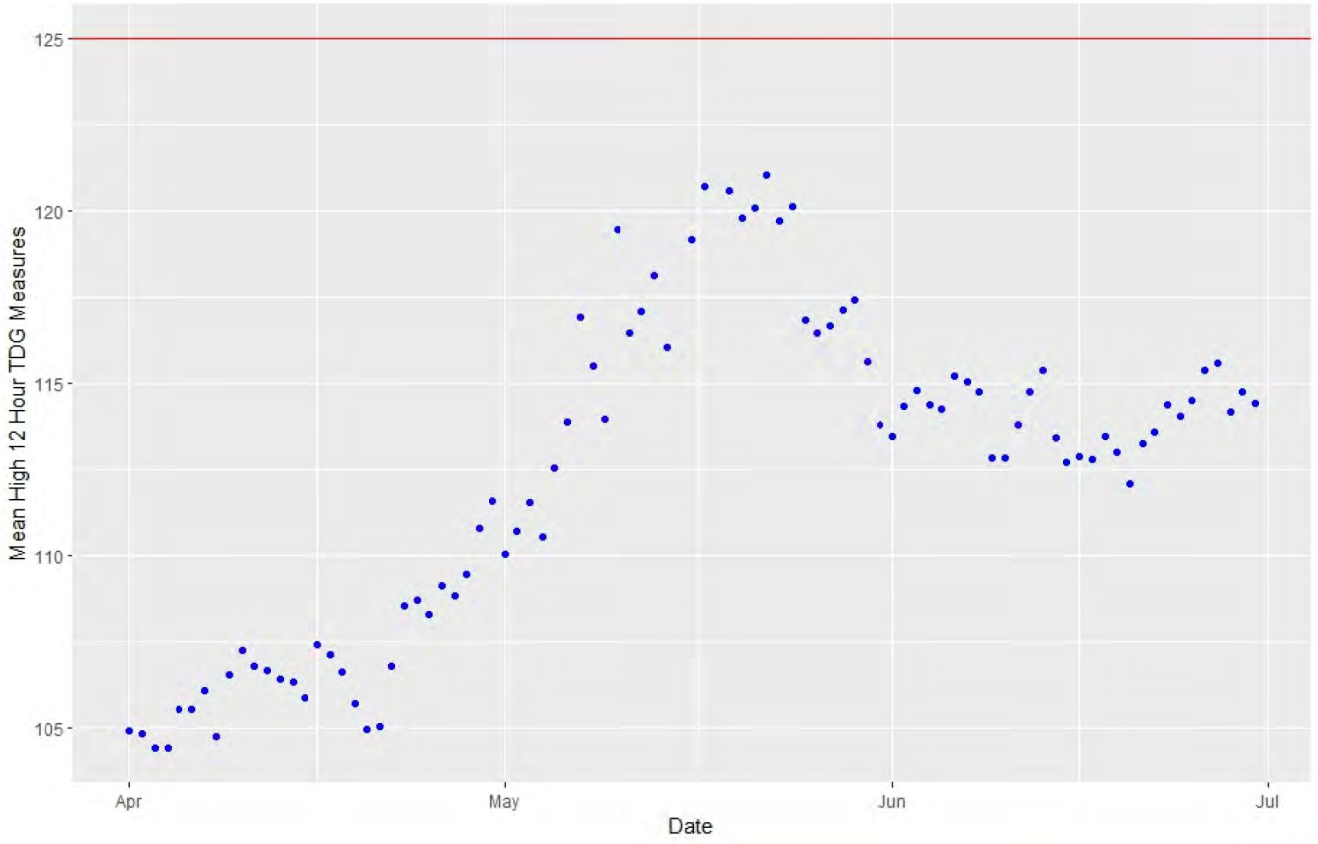
2023 Discharge

April-June: 2 Hour Mean

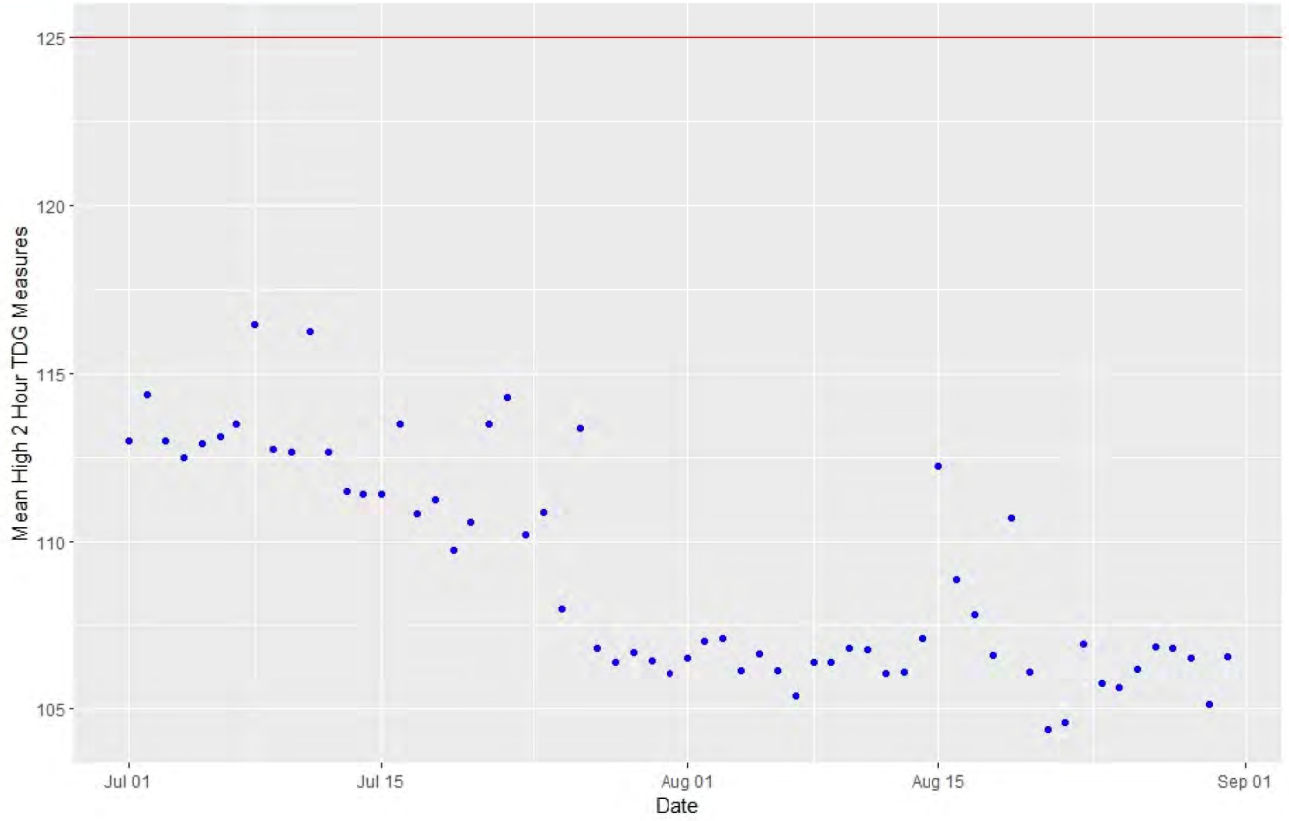


- 99.9% Compliance
- No GBT observed in 2023 (1506 fish sampled)

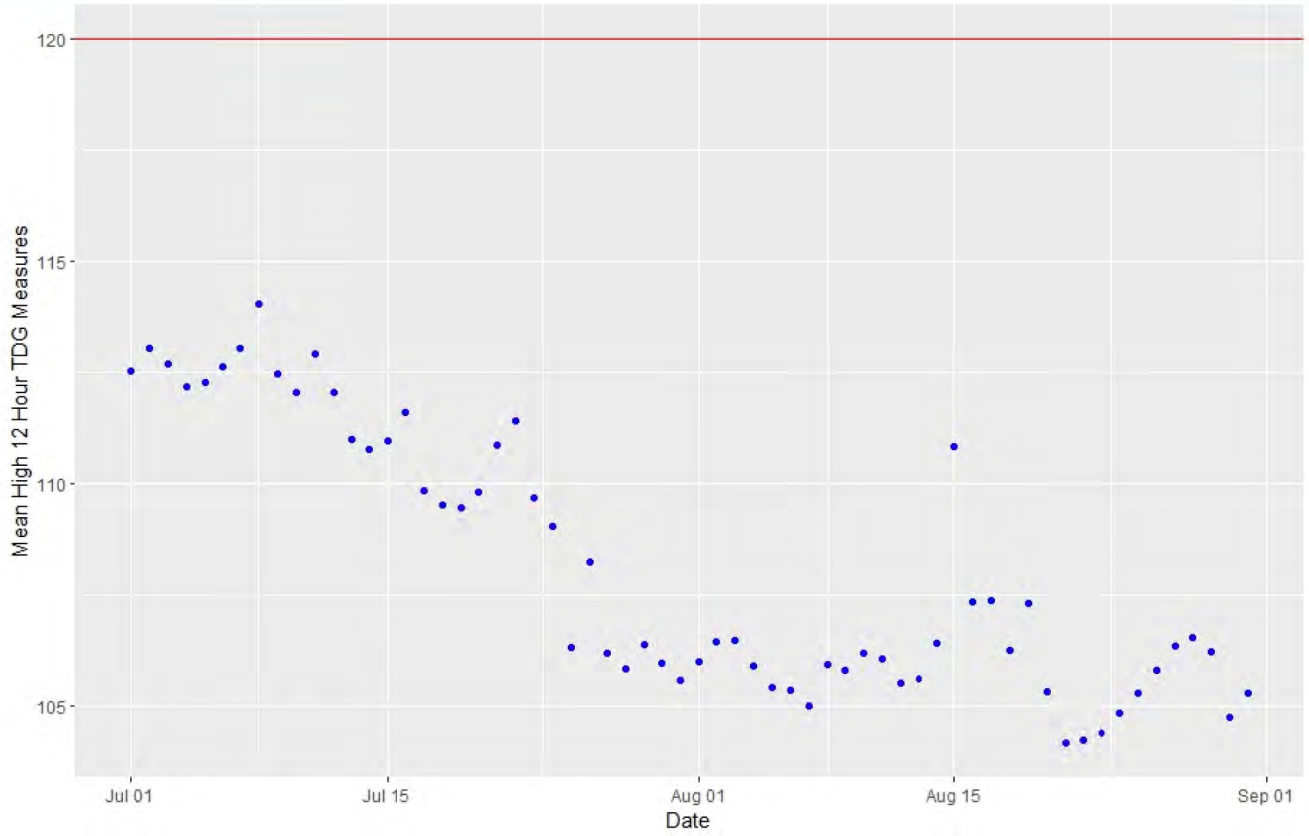
April-June: Mean of 12 Highest Hourly Measures



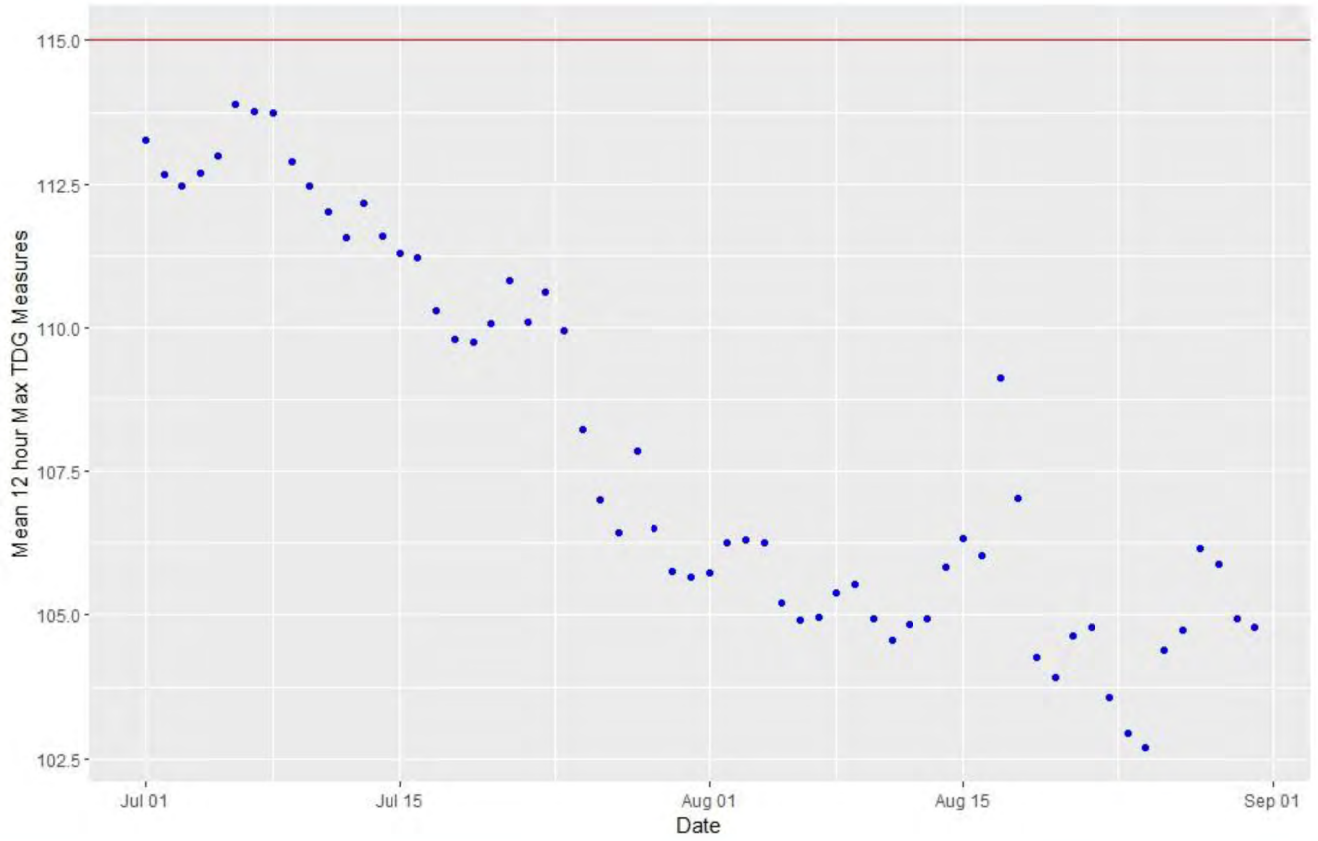
July-August: Mean of 2 Highest Measures



July-August: Mean of 12 Highest Measures

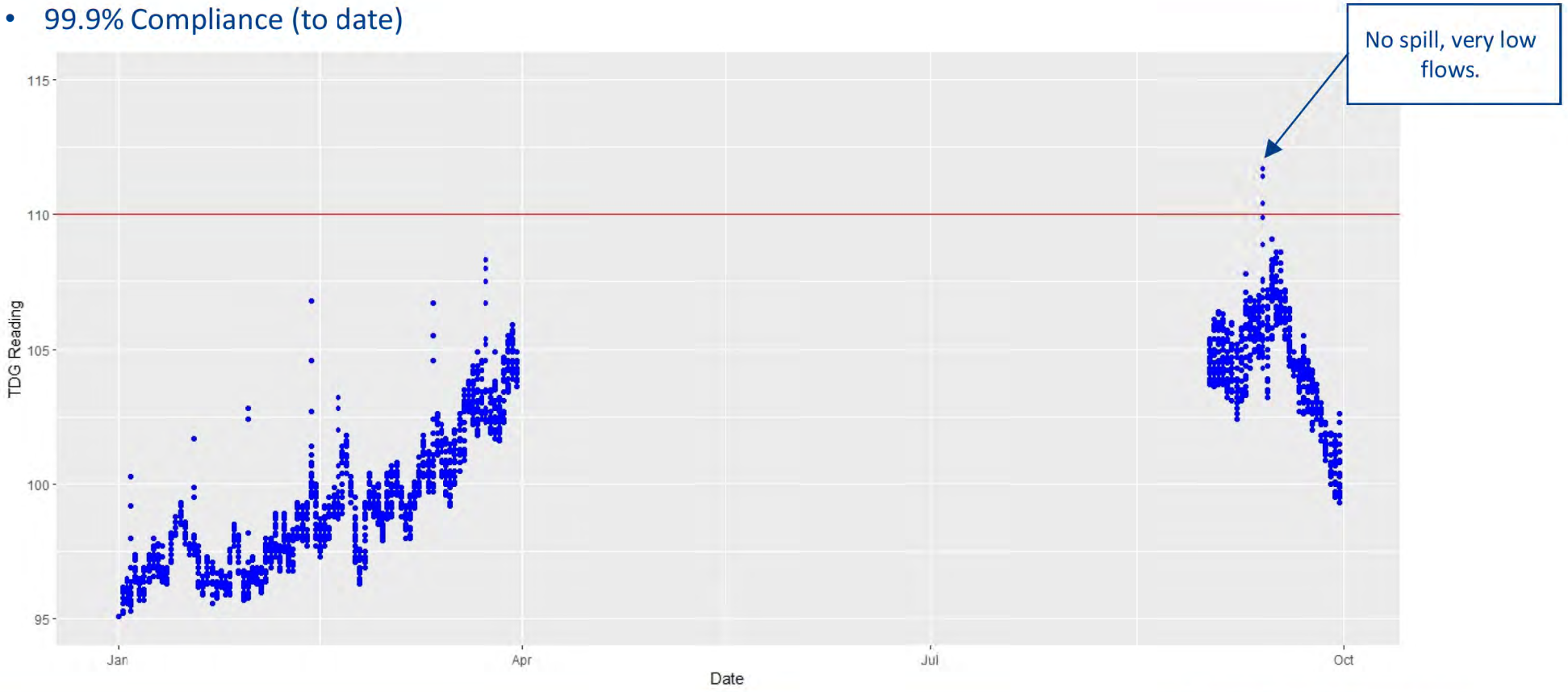


July-August: Rocky Reach Forebay Mean 12 Highest Measures



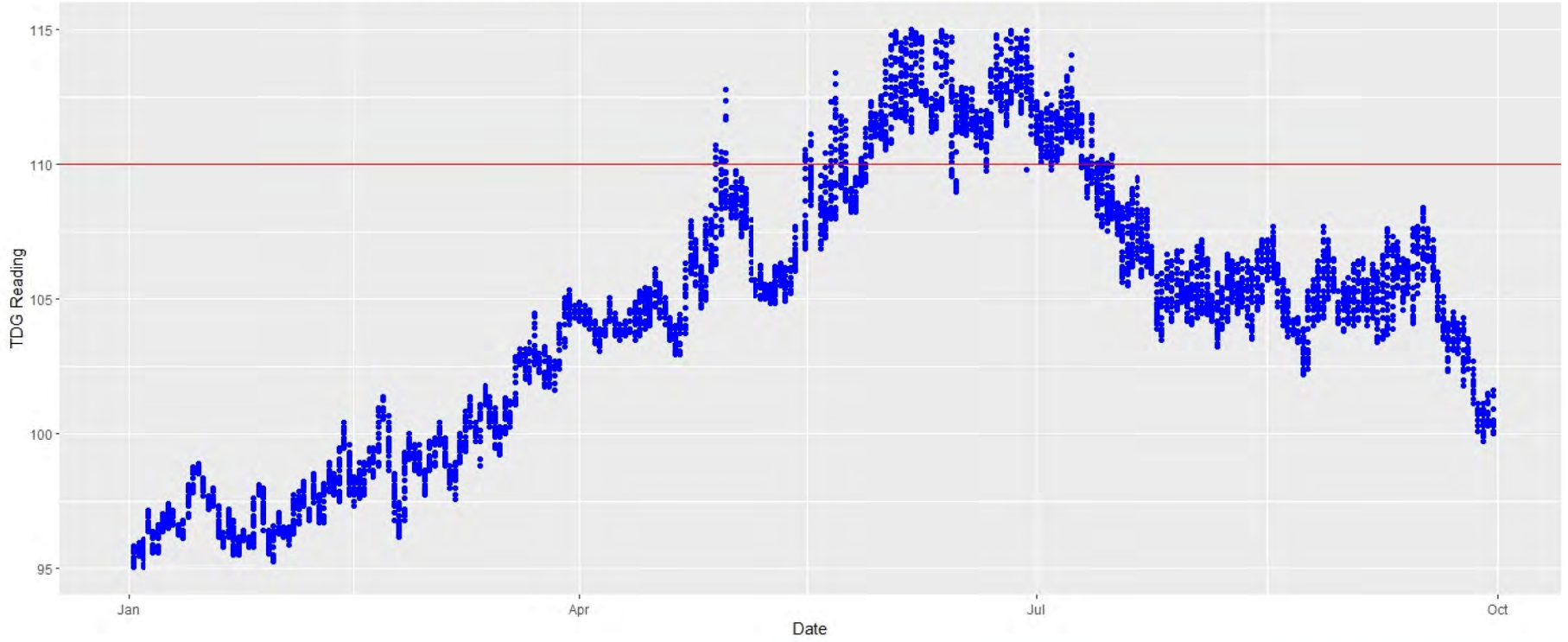
Non-Spill Season: Hourly Measures

- 99.9% Compliance (to date)



Forebay Hourly TDG

- 1128 TDG readings over 110% in the forebay (15% of the time, to date)



FINAL

Conference Call Minutes

Aquatic Settlement Work Group

To: Aquatic SWG Parties Date: December 13, 2023

From: John Ferguson, Chair, Anchor QEA, LLC

Re: Final Minutes of the November 8, 2023, Aquatic SWG Conference Call

The Aquatic Settlement Work Group (SWG) met by conference call on Wednesday, November 8, 2023, from 10:00 a.m. to 11:20 a.m. Attendees are listed in Attachment A of these conference call minutes.

Summary of Action Items

1. Douglas PUD will notify the Aquatic SWG once the winter maintenance dates for Wells Dam are confirmed, and Aquatic SWG members will reach out if there is interest in attending a tour of the dewatered east fishway (Item II-F). *(Note: John Rohrback provided this notification on November 20, 2023, which Kristi Geris distributed to the Aquatic SWG that same day. A tour is scheduled for December 7, 2023.)*
2. The Aquatic SWG meeting on December 13, 2023, will be held by conference call (Item III-C).

Summary of Decisions

1. Aquatic SWG members present approved the *Statement of Agreement Regarding Evaluation and Implementation of White Sturgeon Adult Passage Measures (WSMP Objective 5; Section 4.4)*, as revised (Item II-A).

Agreements

1. Aquatic SWG members present agreed to install perforated plates below the orifices of the weirs where lamprey traps are installed in the east and west fish ladders at Wells Dam (Item II-F).

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 Douglas PUD by December 13, 2023 (Item II-G).
2. The draft report, *Bull Trout Movement and Life History Investigation 2022-2023*, 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 Friday, January 26, 2024. Douglas PUD will request approval of the draft report documents during the Aquatic SWG conference call on February 14, 2024.

Documents Finalized

1. The final *Statement of Agreement Regarding Evaluation and Implementation of White Sturgeon Adult Passage Measures (WSMP Objective 5; Section 4.4)*, as revised, was distributed to the Aquatic SWG by Kristi Geris following the Aquatic SWG conference call on November 8, 2023 (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. The following revisions were requested:

- Ralph Lampman added the following: 1) Pacific Lamprey Conservation Initiative (PLCI) Lamprey Information Exchange and annual meeting; and 2) Yakama Nation (YN) Aquatic SWG representation designation.
- Andrew Gingerich added Water Quality Attainment Plan 10-Year Report.

B. Meeting Minutes Approval (John Ferguson)

The revised draft October 11, 2023, conference call minutes were reviewed. Kristi Geris said no comments or revisions were received from members of the Aquatic SWG. Geris corrected one date for next year's meetings under Item III-A., Administration. Aquatic SWG members present approved the October 11, 2023, conference call minutes, as revised.

C. Review of Action Items (John Ferguson)

Action items from the Aquatic SWG conference call on October 11, 2023, are as follows *(Note: The following italicized item numbers correspond to agenda items from the October 11, 2023, meeting)*:

1. *Douglas PUD will populate the Microsoft Excel file titled "Upper Columbia Juvenile Lamprey Source Datasheet" with Pacific Lamprey count data for their respective locations identified in the "PUD table" tab (Item II-D).*

Mariah Mayfield provided these data to Ralph Lampman following the Aquatic SWG conference call on October 11, 2023.

2. *Washington State Department of Ecology (Ecology) will ask internally about possible causes for isolated exceedances of the 110% total dissolved gas (TDG) tailrace water quality standard during non-spill and low-flow conditions (Item II-F).*
   Breean Zimmerman said she discussed this with the Ecology Hydropower Managers. No one had a definitive answer, but there were additional questions, such as what time of day the exceedances occurred, because respiration levels can be higher during the mid-to-late morning period. Was there a connection between other parameters, such as flow, temperature, or turbidity? Some questions already discussed last month included whether there was a high TDG event upstream, what the forebay TDG was, and whether this could have been a malfunction with the probes. Slide 9 of Attachment D of last month's minutes shows that during different times of the year there were other isolated spikes in TDG. Therefore, she suggested looking for any relationships between these events or between events from past years. Mariah Mayfield said the 2023 spikes did occur during mid-to-late morning, which is why she thought it might be aquatic respiration. Additionally, this cycling of mid-morning increases in TDG was observed the entire week of that mid-September exceedance. Also of note, this was a record low water year at Wells Dam. John Ferguson asked whether it would be helpful to review Slide 9 now. Mayfield said she plans to revisit this in the annual report and suggested closing out the action item for now. Zimmerman agreed.

II. Summary of Discussions

A. DECISION: *Statement of Agreement Regarding Evaluation and Implementation of White Sturgeon Adult Passage Measures (WSMP Objective 5; Section 4.4)* (Chas Kyger)

Chas Kyger said the only edits received on the draft *Statement of Agreement Regarding Evaluation and Implementation of White Sturgeon Adult Passage Measures (WSMP Objective 5; Section 4.4)* were from the Confederated Tribes of the Colville Reservation (CTCR), and the edits were distributed to the Aquatic SWG by Kristi Geris on November 6, 2023. Geris shared on WebEx the CTCR's edits.

Jason McLellan said most edits were just grammatical clarifications. The more substantial changes were to No. 2, No. 3, and No. 5.

2) Document the status of sturgeon passage measures and plans at ~~downstream Mid-~~ Columbia ~~Dams~~and Snake river dams.

3) ~~Develop a draft~~Complete a literature review on ~~adult White S~~sturgeon passage at hydro-electric and dam facilities prior to the end of 2024.

5) Collect and ~~catalog~~ archive ~~DNA~~ tissue samples ~~of~~ from White Sturgeon encountered in the Wells Project during M&E activities for genetic analysis, with an emphasis on sampling fish released from the Wells Fish Hatchery during 2014-2023. ~~These data~~ Data derived from these samples will be used to ~~determine~~ estimate the genetic diversity (e.g., allelic diversity) of the existing White Sturgeon population in the Wells Project. Genetic samples may be analyzed at the request and approval of the Aquatic SWG no sooner than 2025 and may include ~~up~~up to 400 unique individuals in the Wells Project area. Results of this analysis will be ~~used to~~considered in the assessment of the biological merit of fish passage in the context of connectivity with other White Sturgeon populations in the Columbia River. This step will be completed and approved following the review and approval of steps 1 & 2 above.

For No. 2, as discussed last month, it would be beneficial to not limit documenting sturgeon passage measures and plans to just Mid-Columbia dams; rather, include all Columbia River dams and Snake River dams. He does not believe there is a lot going on, so this should not be a heavy lift.

For No. 3, he does not want to limit the literature review to just adults; rather, also consider other life stages. Again, this should not be a heavy lift. John Ferguson that recalled last month, McLellan also suggesting considering work from all over, such as Europe. McLellan said that yes, there is work ongoing in the tributaries of the Danube River Basin, as well as other places.

McLellan said that for No. 5, as discussed last month, genetics are important, but are not the be-all end-all.

Kyger said Douglas PUD can accept these edits. Andrew Gingerich agreed, but noted that for No. 3, the White Sturgeon Management Plan (MP) does include specificity to adults. He has no consternation about including juveniles and agrees this is likely not a heavy lift, but wanted to note that this is outside of the framework of the MP.

Aquatic SWG members present approved the *Statement of Agreement Regarding Evaluation and Implementation of White Sturgeon Adult Passage Measures (WSMP Objective 5; Section 4.4)*, as revised (Item II-A).

The final statement of agreement was distributed to the Aquatic SWG by Geris following the Aquatic SWG conference call on November 8, 2023.

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 on November 7, 2023. Chas Kyger said mortalities have dropped off since the high numbers in September 2023 and continue to remain low. If this continues, stocking targets might be met for both the Chelan PUD and Douglas PUD programs. Fish are growing well, but there are a few tanks with runts. No fish have graduated to the magnum tanks. When fish reach that size, fish will be separated into the magnum tanks for Chelan PUD, and 325 fish will be set aside for Douglas PUD.

John Ferguson asked about Chelan PUD's revised program numbers. Kyger said the revised target is 2,000 fish (±10%), so at least approximately 1,800 fish.

Stuart Fety joined the conference call.

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

Upper Columbia Juvenile Lamprey Source Datasheet

Ralph Lampman shared on WebEx the Microsoft Excel file titled "Upper Columbia Juvenile Lamprey Source Datasheet," which was originally distributed on October 6, 2023, and an updated file was distributed by Lampman during the conference call on November 8, 2023.

(Note: Last month, Lampman asked each responsible party [i.e., Douglas PUD, Chelan PUD, Grant PUD, and the YN] to populate the "PUD table" tab with Pacific Lamprey count data for their respective locations, including the mean, minimum, and maximum for all years, the last 3 years, and 2023 only, for the ratio of juveniles versus larvae, juvenile counts only, and fish lengths.)

Lampman said he received some data from Douglas PUD and Chelan PUD, and he added YN data to the spreadsheet. He also requested data from Pacific Northwest National Laboratory (PNNL) for McNary and John Day dams. There is still some discussion about where traps can be deployed at Wanapum, Priest Rapids, and Wells dams. In the Okanogan and Methow basins, the data so far show low rates of juveniles collected, which is surprising because in the Yakima basin, the vast majority of individuals collected are juveniles. The lengths of juveniles in the Okanogan, Methow, and Yakima basins are similar.

Mariah Mayfield asked whether the rotary screw traps (RSTs) in these locations are a similar design. Lampman said that yes, the RSTs are a standard 8-foot or 5-foot designs. John Ferguson said the difference between the sites is the location, depth, and environmental conditions. Mayfield thought that one explanation for the difference is that the Methow River may be flashier than the Yakima River and is pushing ammocoetes out.

John Rohrback recalled working for the CTCR, who operate the Okanogan RST. He noted that he believes this location recorded "macrophthalmia" or "juveniles," not "larvae/ammocetes." He said that prior to translocation, the last instance of Pacific Lamprey encountered in the Okanogan was in 2008 or 2010. The ratio of juveniles to larvae in the Okanogan at the present time could be related to translocated Pacific Lamprey progeny that have not yet matured to great numbers of outmigrating juveniles. Perhaps in future years, this could shift. Lampman said this is a good point. Translocation in the Methow and Okanogan started in 2015, and these adults would have spawned in 2016, so the progeny would be 7 years old now, which is about the time juveniles start transforming and outmigrating. Some systems are colder. In the Snake River basin, juveniles begin outmigrating around 8 to 9 years old. Maybe a wave of juveniles is yet to come.

Lampman said that at Lower Granite Dam in the Snake River, about 50% of the individuals collected are larvae. This ratio of larvae gradually declines moving downstream. There is a similar trend in the Upper Columbia River, but it is not as drastic. Maybe this is a basin-scale pattern. Maybe Pacific Lamprey in higher reaches know to start migrating as larvae to make the longer trip. Ferguson said it is interesting that this strategy is not observed in the Yakima River.

Framework and Implementation Plan for the Upper Columbia Juvenile Pacific Lamprey Passage Acoustic Telemetry Study

Lampman shared on WebEx the YN's document titled *Framework and Implementation Plan for the Upper Columbia Juvenile Pacific Lamprey Passage Acoustic Telemetry Study*.[1] Last week, he and the Priest Rapids Fish Forum and Rocky Reach Fish Forum revisited the key questions outlined in this document. He said a bit of time was spent discussing precision level (Question No. 3, page 10 of the Framework):

[1] Distributed to the Aquatic SWG by Kristi Geris on September 16, 2023, and Attachment C to the Aquatic SWG September 13, 2023, conference call minutes. To note, Douglas PUD provided responses to this document, which were distributed on October 9, 2023.

3. **What is the acceptable precision level?**
   a. 10%
   b. 5%
   c. 3%
   d. 2.5%

SE	Half of 95% C.I.	Full 95% C.I.	Min of 50% Survival Rate	Max of 50% Survival Rate	Min of 90% Survival Rate	Max of 50% Survival Rate
0.100	0.196	0.392	30.4%	69.6%	70.4%	109.6%
0.050	0.098	0.196	40.2%	59.8%	80.2%	99.8%
0.030	0.059	0.118	44.1%	55.9%	84.1%	95.9%
0.025	0.049	0.098	45.1%	54.9%	85.1%	94.9%
0.015	0.029	0.059	47.1%	52.9%	87.1%	92.9%

The question came up, "What are our objectives and what are we trying to learn?" Both forums ended the meeting with an action item to share key questions to answer with a study. Based on this, the forums should have a better idea of what precision level is best suited for what the study is trying to learn. He suggested considering PNNL's study objectives (in the Snake River) as a starting point. There was some discussion about a 20% range for a confidence interval and what can be gained by a 50% versus 90% survival rate. He emphasized that conducting a study together, even with a high confidence interval, can inform where the survival bottle necks are in the region and, at dams, which passage routes juveniles are taking and the fates of these fish. Given the small sample sizes, it would be beneficial to share as much data as possible. Fish from upstream can contribute to studying sites downstream. He thinks the goal should be a 3% precision level. He believes Chelan PUD might be interested in 2.5%, the same standard as is required for salmonid survival studies.

Ferguson asked whether these precision levels are for the same sample sizes. Lampman said these are standard errors regardless of sample size.

Mayfield thanked Lampman for providing the final 2022 PNNL study report.[2] She is excited to see how the 2023 study turns out and hopes to hear these results at the U.S. Army Corps of Engineers Anadromous Fish Evaluation Program, or perhaps PNNL could provide a presentation specifically to the Mid-Columbia PUDs. Lampman said this is a good idea, and that perhaps this could happen at a future Pacific Lamprey Subgroup meeting. The final 2023 PNNL study report will likely be available next spring (2024), or perhaps PNNL can present the preliminary results before the final report is ready.

[2] Deng et al., 2023. "Juvenile Pacific Lamprey Passage Behavior and Survival at Lower Granite Dam." Distributed to the Aquatic SWG by Kristi Geris on November 2, 2023.

Lampman said the forums did not spend much time on the models (Question No. 2, page 8 of the Framework).

Scope was a key issue (Question No. 1, page 7 of the Framework). Each member stated their thoughts on scope. Some felt it makes the most sense to focus on the dam. Others want to learn as much as possible about passage through the reservoir, but this requires a study design that incorporates tags from other areas. For Wells Dam, there would need to be a release farther upstream.

Ferguson said it sounds like the fish forums are still discussing all aspects of a possible study. Lampman said that is correct, and the plan is to keep thinking through these questions and have a firmer answer at the next meeting.

Ferguson asked whether Chelan PUD and Grant PUD are considering a multi-year study, relative to their MPs. Douglas PUD's MP specifies a 1-year study. Lampman said years have not been specified. Chelan PUD mentioned a potential pilot study, but he believes this pilot would be more about how to collect enough fish to do a study and not an acoustic-telemetry-type pilot. Chelan PUD wants to make sure there are clearly defined objectives and that there are enough fish to achieve these objectives.

Lampman said the forums also discussed source of fish (Question No. 4, page 12 of the Framework). He wants to keep options open but prioritize the systems. That is, collect fish closest to the dam with the upstream source as the highest priority, then use a tiered system moving downstream so the study does not exclude fish collected from downstream locations. Although collecting study fish from downstream and placing them upstream is not ideal, given the genetic traits of Pacific Lamprey where they mix quite a bit and do not necessarily have well-adapted populations in certain areas, this may not be as big of an issue as it is for salmonids. The study would still need to keep different source fish separated and analyze these fish separately, but if it comes down to doing the study or not, he would rather do the study with whatever sources of fish that can be collected. Having some data is better than nothing, and right now there is nothing.

Ferguson asked whether Lampman is still gathering more data for the Upper Columbia Juvenile Lamprey Source Datasheet. Lampman said yes. The forums also talked about different protocols at the RSTs. For example, at the Entiat RST, when numbers are high, crews just collect a subsample and release the rest. He wants to add a column to describe this. Ferguson recalled Mayfield mentioning something about Washington Department of Fish and Wildlife (WDFW) protocols at the Methow RST. Mayfield said that at this point, Dave Grundy (WDFW) indicated that his crew is still trying to count all fish, but he is unsure how long he can continue this. Mayfield said she is still waiting on 2023 data from Grundy and can send him a reminder.

Ferguson asked whether Aquatic SWG members had any further questions for Lampman on this topic. None were expressed.

D. PLCI Lamprey Information Exchange and Annual Meeting (Ralph Lampman)

Ralph Lampman said the PLCI will convene their annual policy meeting on December 12, 2023, from 12:30 p.m. to 5:00 p.m. The Lamprey Information Exchange will follow on December 13, 2023, from 9:00 a.m. to 4:00 p.m., and on December 14, 2023, from 9:00 a.m. to 12:30 p.m.

Lampman said the policy meeting agenda is forthcoming. He shared on WebEx the agenda for the Lamprey Information Exchange, which was distributed to the Aquatic SWG by Kristi Geris after the conference call on November 8, 2023. Lampman said there will be a variety of topics, including genetics; habitat restoration; and juvenile entrainment, dewatering, and dredging. He will co-present on migration, tagging, and passage. Lastly, there will be an open session at the end of Day 2. There is also a rockstar award that attendees can vote on. In 2022, the individual winner was Mary Moser (NMFS), the team winner was the YN, and the Spoke winner was WDFW.

John Ferguson asked whether there is a virtual option, whether Douglas PUD plans to attend, and whether this is open to anyone on the Aquatic SWG. Mariah Mayfield said she plans to attend in person. Lampman said the information exchange is open to anyone, in-person attendance is encouraged, but there is a link for remote attendance. He noted that the question-and-answer session might be harder to do virtually.

Lampman shared this link in the WebEx chat: https://www.pacificlamprey.org/infoexchange/.

Lampman noted that there will be a presentation on the acoustic telemetry study by researchers in the Great Lakes,[3] which is one of the papers Douglas PUD shared in the juvenile Pacific Lamprey document library.[4]

E. Bull Trout Study Update (Chas Kyger)

Chas Kyger said Douglas PUD ran the final query for passive integrated transponder detections last Monday, November 6, 2023, which will be the end date for the study. These data are now being processed. In total, 41 fish were tagged from 2022 to 2023 for inclusion in the study. Of these, 29 tissue samples were sent to the lab for genetic analysis. These results will be incorporated into the report. He hopes to have the draft report out for review before the next Aquatic SWG meeting.

[3] Haas, T.F., T. Castro-Santos, S.M. Miehls, Z.D. Deng, T.M. Bruning, and C.M. Wagner, (2023). "Survival, Healing, And Swim Performance of Juvenile Migratory Sea Lamprey (*Petromyzon marinus*) Implanted with a New Acoustic Microtransmitter Designed for Small Eel-Like Fishes." *Animal Biotelemetry* 11:9.

[4] Discussed during the Aquatic SWG conference call on October 11, 2023.

F. Wells Dam Winter Maintenance Update (John Rohrback and Mariah Mayfield)

Winter Maintenance Schedule

John Rohrback said that, tentatively, the east fishway is scheduled to be dewatered the weeks of November 27 through December 7, 2023. This will be the shorter outage. The west fishway is scheduled to be dewatered December 11 through December 28, 2023. This will be the longer outage. Recall, the initial proposed winter maintenance schedule is often delayed 1 week due to other activities ongoing at the dam.

Ralph Lampman said he has not yet seen the dewatered east ladder, and he asked whether a tour of the east fishway might be possible during this outage. Rohrback said yes. Currently, the fish rescue in the upper ladder is scheduled for November 27 and in the collection gallery and lower ladder for November 29, 2023. He suggested noting these tentative dates. Once the dates are confirmed, he can notify the Aquatic SWG to schedule a tour.

John Ferguson asked whether any other Aquatic SWG members are interested in a tour. Stuart Fety indicated in the WebEx chat that he is interested. Jason McLellan said he will be unable to attend a tour during this time frame. Mariah Mayfield added in the chat that the tour can include the Wells Fish Hatchery. Ferguson suggested, once Douglas PUD confirms the dates, Aquatic SWG members reach out to Rohrback if there is interest in attending the tour. *(Note: Rohrback provided this notification on November 20, 2023, which Kristi Geris distributed to the Aquatic SWG that same day. A tour is scheduled for December 7, 2023.)*

Adult Pacific Lamprey Passage Improvements

Mayfield said while the ladders are dewatered, mechanics will inspect the surfaces to make sure modifications installed to improve Pacific Lamprey passage through the fishways are still in good working order.

Lamprey Trap Modifications

Mayfield recalled that last August and September, Douglas PUD conducted lamprey trap testing in the east fish ladder. The part not tested was perforated plates installed below the weir orifices to encourage fish to pass over the top of the weir and into the traps. Mayfield shared on Webex a photograph of the perforated plate (Attachment C), which was distributed to the Aquatic SWG by Geris after the conference call on November 8, 2023. Mayfield said she already spoke with Lampman about installing these plates in the east and west fishways during this winter maintenance outage, and Lampman had no issues. Andrew Gingerich noted that once approved in the Aquatic SWG, installing these plates will also need to be approved by the Wells Habitat Conservation Plan Coordinating Committee.

Ferguson asked about the cutouts on the sides of the plates (as shown in Attachment C). Mayfield said she believes the cutouts are the shape of the concrete weir, so installing these plates involves turning them diagonally and sliding them into place.

Mayfield said in addition to installing these plates, mechanics plan to repair the guide rails for lowering the lamprey traps in the west fish ladder, which appear to be warped.

Gingerich acknowledged that this topic was not presented as a Decision Item and asked that Aquatic SWG members let him know whether more time is needed before a vote. No concerns were raised.

Aquatic SWG members present agreed to install perforated plates below the orifices of the weirs where lamprey traps are installed in the east and west fish ladders at Wells Dam.

Lampman asked to see photographs of the lamprey trap. Mayfield shared on Webex the information sheet with photographs of the lamprey trap (Attachment D), which was distributed to the Aquatic SWG by Geris on September 15, 2023. Lampman asked about the dimensions of the trap entrance. Mayfield said it looks like a 4x4-inch opening (Page 2 of Attachment D). The opening also has zip ties around the edges to prevent fish from coming back out. The trap drops down and sits on top of the weir, and lamprey go up and over the weir into the trap. The perforated plate is installed below the weir orifice. Lamprey can still swim through the orifice but cannot attach and burst through the orifice due to the perforated plate. Lampman asked whether the trap funnel is connected by rope. Mayfield said it is connected by metal bars welded together.

Lampman wrote in the WebEx chat that normally the trap opening is only 2 inches, so 4 inches is large. Lamprey are likely able to escape if the zip ties framework is not lamprey-tight. He would like to check this closely in person. Are there photographs of this entrance portion? Mayfield responded in the chat that it is hard to get good photographs, so Douglas PUD would appreciate an in-person evaluation of the trap.

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

Mariah Mayfield said the Water Quality Attainment Plan 10-Year Report culminates 10 years of TDG data and gas bubble trauma monitoring under the Water Quality Attainment Plan, which was approved by Ecology and the Aquatic SWG in 2013, as part of Douglas PUD's 401 Water Quality Certification. The Water Quality Attainment Plan includes a requirement every 10 years to draft the report, have it approved by the Aquatic SWG, and submit it to Ecology. The draft report is still under internal review, but she hopes to distribute the report for review soon and request approval of the report during the Aquatic SWG conference call on December 13, 2023. If distributing the report is delayed, Douglas PUD may request a vote via email or request a deadline extension from Ecology.

Breean Zimmerman apologized for missing an email from Douglas PUD and said to let her know whether there is still anything to discuss. Mayfield said she mainly wanted to be sure nothing was missing that Ecology wanted included in the report.

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 Douglas PUD by December 13, 2023.

III. Administration

A. WDFW Representation – Ben Cox (Observer) (John Ferguson)

John Ferguson said he received an email from Patrick Verhey indicating that Ben Cox is helping Laura Heironimus with White Sturgeon topics and may attend Aquatic SWG meetings while Heironimus is out on leave. Verhey noted that Cox is also an experienced modeler.

B. USFWS Representation – Michael Lucid (Policy Representative) and Stuart Fety (Technical Alternate) (John Ferguson)

John Ferguson said a U.S. Fish and Wildlife Service (USFWS) Aquatic SWG representation designation letter was distributed to the Aquatic SWG by Kristi Geris on October 17, 2023, designating Michael Lucid as the USFWS Aquatic SWG Policy Representative and Stuart Fety as the USFWS Aquatic SWG Technical Alternate. Bill Gale will remain the USFWS Aquatic SWG Policy Alternate, and RD Nelle will remain the USFWS Aquatic SWG Technical Representative.

C. YN Aquatic SWG Representation Designation Letter (Ralph Lampman)

Ralph Lampman said a YN Aquatic SWG representation designation letter is forthcoming, designating Keely Murdoch as the YN Aquatic SWG Technical Alternate and Shannon Adams as the YN Aquatic SWG Policy Alternate. *(Note: this letter was distributed to the Aquatic SWG by Kristi Geris on November 17, 2023.)*

D. Upcoming Meetings (John Ferguson)

The Aquatic SWG meeting on December 13, 2023, will be held by conference call.

Other upcoming meetings include January 10 and February 14, 2024 (conference call).

List of Attachments

Attachment A List of Attendees
Attachment B BY 2023 White Sturgeon Rearing Update
Attachment C Lamprey trap perforated plate photograph
Attachment D Information sheet with photographs of the lamprey trap

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
Ralph Lampman	Aquatic SWG Technical Representative	Yakama Nation
Jason McLellan	Aquatic SWG Technical Representative	Confederated Tribes of the Colville Reservation

Notes:

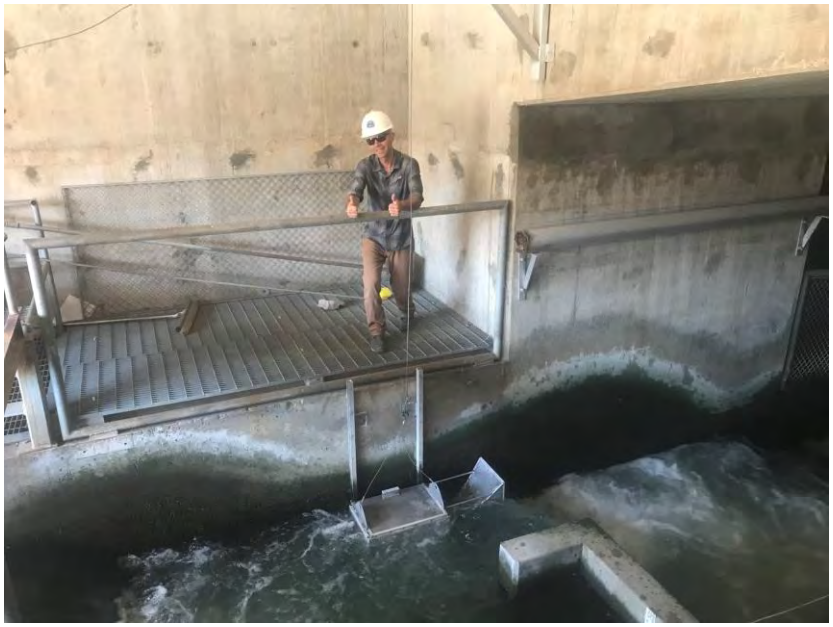
* Joined the meeting before Item II-C.

	11-Oct		7-Nov	
Tank	Population	Grams	Population	Grams
1	237	6.1	248	10.3
2	210	32.4	190	85.7
3	223	8.4	169	65.8
4	78	3.4	142	6.5
5	193	37.8	267	12.6
6	155	17.5	171	45.0
7	205	9.5	151	85.7
8	245	64.9	191	28.7
9	58	90.8	80	122.7
10	214	8.0	235	18.9
11	232	18.2	267	56.0
12	227	11.6	171	40.2
Mag 1	--	--	--	--
Mag 2	--	--	--	--
Total	2,277	22.9	2,282	42.3

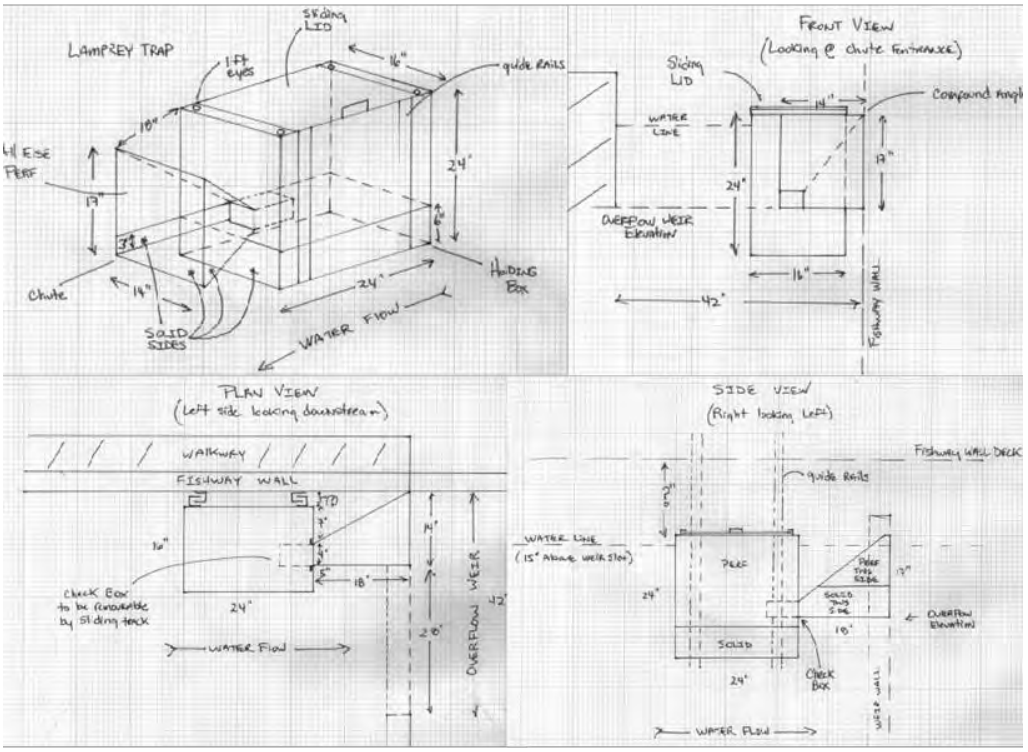
Lamprey Trap Perforated Plate

Wells Dam Adult Lamprey Trap Info

Lamprey trap shown with the de-watered ladder. Opening sits flush on the concrete lip of the overflow weir. To improve trapping efficiency in future years, perforated plates could be installed over the bottom opening but would have to be planned in advanced in order to de-water the ladder.



Trap installed in weir. This is only one side of the weir- we had another trap on the opposite side.



Original plans to the trap. There might be opportunities to increase trapping efficiency by making these traps more similar to Priest Rapids' traps.

Trap opening encompasses about ~30-40% of the weir cross sectional area. Note- this trap is not fully installed in this picture. We have verified with trapping staff that trap is flush with the weir when in operation.

FINAL

Conference Call Minutes

Aquatic Settlement Work Group

To: Aquatic SWG Parties Date: January 10, 2024

From: John Ferguson, Chair, Anchor QEA, LLC

Re: Final Minutes of the December 13, 2023, Aquatic SWG Conference Call

The Aquatic Settlement Work Group (SWG) met by conference call on Wednesday, December 13, 2023, from 10:00 a.m. to 10:50 a.m. Attendees are listed in Attachment A of these conference call minutes.

Summary of Action Items

1. The draft *Total Dissolved Gas Water Quality Attainment Plan Year 10 Report* (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). *(Note: this was placed on the agenda.)*
2. The draft *2023 Annual Report Total Dissolved Gas Abatement Plan* (2023 TDG/GAP Report) and draft *2024 Total Dissolved Gas Abatement Plan* and appended *Wells Bypass Operating Plan* (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). *(Note: the draft 2023 TDG/GAP Report and draft 2024 GAP/BOP were distributed on January 9, 2024.)*
3. The *Bull Trout Movement and Life History Investigation 2022-2023* (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). *(Note: This was placed on the agenda.)*
4. The Wells Fish Passage System Overview will be redistributed to the Aquatic SWG (Item II-F). *(Note: Kristi Geris redistributed this document following the conference call on December 13, 2023.)*
5. The Aquatic SWG meeting on January 10, 2024, will be held by conference call (Item III-D).

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 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 Douglas PUD by December 13, 2023 (Item II-A).
2. 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 prior to the Aquatic SWG conference call on December 13, 2023, and are available for a 45-day review with edits and comments due to Chas Kyger by Friday, 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 TDG/GAP Report and draft 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).

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. The following revisions were requested:

- Andrew Gingerich added the following: 2023 TDG/GAP Report and 2024 GAP/BOP.

B. Meeting Minutes Approval (John Ferguson)

The revised draft November 8, 2023, 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 2022–2023 Bull Trout Study Report,

including Appendices A, B, and C. Aquatic SWG members present approved the November 8, 2023, conference call minutes, as revised.

C. Review of Action Items (John Ferguson)

Action items from the Aquatic SWG conference call on November 8, 2023, are as follows *(Note: The following italicized item numbers correspond to agenda items from the November 8, 2023, meeting)*:

1. *Douglas PUD will notify the Aquatic SWG once the winter maintenance dates for Wells Dam are confirmed, and Aquatic SWG members will reach out if there is interest in attending a tour of the dewatered east fishway (Item II-F).*
   John Rohrback provided this notification on November 20, 2023, which Kristi Geris distributed to the Aquatic SWG that same day. A tour was scheduled for December 7, 2023. This will be discussed during today's conference call.

II. Summary of Discussions

A. Water Quality Attainment Plan 10-Year Report (Andrew Gingerich)

The draft Water Quality Attainment Plan 10-Year Report was distributed to the Aquatic SWG by Kristi Geris on November 14, 2023, and was available for review with edits and comments due to Douglas PUD by December 13, 2023 (today).

Andrew Gingerich said that, for context, Douglas PUD received its Federal Energy Regulatory Commission (FERC) license in 2012, which also adopted conditions in the Washington State Department of Ecology (Ecology)-issued Clean Water Act 401 Water Quality Certification (401 Certification), including a requirement to develop a 10-year compliance schedule for TDG production at the Wells Project, to be filed with Ecology and FERC 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 a 10-year report. Ecology is the Action Agency for this document, but Douglas PUD is providing an Aquatic SWG review, as well. Yesterday, Gingerich and Mariah Mayfield met with Breean Zimmerman to review the draft report and address preliminary comments. This was a high-level conversation, with no specific edits quite yet. In summary, Ecology is interested in an iterative process to complete this report, which means the final report is now expected in Q1 2024. Sometime in January 2024, Douglas PUD plans to meet with Zimmerman and Chad Brown (Ecology Hydropower Unit Supervisor) to formally review the document and make revisions where necessary. Douglas PUD's concern was about staying true to the compliance schedule by finalizing the report by the end of this calendar year. Per the schedule, the report is supposed to be filed with Ecology and FERC by 2023; however, this is an Ecology-imposed deadline. He and Zimmerman have discussed obtaining a letter from Ecology, explaining the expectation to work with Ecology into January 2024,

toward completing this document. No other comments on the draft report were received from Aquatic SWG members. Once ready, Douglas PUD plans to present the final draft report for Aquatic SWG approval.

Zimmerman said Gingerich characterized these discussions well. She believes Douglas PUD has complied with the 401 Certification requirement by submitting the draft Water Quality Attainment Plan 10-Year Report for Ecology review prior to the December 31, 2023, deadline. In the next few weeks, Ecology and Douglas PUD will work to finalize this report and develop an updated plan and schedule.

John Ferguson asked about a timeline for approving the report. Zimmerman said approval in January would be nice but will more likely be in February 2024. Gingerich agreed. Ferguson said 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. *(Note: this was placed on the agenda.)*

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

Andrew Gingerich said Douglas PUD is working on the draft 2023 TDG/GAP Report and draft 2024 GAP/BOP. He recalled that each year, these documents have a hard deadline to FERC by end of February. Therefore, Douglas PUD begins working on these documents each December (understanding that data are still rolling in through the month of December) with a goal of producing the documents for distribution in the first weeks of January for a 30-day review and, ideally, approving the documents during the Aquatic SWG meeting in early February. Additionally, as required by the 401 Certification, the 2024 GAP/BOP is co-reviewed with the Anadromous Fish Agreement and Habitat Conservation Plan (HCP) Coordinating Committee because of the bypass operating plan component. The Wells HCP Coordinating Committee approval occurs in late February, in just enough time for Douglas PUD to build the consultation record and file the documents by the end of February. He believes most everyone is familiar with these documents, but he asked for Aquatic SWG members to contact him with questions if there are any.

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. *(Note: the draft 2023 TDG/GAP Report and draft 2024 GAP/BOP were distributed on January 9, 2024.)*

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

The draft 2022–2023 Bull Trout Study Report, including Appendices A, B, and C, were distributed to the Aquatic SWG by Kristi Geris prior to the Aquatic SWG conference call on December 13, 2023. Chas Kyger said that, considering the holiday season, Douglas PUD is proposing a 45-day review with

edits and comments due to Kyger by Friday, January 26, 2024. He recalled that this was originally a radio telemetry study, but due to concerns about the low size of the local Bull Trout populations, the study design was pared back to a passive integrated transponder (PIT) investigation. Considering the limitations of PIT technology, this is more of a qualitative investigation about seasonal movement patterns of Bull Trout at the Wells Project and Twisp Weir. Kyger suggested adding this draft report to next month's agenda, to address questions and comments, before requesting approval of the report during the Aquatic SWG conference call on February 14, 2024. John Ferguson agreed, noting that RD Nelle, who is absent today, will likely be interested in this discussion. Stuart Fety said the U.S. Fish and Wildlife Service (USFWS) appreciates the additional time to review and comprehend the document.

The 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. *(Note: this was placed on the agenda.)*

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

A brood year 2023 White Sturgeon Rearing Update (Attachment B) was distributed to the Aquatic SWG by Kristi Geris on December 12, 2023. Chas Kyger said hatchery staff are beginning to transfer fish into the magnum tanks. Once enough fish are transferred so enough free tank space is available to keep fish separated by program, staff can identify dates for PIT-tagging and scute-marking that typically occurs in the January to February time frame. Recall discussions about possibly bringing in surplus fish from Sherman Creek Hatchery to account for any shortfall in the Chelan PUD program; unfortunately, Sherman Creek Hatchery no longer has surplus fish available. If there is additional fish loss during rearing, tagging, and blood sampling, the Chelan PUD program may be close to below the (±10%) 2,000-fish target.

Jason McLellan said that, as of yesterday, Sherman Creek Hatchery had 786 surplus fish, of which 561 fish were transferred to the Confederated Tribes of the Colville Reservation (CTCR) Resident Fish Hatchery and 25 fish went to the Spokane Tribe of Indians for experimental work. The CTCR would be willing to transfer some of the 561 fish to Wells Fish Hatchery to make up for shortfall in the Chelan PUD, but this needs to be a decision and request from Chelan PUD and the Rocky Reach Fish Forum (RRFF) because it is their program that is short.

John Ferguson asked whether the CTCR have been coordinating with Lance Keller (Chelan PUD RRFF Alternate). McLellan said he has not yet connected with Keller, but he has discussed with Bill Towey (Chelan PUD RRFF Representative) about possibly providing fish to meet a shortfall in program. At that time, the estimated shortfall was 50 fish. Based on this update (Attachment B), the shortfall is up to 101 fish. McLellan said this topic will be on the next RRFF meeting agenda. Ferguson asked

whether this can solely be addressed in that forum (i.e., no action item for this work group). McLellan said yes. Ferguson asked whether the CTCR can accommodate the entire shortfall. McLellan said he thinks so, keeping in mind that Rufus Woods has objectives, as well. Kyger said Douglas PUD will let Chelan PUD and the RRFF coordinate directly with the CTCR. As far as Wells Fish Hatchery goes, the facility can accommodate surplus fish for the Chelan PUD program.

McLellan noted there has been a loss of 50 fish since last month and asked whether fish losses have leveled off. Kyger said for most tanks, yes, but the tanks with small fish are where the losses are still occurring. He anticipates that these losses will continue unless these fish grow in size. The losses do not seem to be related to fish husbandry; rather, these fish have not yet reached the size threshold when mortalities let up. Andrew Gingerich agreed. Ferguson said perhaps more than 101 fish will be needed for the Chelan PUD program. McLellan said this was the point of his question.

Gingerich noted that last year, there were also fish losses during blood sampling. Ferguson asked when blood sampling will occur. McLellan said the CTCR are contracted to sample the Chelan PUD program but still need to discuss dates with Chelan PUD and Wells Fish Hatchery staff. Blood sampling has typically been conducted in late January into February, but this timing means that smaller fish would be sampled, which is what he believes was the cause for some fish losses last year, along with inexperienced trainees. This timing also meant having to come back to sample the smaller fish once they grew larger. The CTCR's preference is to push back sampling to draw blood from larger fish. However, he recognizes the need to clear space so Douglas PUD can do the same thing. He is not sure how much time there is before fish need to be moved to the large tanks. Kyger said there is some flexibility here. Typically, Douglas PUD targets January to February for PIT-tagging and scute-marking, and Douglas PUD was contemplating waiting longer to sample blood for the same reasons mentioned. Douglas PUD can monitor fish size and predict a good time for the CTCR to sample the Chelan PUD program. Additionally, there is no hard deadline for PIT-tagging and scute-marking. It is just whatever works best in terms of tank availability. McLellan said he appreciates this. The CTCR would like to target blood sampling in the March time frame. He will speak with Keller and coordinate with Douglas PUD.

E. Juvenile Pacific Lamprey Downstream Passage Study (John Ferguson)

John Ferguson said he has nothing new to report. He recalled that Ralph Lampman has done a lot of work to articulate his framework and the Yakama Nation's (YN's) desires in this forum, the RRFF, and the Grant PUD Priest Rapids Fish Forum. Lampman is interested in tying a Mid-Columbia River study with all three PUDs to a suite of U.S. Army Corps of Engineers studies in the Snake and Lower Columbia rivers in 2024 and 2025. Lampman created a spreadsheet to identify sources of study fish. Douglas PUD presented data from screw traps located upstream of Wells Dam that illustrate concern about obtaining a required sample size. Lampman believes that Pacific Lamprey are one

metapopulation, so source fish from downstream locations is acceptable. Douglas PUD's Pacific Lamprey Management Plan (MP) specifies that source fish must come from upstream locations. These discussions are ongoing within each forum, and it does not seem that any Mid-Columbia PUD studies are planned for 2024.

Ferguson said Lampman could not attend today's meeting, and he asked whether Aquatic SWG members had anything further to share at this time. Nothing was expressed.

F. Wells Dam Winter Maintenance Update (John Rohrback)

Fishway Maintenance and Fish Salvage Memorandum

John Rohrback said crews dewatered the upper ladder of the Wells Dam east fishway for annual maintenance on November 27, and the lower ladder and collection gallery were dewatered on December 5, 2023. Maintenance concluded on December 7, 2023. Fish salvages were conducted in the upper fishway on November 27 and in the collection gallery from December 4 to December 5, 2023. There were many rescued fish, all of which were released downstream at Carpenter Island boat launch. Of note, crews captured 44 Pacific Lamprey, including 40 juvenile and 4 larval Pacific Lamprey. DNA fin clips were collected from all Pacific Lamprey, and most but not all Pacific Lamprey were PIT-tagged prior to release. A fish salvage memorandum from dewatering the Wells Dam east fishway was distributed to the Wells HCP Coordinating Committee (on December 7, 2023) and to the Aquatic SWG on December 11, 2023. The east fishway is now rewatered, and the upper portion of the west fishway is dewatered. The collection gallery in the west fishway will be dewatered next Monday, December 18, 2023.

East Fishway Tour

Rohrback said prior to rewatering the east fishway, Douglas PUD hosted a tour attended by Ralph Lampman and another member from the YN, Stuart Fety, and with two other members from USFWS. Rohrback said he feels the tour was informative and enjoyed by all. Lampman noted one gap larger than 1 inch on a wall-oriented diffuser grating in the collection gallery. After the tour, mechanics closed this gap to 1 inch. *(Note: Rohrback notified Lampman about this repair on December 19, 2023.)*

Fety thanked Douglas PUD for the tour on behalf of all USFWS attendees. The tour provided a better understanding of the project that he did not have prior. Other USFWS attendees included Fety's supervisor, Michael Lucid, and Fety's colleague Lizzy Mckeag, who also works in dam passage. Seeing inside the project provided great context for the work he is involved in. It was a fun, interactive tour.

Andrew Gingerich recalled a Wells Fish Passage System Overview document that has been shared with the Aquatic SWG many times and makes more sense after seeing the dewatered fishways. He suggested redistributing this document, which can be helpful to people who are new to

Wells Dam. The Wells Fish Passage System Overview will be redistributed to the Aquatic SWG. *(Note: Kristi Geris redistributed this document following the conference call on December 13, 2023.)*

Lamprey Trap and Perforated Plates

Rohrback said the tour of the dewatered east fishway included visiting the lamprey traps and recently installed perforated plates. Lampman had a few suggestions for the lamprey traps, which Douglas PUD will incorporate. For example, Lampman suggested adding more zip ties to the entrance of the boxes, so individuals inside the trap cannot get out.

John Ferguson said Douglas PUD has also coordinated with the Wells HCP Coordinating Committee regarding trap operations and installation of the perforated plates. Rohrback said yes, during the last HCP Coordinating Committees meeting on November 28, 2023, the Wells HCP Coordinating Committee approved installation of the perforated plates and the proposed expanded lamprey trapping operations in 2024, contingent upon weekly in-season updates on adult salmonid and steelhead passage timing through the east and west fishways (including summary updates at the monthly HCP Coordinating Committees meetings in August and September 2024).

III. Administration

A. Ecology Aquatic SWG Representation Designation – Chad Brown (Policy Representative) (John Ferguson)

John Ferguson said Chad Brown has been designated as the new Ecology Aquatic SWG Policy Representative, replacing Mark Peterschmidt, the former Ecology Aquatic SWG Policy Representative. Brown was added to the appropriate email lists and was provided access to the extranet site.

Breean Zimmerman explained that Ecology recently underwent a reorganization. Previously, there were four hydropower management staff working in each region under separate supervisors. Peterschmidt was Zimmerman's supervisor. Now the four hydropower management staff work under one hydropower unit, under the same supervisor, Brown, who operates out of headquarters, and the four hydropower management staff operate from their respective regions. The purpose of this reorganization is to improve coordination and consistency across the state.

B. YN Aquatic SWG Representation Designation – Shannon Adams (Policy Alternate) and Keely Murdoch (Technical Alternate) (John Ferguson)

John Ferguson said a YN Aquatic SWG Representation Designation letter was distributed to the Aquatic SWG by Kristi Geris on November 17, 2023. The letter designated Shannon Adams as the new YN Aquatic SWG Policy Alternate to David Blodgett III, the YN Aquatic SWG Policy Representative. Also, Keely Murdoch was designated as the new YN Aquatic SWG Technical Alternate

to Ralph Lampman, the YN Aquatic SWG Technical Representative. Adams and Murdoch were added to the appropriate email lists and were provided access to the extranet site.

C. 2023 Aquatic Settlement Agreement Annual Report Schedule (Kristi Geris)

Kristi Geris said that this is a courtesy notification that Anchor QEA, LLC, and Douglas PUD are now compiling the 2023 Aquatic Settlement Agreement (ASA) Annual Report and the six appended resource MP annual reports. The draft 2023 ASA Annual Report and appended MP annual reports will be distributed for a 45-day Aquatic SWG review on March 8, with comments due on April 22, 2024.

The final draft reports will be distributed to the Aquatic SWG on May 1, and Douglas PUD will request approval of the reports during the Aquatic SWG conference call on May 8, 2024.

The final approved reports are due to FERC on May 31, 2024.

D. Upcoming Meetings (John Ferguson)

The Aquatic SWG meeting on January 10, 2024, will be held by Microsoft Teams conference call. Microsoft Teams will replace WebEx moving forward.

Other upcoming meetings include February 14 and March 13, 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, 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
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

	7-Nov		11-Dec	
Tank	Population	Grams	Population	Grams
1	248	10.3	160	78.7
2	190	85.7	223	13.6
3	169	65.8	168	115.2
4	142	6.5	81	126.1
5	267	12.6	251	60.1
6	171	45.0	163	127.2
7	151	85.7	143	183.1
8	191	28.7	179	28.8
9	80	122.7	165	132.4
10	235	18.9	241	77.2
11	267	56.0	109	168.1
12	171	40.2	258	82.1
Mag 1	--	--	--	--
Mag 2	--	--	83	200.9
Total	2,282	42.3	2,224	94.0

Appendix B
Aquatic Settlement Work Group Members

2023 Aquatic Settlement Work Group Members

Organization	Policy Representative	Technical Representative
Anchor QEA	John Ferguson (Chairman)	John Ferguson (Chairman)
Douglas PUD	Shane Bickford	Andrew Gingerich Chas Kyger* John Rohrback† Mariah Mayfield† (Jul to Dec)
Confederated Tribes of the Colville Reservation	Cody Desautel	Jason McLellan
Yakama Nation	Donella Miller (Jan to Mar) David Blodgett, III (Apr to Dec) Shannon Adams* (Nov to Dec)	Ralph Lampman Keely Murdoch* (Nov to Dec)
U.S. Bureau of Land Management	Chris Sheridan	Chris Sheridan
U.S. Fish and Wildlife Service	Sonja Kokos (Jan to Oct) Michael Lucid (Oct to Dec) Bill Gale*	RD Nelle Judy Neibauer* (Jan to Jul) Stuart Fety* (Oct to Dec)
Washington Department of Fish and Wildlife	Brock Hoenes Chad Jackson*	Patrick Verhey Laura Heironimus*
Washington State Department of Ecology	Mark Peterschmidt (Jan to Nov) Chad Brown (Nov to Dec)	Breean Zimmerman

*Alternate Representative
† Technical Support who regularly participates on the Work Group

Appendix C
2023 Annual Report White Sturgeon Management Plan

2023 ANNUAL REPORT

WHITE STURGEON MANAGEMENT PLAN

WELLS HYDROELECTRIC PROJECT

FERC PROJECT NO. 2149

March 2024

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 2023 – 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 in 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 250 g to a minimum of 350 g, based on the belief that raising fish to a larger size will improve survival. 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 2023, Douglas PUD released 328 larval-origin White Sturgeon into the Wells Project (Table 1). Also, blood samples from 328 White Sturgeon at Wells Fish Hatchery were analyzed for SAP prior to the release of those fish into the Wells Reservoir. All of the fish tested were 8N chromosome types and none were euthanized.

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

[2] White Sturgeon are normally evolutionary octoploids having 8 copies of each chromosome (8N).

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).

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 2023 – 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 300 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.

Table 1. White Sturgeon released into the Wells Reservoir 2014-2023.

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

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 2023 – 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 22,437 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. 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.

Table 3. Timing and sample sizes for index monitoring sessions from 2015 to 2022.

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

In 2015, there were 441 White Sturgeon capture events (including some individuals that were caught multiple times) within the Wells Project area. Of these, 242 captures were made during 26 days of sampling in July through August; and 199 captures were made over 27 days of sampling from September through October. These capture events involved 382 unique individuals (Table 4), including 1 fish released in 2013 (by Chelan PUD near Beebe Bridge), 317 fish released in 2014, 43 fish released in 2015, and 7 fish of wild origin. In addition, there were three fish whose PIT tag number was not properly recorded, and 11 newly-tagged fish of hatchery origin, whose PIT tag was missing or not functional (instances of tag-loss).

In 2016, there were 723 White Sturgeon capture events (including some individuals that were caught multiple times) within the Wells Project area. Of these, 240 captures were made during 28 days of sampling in July through August; and 483 captures were made over 26 days of sampling from September through October. These capture events involved 567 unique individuals (Table 4), including 2 fish released in 2013 by Chelan PUD (one was also recaptured in 2015, see above), 470 fish released in 2014, 57 fish released in 2015, 3 fish released in 2016, 11 fish of wild origin (one had been PIT-tagged in 2015), seven fish that were

PIT tagged in situ in 2015, and 3 that were PIT tagged in situ during adult fishing activities (August 2016). In addition, there were six fish whose PIT tag number was not properly recorded, and eight newly-tagged fish of hatchery origin whose tags had been lost or were not functioning properly.

In 2017, there were 610 White Sturgeon capture events (including some individuals that were caught multiple times) within the Wells Project area. Of these, 273 captures were made during 26 days of sampling in July through August; and 337 captures were made over 25 days of sampling from September through October. These capture events involved 491 unique individuals (Table 4), including 2 fish released in 2013 by Chelan PUD (1 was also recaptured in 2016, see above), 357 fish released in 2014, 61 fish released in 2015, 28 fish released in 2016, 5 fish released in 2017, 13 fish of wild origin (two had been PIT tagged in 2015, five during juvenile sampling in 2016, and 1 during the 2016 adult sampling; thus 5 fish were newly tagged in 2017), 2 fish that were PIT tagged in situ in 2015, 5 that were PIT tagged in situ during juvenile sampling in 2016, and 1 tagged during the adult fishing activities in 2016. In addition, there were 3 fish whose PIT tag number was not properly recorded, and 14 newly-tagged fish of hatchery origin whose tags had been lost or were not functioning properly. Juvenile indexing did not occur in 2018.

In 2019, there were 836 White Sturgeon capture events (including some individuals that were caught multiple times) during juvenile indexing within the Wells Project area. Of these, 367 captures were made during 20 days of sampling in July through August in 240 setlines (1.53 fish/line or 18.4 fish/day); and 469 captures were made over 20 days of sampling from September through October in 240 setlines (1.95 fish/line or 23.4 fish/day). These capture events involved 631 unique individuals (Table 4), including 3 hatchery fish released in 2013 or 2014 by Chelan PUD, and 599 hatchery fish released by Douglas PUD (357 released in 2014, 120 released in 2015, 71 released in 2016, 44 released in 2017, 4 released in 2018, and 3 released in 2019). Also included among the tally of unique fish, were 5 fish of wild origin (three recaps and two new encounters), 14 hatchery fish recaptured after having been tagged in situ during previous years' sampling, and 10 newly-tagged fish of hatchery origin whose tags had been lost or were not functioning properly. Indexing did not occur in 2020.

In 2021, there were 705 White Sturgeon capture events (including some individuals that were caught multiple times) during indexing within the Wells Project area. These capture events involved 615 unique individuals (Table 4). Also included among the tally of unique fish, were 10 fish of wild origin (8 recaps and 2 new encounters), and 8 newly-tagged fish of hatchery origin whose tags had been lost or were not functioning properly.

In 2022, there were 427 White Sturgeon capture events (including some individuals that were caught multiple times) during indexing within the Wells Project area. These capture events involved 403 unique individuals (Table 4). Also included among the tally of unique fish, were 5 fish of wild origin (2 recaps and 3 new encounters). Indexing monitoring did not occur in 2023.

Table 4. Number of hatchery–reared White Sturgeon released into the Wells Reservoir and the number of unique individuals caught during each of the juvenile indexing years. The vertical dashed line after 2017 and 2019 denotes that indexing did not occur in 2018 or 2020.

		Juvenile Indexing Year					
Tagging Location / Time	**# Released**	**2015**	**2016**	**2017**	**2019**	**2021**	**2022**
Chelan County PUD	--	1	2	2	3	1	1
DPUD Hatchery 2014	5,044	317	470	357	357	287	173
DPUD Hatchery 2015	5,009	43	57	61	120	78	51
DPUD Hatchery 2016	5,289	n/a	3	28	71	56	36
DPUD Hatchery 2017	5,131	n/a	n/a	5	44	84	54
DPUD Hatchery 2018	337	--	--	--	4	14	6
DPUD Hatchery 2019	99	--	--	--	3	17	13
DPUD Hatchery 2020	570	--	--	--	--	44	43
DPUD Hatchery 2021	338	--	--	--	--	4	11
DPUD Hatchery 2022	332	--	--	--	--	--	10
Wild (recap)	n/a	n/a	1	8	3	8	2
Wild (new PIT tag applied)	n/a	7	10	5	2	2	3
Tag Loss (new PIT tag applied)	n/a	11	8	14	10	8	0
Other recaptures *	n/a	3	16	11	14	3	0
TOTAL	**22,109**	**382**	**567**	**491**	**631**	**615**	**403**

* Includes recaptures of fish with PIT tags applied *in-situ* during previous juvenile or adult setlining sessions; and fish with incorrectly recorded PIT tag data.

In cases where hatchery-reared fish (identified by scute pattern) were observed to not have a functioning PIT tag (instances of 'tag loss'), one was applied in the usual location on the left dorsal side, just posterior of the head. The new PIT tag numbers were recorded and all data and metadata were uploaded to PTAGIS. Since 2015, Douglas PUD estimates that less than 2% of hatchery fish have either shed PIT tags or have a nonfunctioning one.

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.

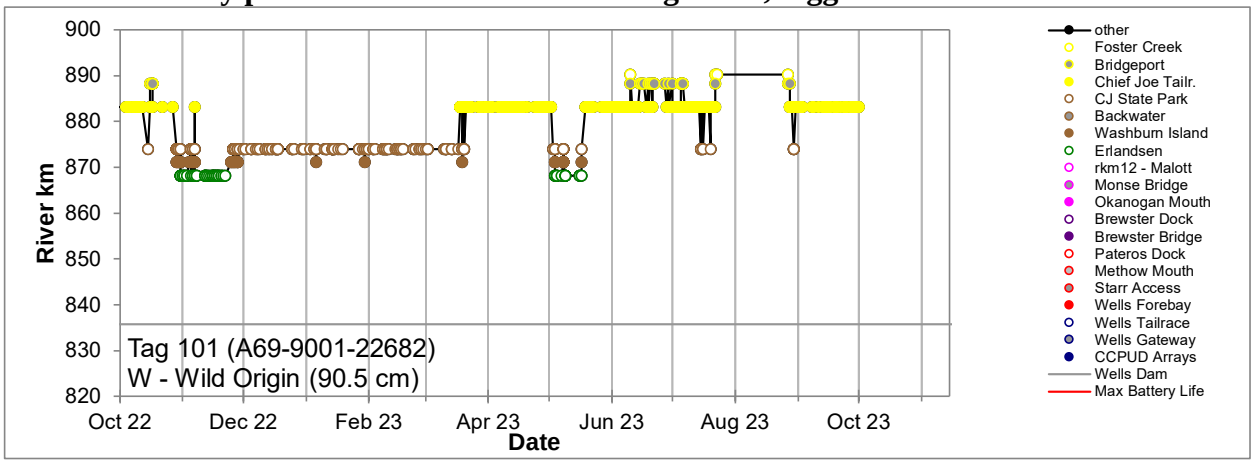
4.2.2.1 Progress Towards Objective 2 in 2023 – Monitoring and Evaluation Program

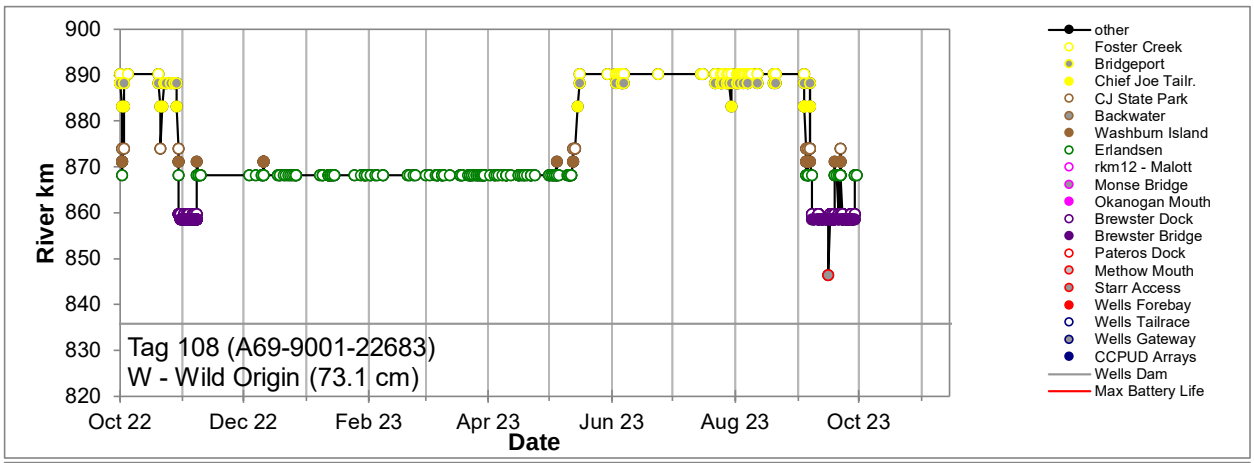
On January 8, 2014, the Aquatic SWG approved the Phase I White Sturgeon Management Plan Monitoring and Evaluation Study Plan (See Anchor QEA., 2015). (Note: Ecology and USFWS approved the study plan via email on December 20, 2013.) Consistent with the WSMP, Monitoring and Evaluation with specific emphasis 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.

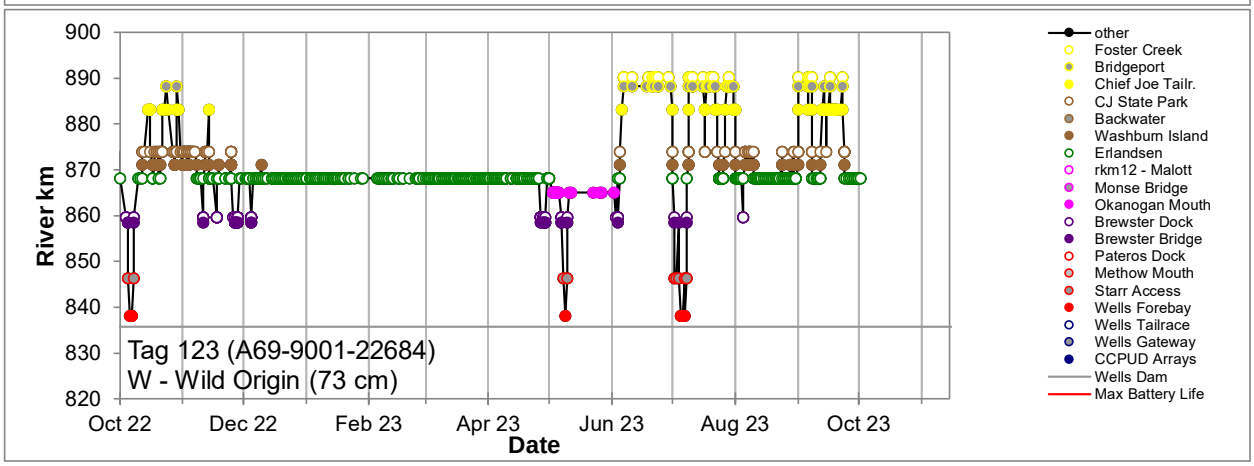
Acoustic tracking was done using an array of 16-22 receivers deployed throughout the study area from the Chief Joseph Dam tailrace to the Wells Dam tailrace. Sturgeon were detected in all of the reservoir sampling zones, although some areas had more sturgeon detections than others. The distribution of 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 108 (A69-9001-22683)
W - Wild Origin (73.1 cm)
Oct 22
Dec 22
Feb 23
Apr 23
Jun 23
Aug 23
Oct 23
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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890
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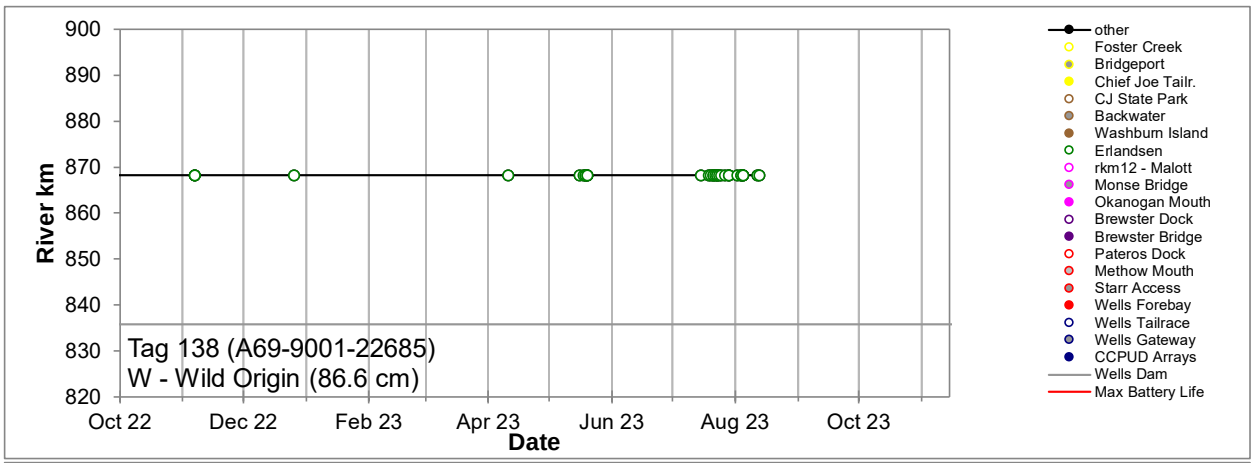
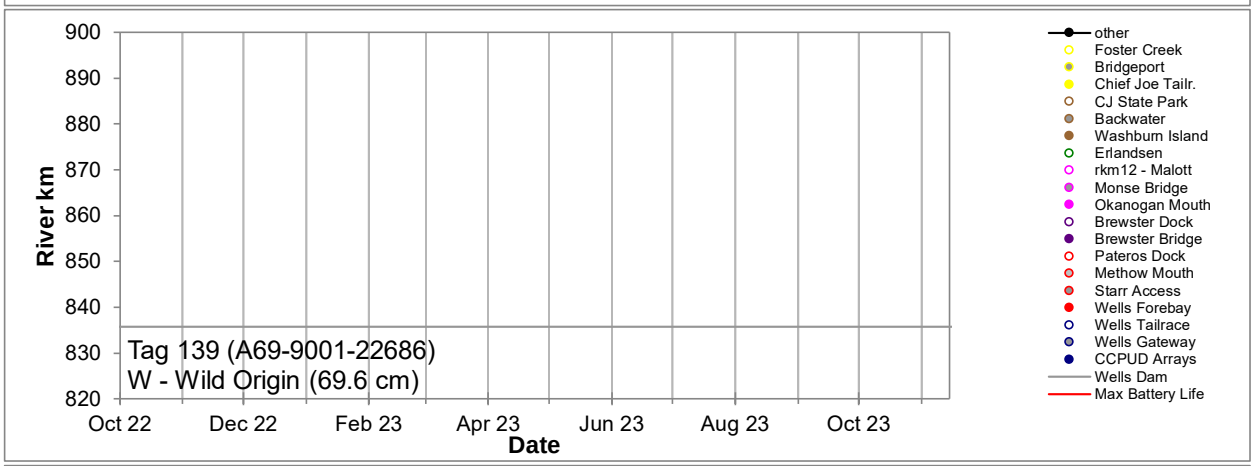
850
840
830
820
River km
Tag 123 (A69-9001-22684)
W - Wild Origin (73 cm)
Oct 22
Dec 22
Feb 23
Apr 23
Jun 23
Aug 23
Oct 23
Date
other
Foster Creek
Bridgeport
Chief Joe Tailr.
CJ State Park
Backwater
Washburn Island
Erlandsen
rkm12 - Malott
Monse Bridge
Okanogan Mouth
Brewster Dock
Brewster Bridge
Pateros 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 22
Dec 22
Feb 23
Apr 23
Jun 23
Aug 23
Oct 23
Date
Tag 138 (A69-9001-22685)
W - Wild Origin (86.6 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
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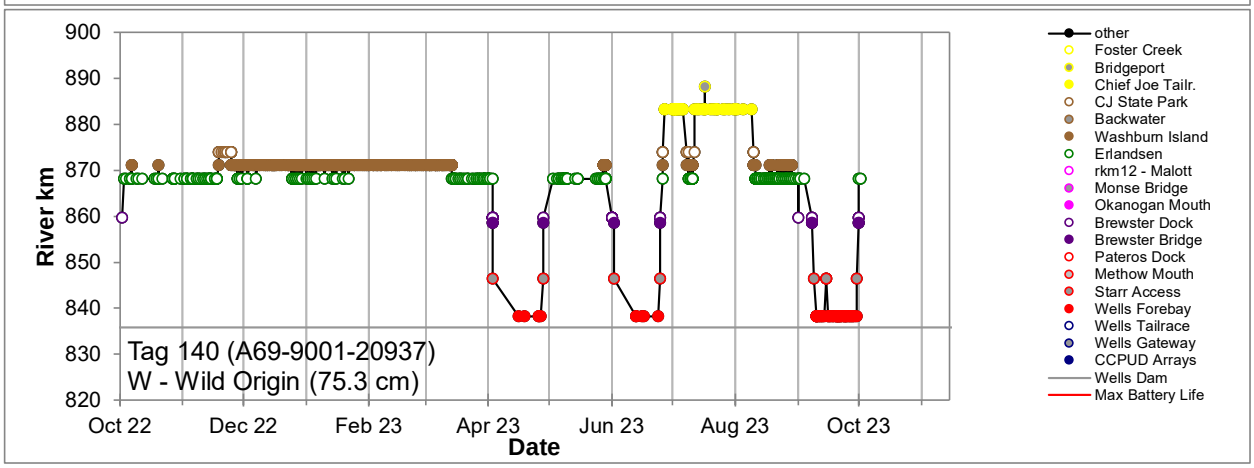
890
880
870
860
850
840
830
820
Oct 22
Dec 22
Feb 23
Apr 23
Jun 23
Aug 23
Oct 23
Date
Tag 139 (A69-9001-22686)
W - Wild Origin (69.6 cm)
other
Foster Creek
Bridgeport
Chief Joe Tailr.
CJ State Park
Backwater
Washburn Island
Erlandsen
rkm12 - Malott
Monse Bridge
Okanogan Mouth
Brewster Dock
Brewster Bridge
Pateros Dock
Methow Mouth
Starr Access
Wells Forebay
Wells Tailrace
Wells Gateway
CCPUD Arrays
Wells Dam
Max Battery Life


River km
900
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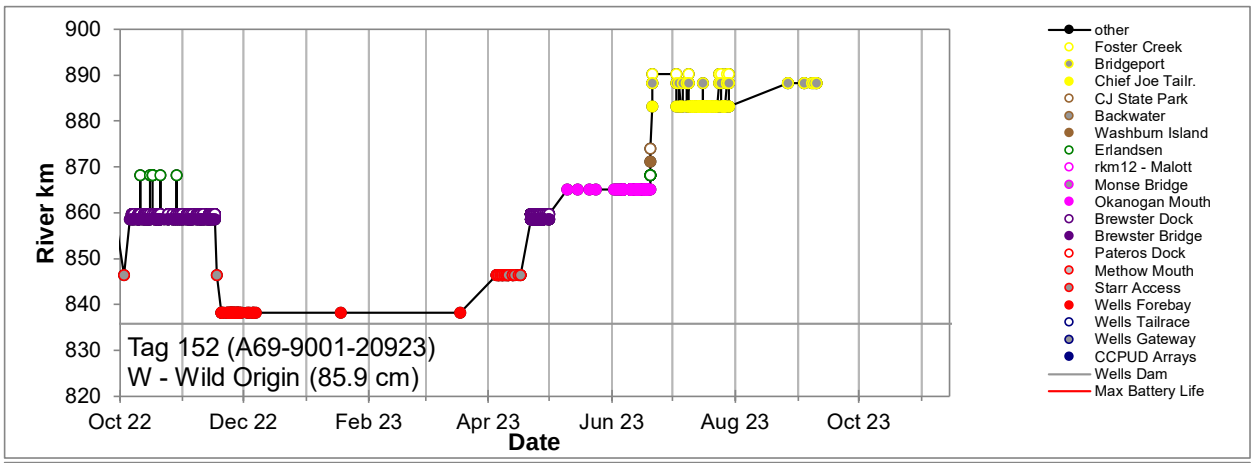
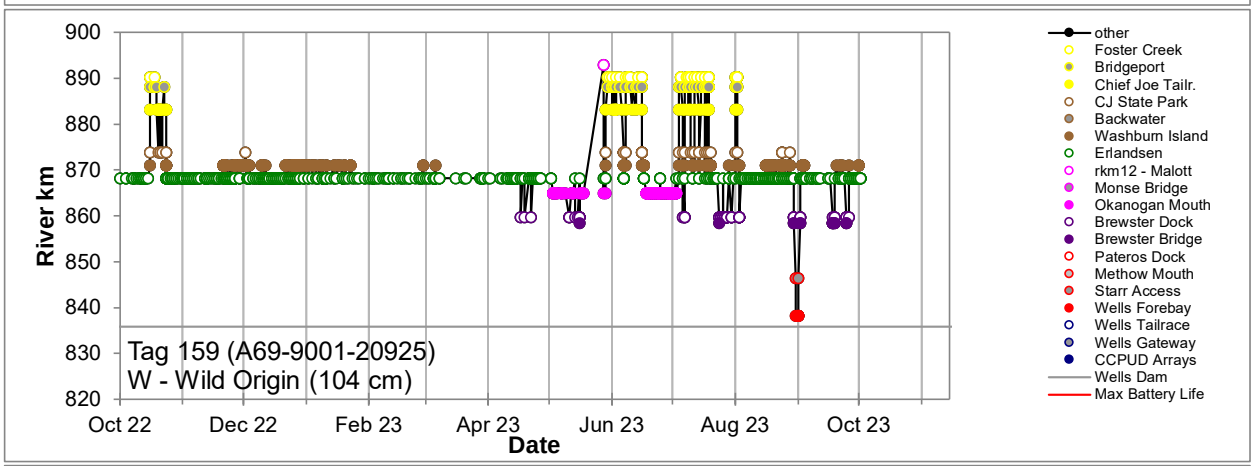
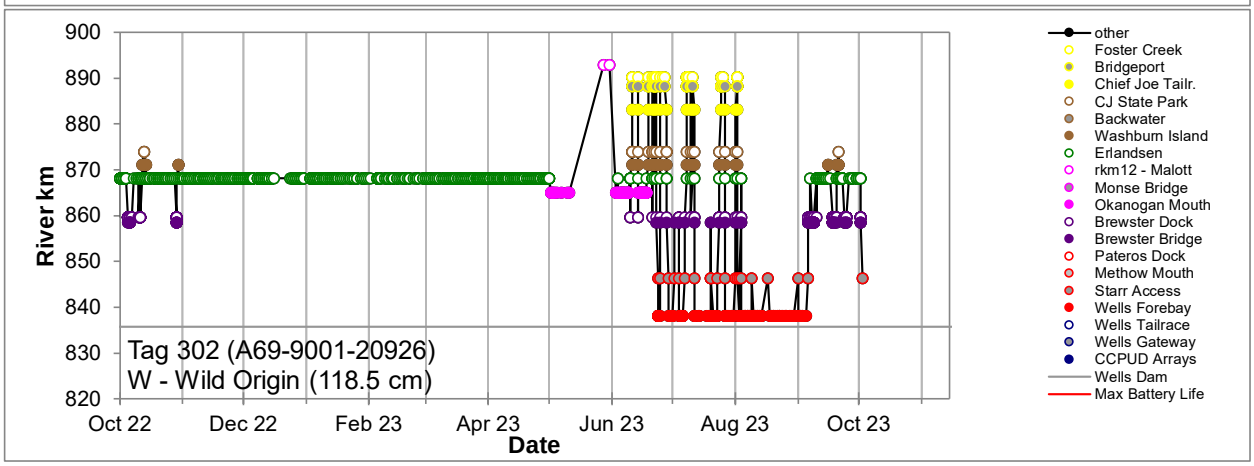
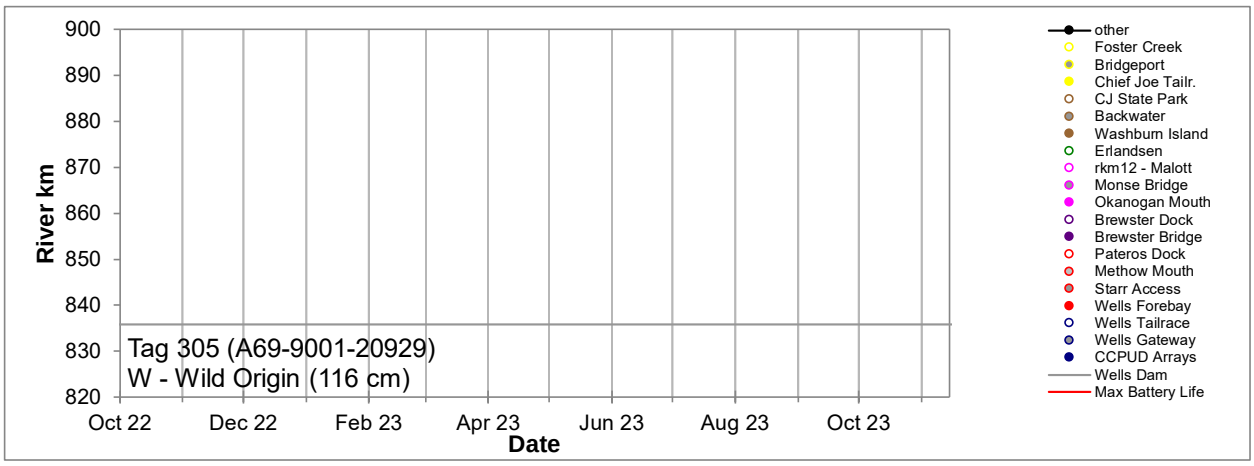
870
860
850
840
830
820
Oct 22
Dec 22
Feb 23
Apr 23
Jun 23
Aug 23
Oct 23
Date
Tag 140 (A69-9001-20937)
W - Wild Origin (75.3 cm)
other
Foster Creek
Bridgeport
Chief Joe Tailr.
CJ State Park
Backwater
Washburn Island
Erlandsen
rkm12 - Malott
Monse Bridge
Okanogan Mouth
Brewster Dock
Brewster Bridge
Pateros Dock
Methow Mouth
Starr Access
Wells Forebay
Wells Tailrace
Wells Gateway
CCPUD Arrays
Wells Dam
Max Battery Life

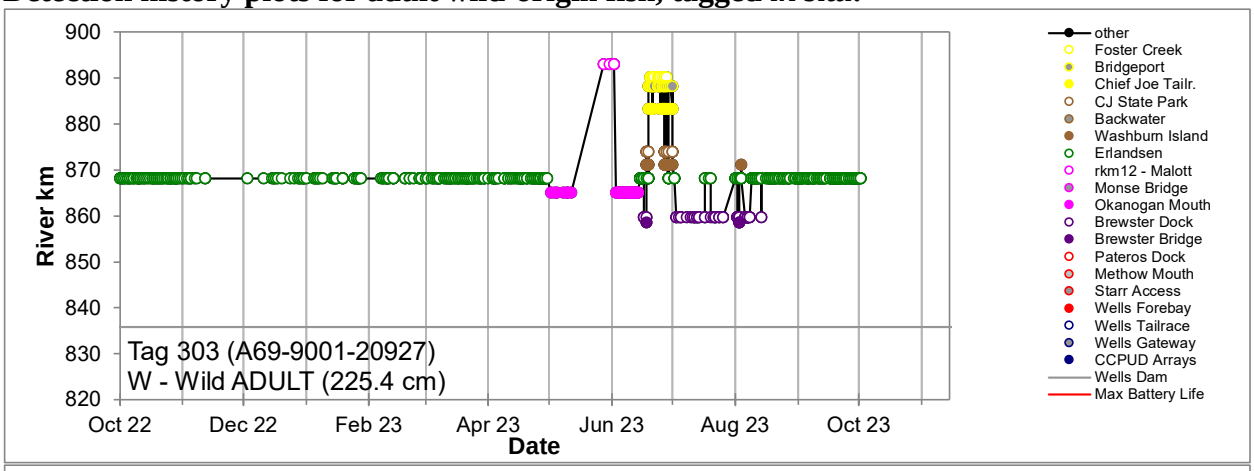

River km
900
890
880
870
860
850
840
830
820
Oct 22
Dec 22
Feb 23
Apr 23
Jun 23
Aug 23
Oct 23
Date
Tag 152 (A69-9001-20923)
W - Wild Origin (85.9 cm)
other
Foster Creek
Bridgeport
Chief Joe Tailr.
CJ State Park
Backwater
Washburn Island
Erlandsen
rkm12 - Malott
Monse Bridge
Okanogan Mouth
Brewster Dock
Brewster Bridge
Pateros Dock
Methow Mouth
Starr Access
Wells Forebay
Wells Tailrace
Wells Gateway
CCPUD Arrays
Wells Dam
Max Battery Life

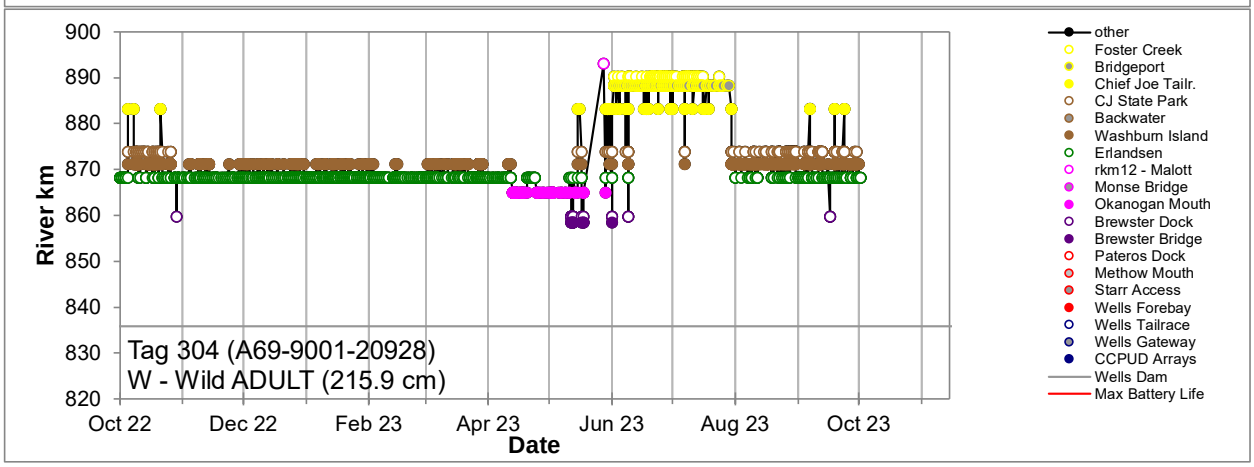

River km
900
890
880
870
860
850
840
830
820
Oct 22
Dec 22
Feb 23
Apr 23
Jun 23
Aug 23
Oct 23
Date
Tag 159 (A69-9001-20925)
W - Wild Origin (104 cm)
other
Foster Creek
Bridgeport
Chief Joe Tailr.
CJ State Park
Backwater
Washburn Island
Erlandsen
rkm12 - Malott
Monse Bridge
Okanogan Mouth
Brewster Dock
Brewster Bridge
Pateros Dock
Methow Mouth
Starr Access
Wells Forebay
Wells Tailrace
Wells Gateway
CCPUD Arrays
Wells Dam
Max Battery Life

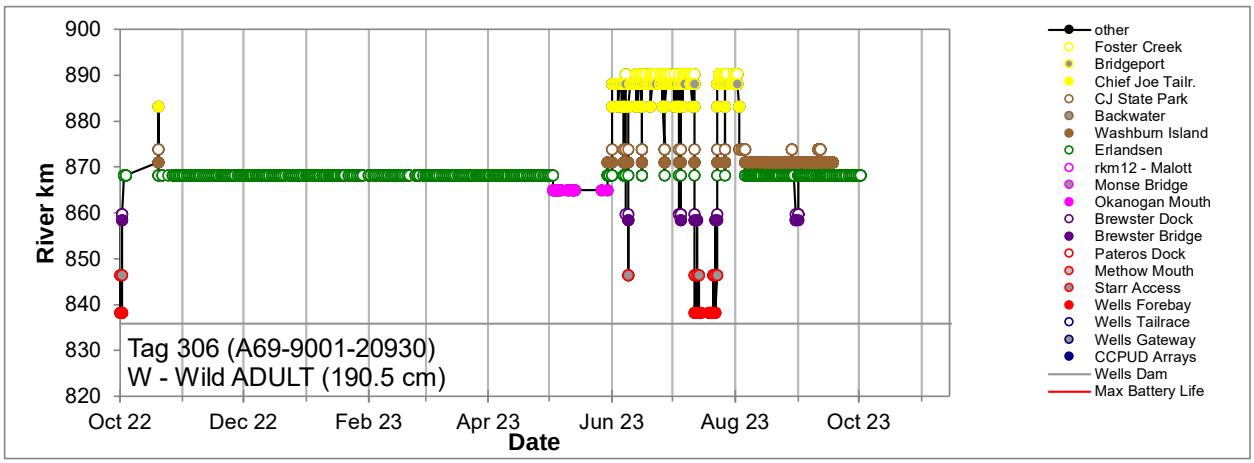

River km
900
890
880
870
860
850
840
830
820
Oct 22
Dec 22
Feb 23
Apr 23
Jun 23
Aug 23
Oct 23
Date
Tag 302 (A69-9001-20926)
W - Wild Origin (118.5 cm)
other
Foster Creek
Bridgeport
Chief Joe Tailr.
CJ State Park
Backwater
Washburn Island
Erlandsen
rkm12 - Malott
Monse Bridge
Okanogan Mouth
Brewster Dock
Brewster Bridge
Pateros Dock
Methow Mouth
Starr Access
Wells Forebay
Wells Tailrace
Wells Gateway
CCPUD Arrays
Wells Dam
Max Battery Life

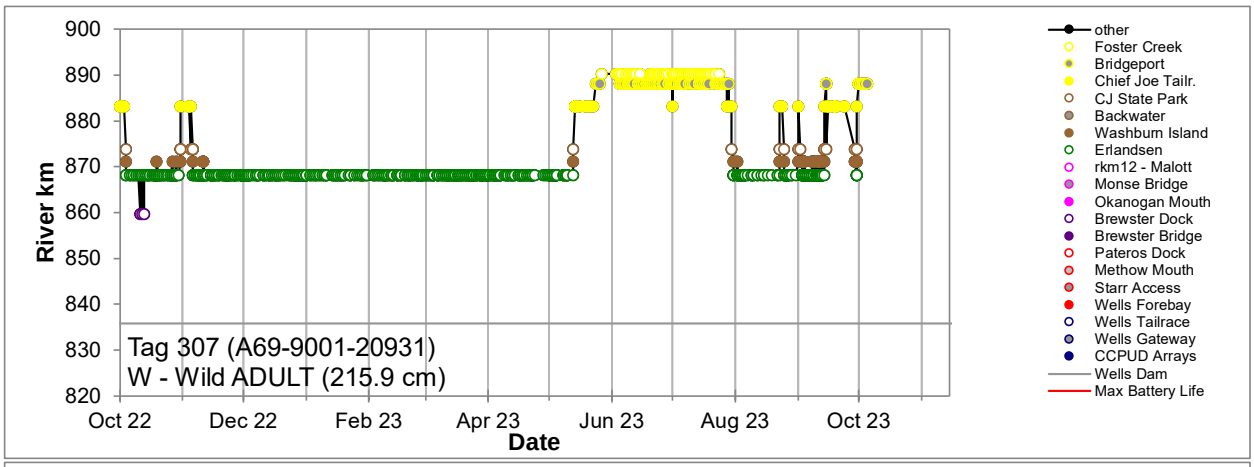


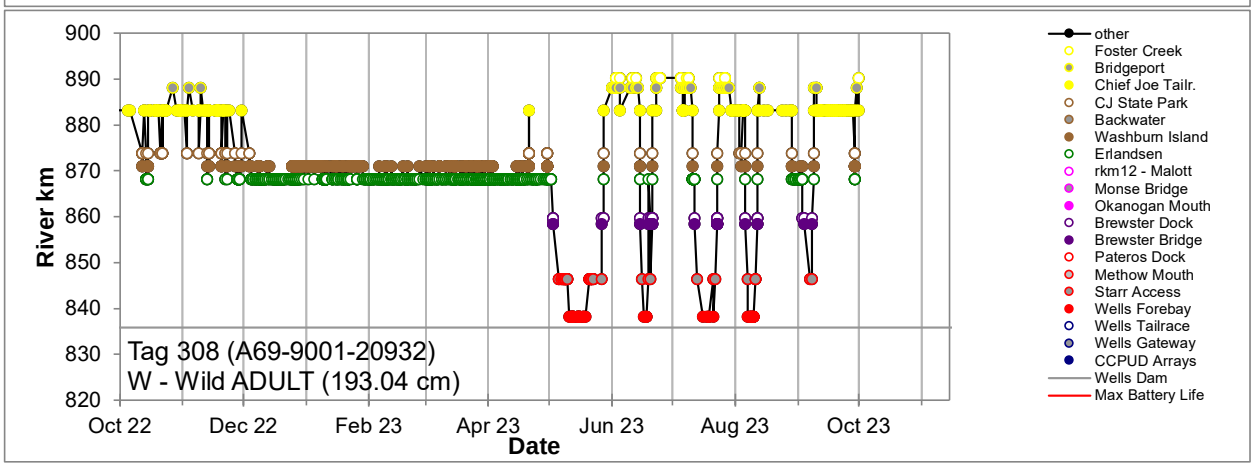
Detection history plots for adult wild-origin fish, tagged *in situ*.

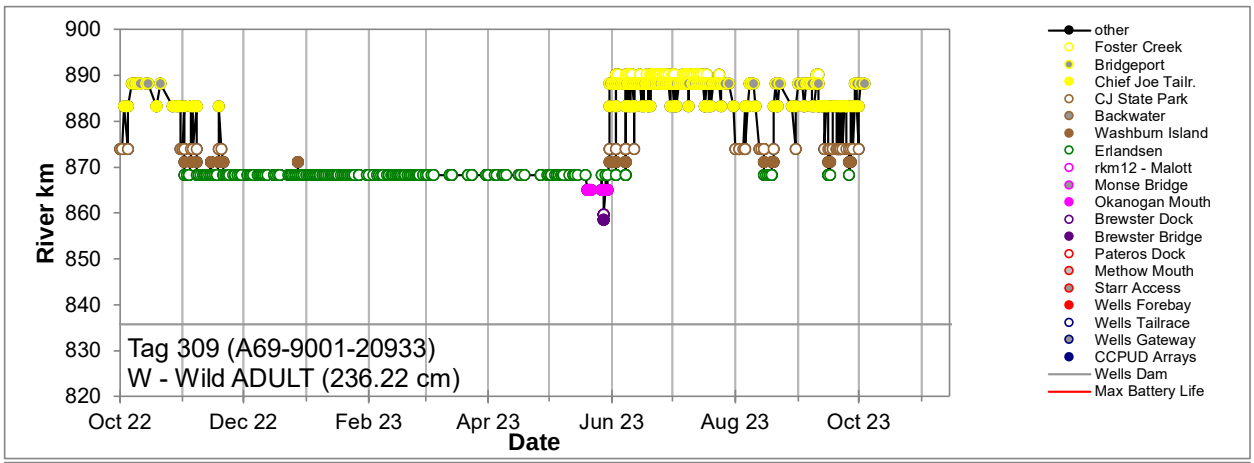


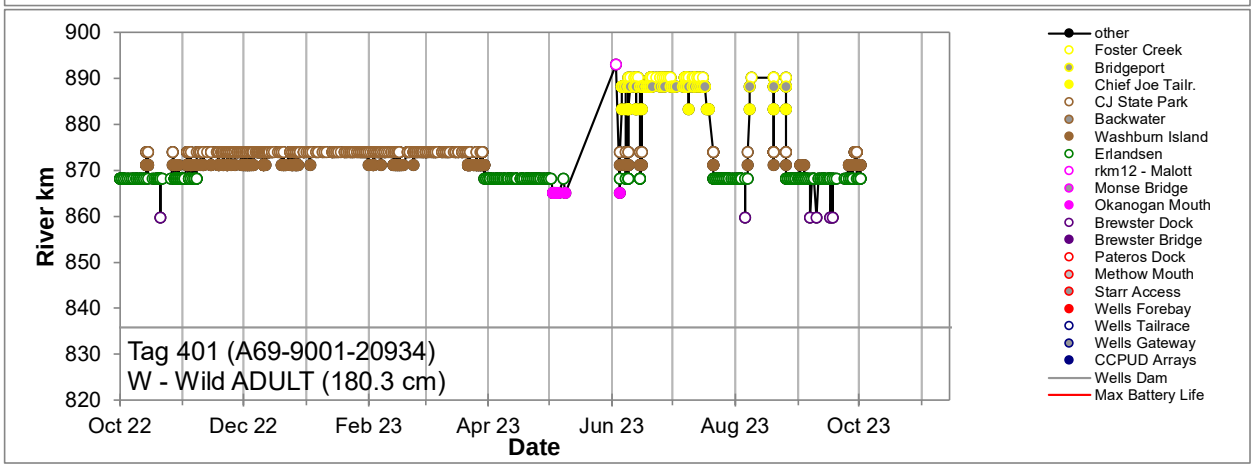



River km
900
890
880
870
860
850
840
830
820
Oct 22
Dec 22
Feb 23
Apr 23
Jun 23
Aug 23
Oct 23
Date
Tag 306 (A69-9001-20930)
W - Wild ADULT (190.5 cm)
other
Foster Creek
Bridgeport
Chief Joe Tailr.
CJ State Park
Backwater
Washburn Island
Erlandsen
rkm12 - Malott
Monse Bridge
Okanogan Mouth
Brewster Dock
Brewster Bridge
Pateros Dock
Methow Mouth
Starr Access
Wells Forebay
Wells Tailrace
Wells Gateway
CCPUD Arrays
Wells Dam
Max Battery Life

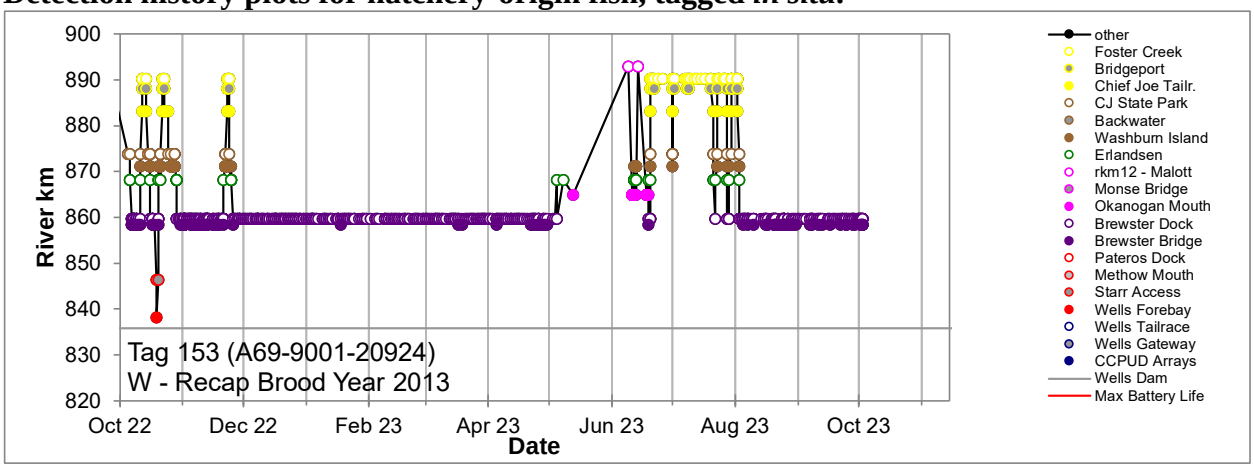

River km
900
890
880
870
860
850
840
830
820
Oct 22
Dec 22
Feb 23
Apr 23
Jun 23
Aug 23
Oct 23
Date
Tag 307 (A69-9001-20931)
W - Wild ADULT (215.9 cm)
other
Foster Creek
Bridgeport
Chief Joe Tailr.
CJ State Park
Backwater
Washburn Island
Erlandsen
rkm12 - Malott
Monse Bridge
Okanogan Mouth
Brewster Dock
Brewster Bridge
Pateros Dock
Methow Mouth
Starr Access
Wells Forebay
Wells Tailrace
Wells Gateway
CCPUD Arrays
Wells Dam
Max Battery Life

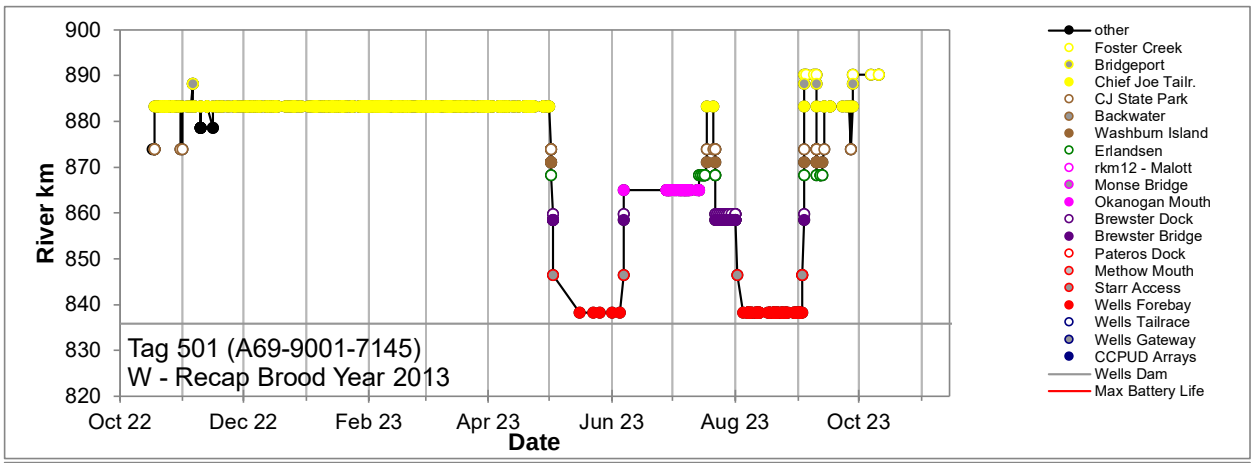

River km
900
890
880
870
860
850
840
830
820
Oct 22
Dec 22
Feb 23
Apr 23
Jun 23
Aug 23
Oct 23
Date
Tag 308 (A69-9001-20932)
W - Wild ADULT (193.04 cm)
other
Foster Creek
Bridgeport
Chief Joe Tailr.
CJ State Park
Backwater
Washburn Island
Erlandsen
rkm12 - Malott
Monse Bridge
Okanogan Mouth
Brewster Dock
Brewster Bridge
Pateros Dock
Methow Mouth
Starr Access
Wells Forebay
Wells Tailrace
Wells Gateway
CCPUD Arrays
Wells Dam
Max Battery Life

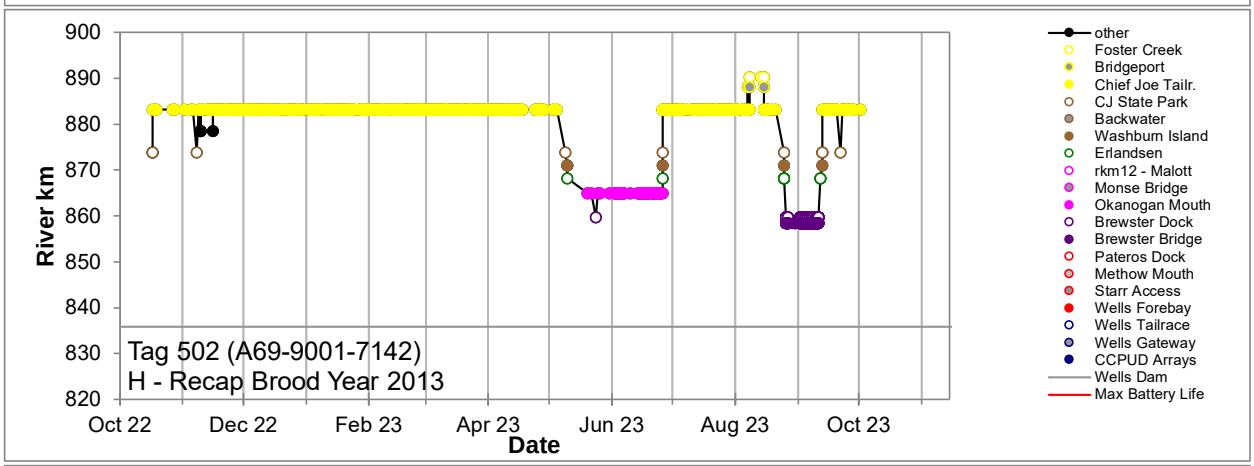


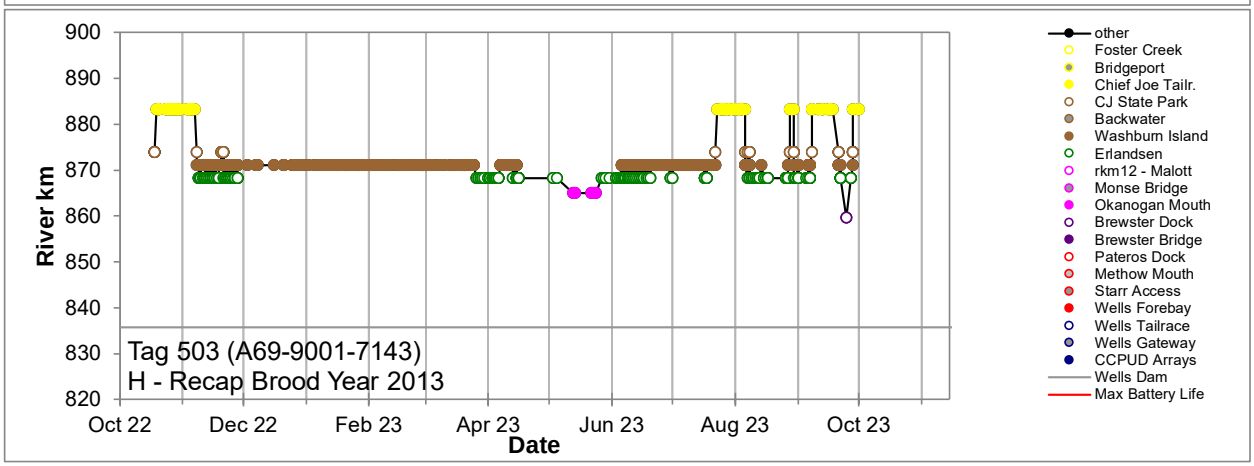


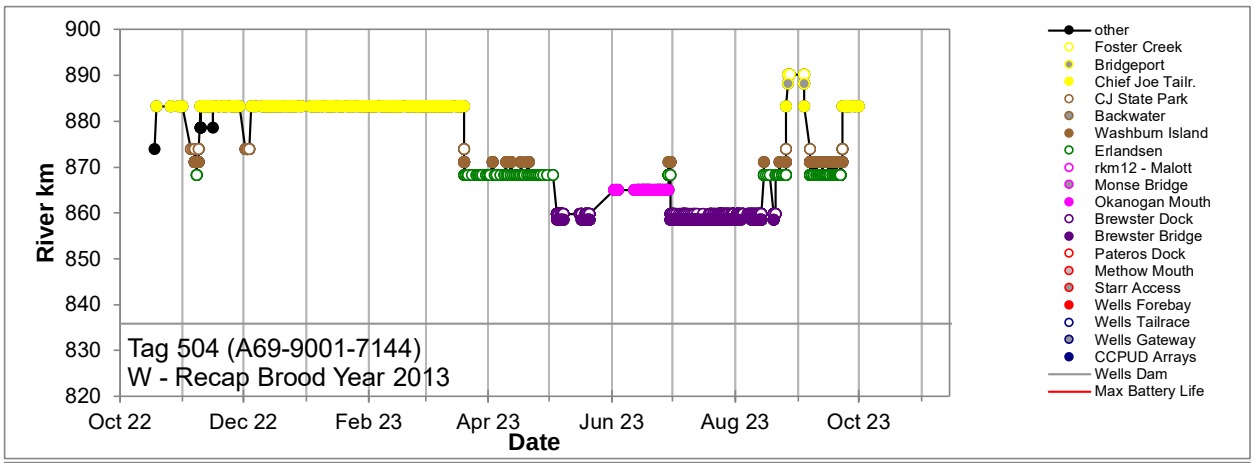
Detection history plots for hatchery-origin fish, tagged *in situ*.

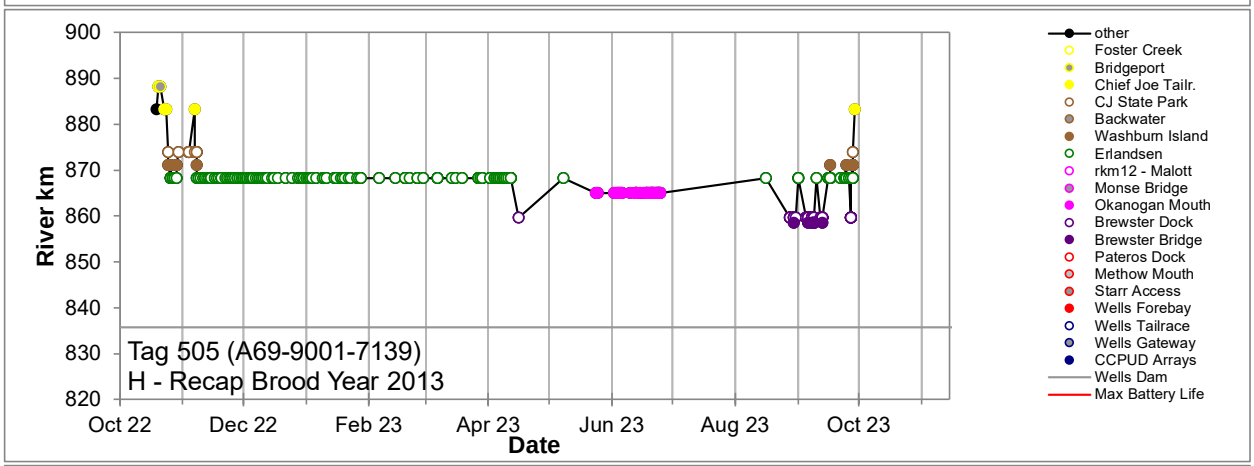


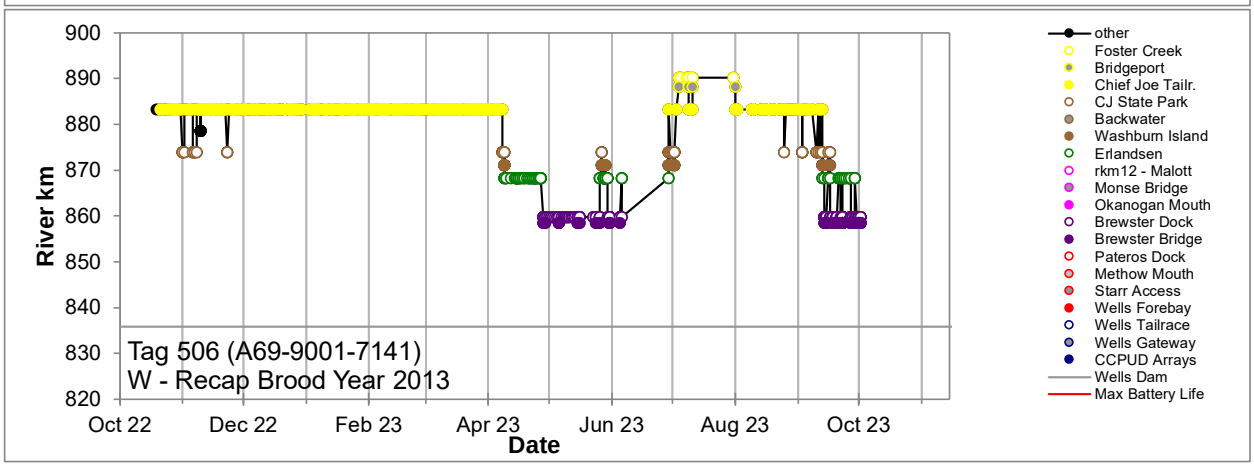

River km
900
890
880
870
860
850
840
830
820
Oct 22
Dec 22
Feb 23
Apr 23
Jun 23
Aug 23
Oct 23
Date
Tag 501 (A69-9001-7145)
W - Recap Brood Year 2013
other
Foster Creek
Bridgeport
Chief Joe Tailr.
CJ State Park
Backwater
Washburn Island
Erlandsen
rkm12 - Malott
Monse Bridge
Okanogan Mouth
Brewster Dock
Brewster Bridge
Pateros Dock
Methow Mouth
Starr Access
Wells Forebay
Wells Tailrace
Wells Gateway
CCPUD Arrays
Wells Dam
Max Battery Life

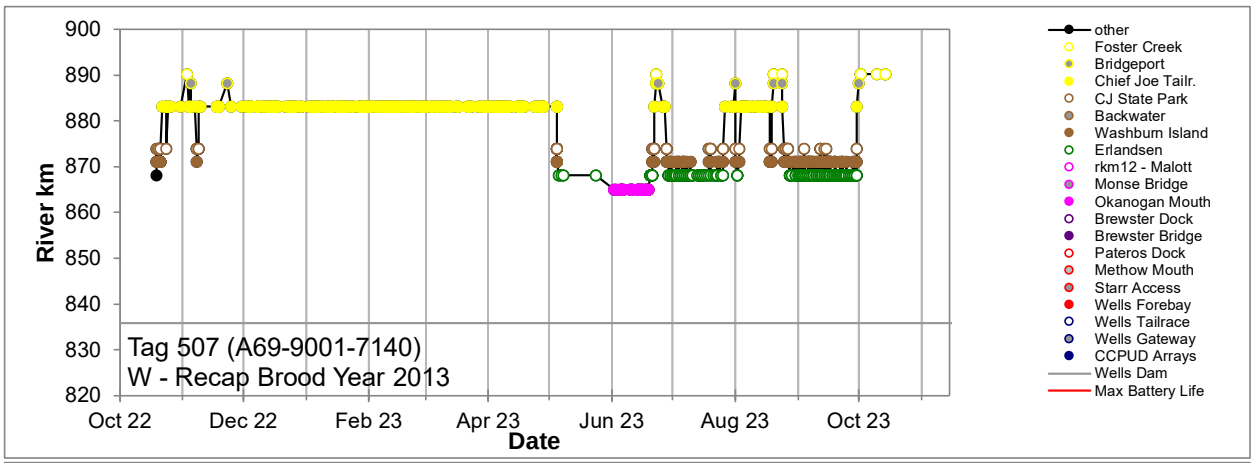

River km
900
890
880
870
860
850
840
830
820
Oct 22
Dec 22
Feb 23
Apr 23
Jun 23
Aug 23
Oct 23
Date
Tag 502 (A69-9001-7142)
H - Recap Brood Year 2013
other
Foster Creek
Bridgeport
Chief Joe Tailr.
CJ State Park
Backwater
Washburn Island
Erlandsen
rkm12 - Malott
Monse Bridge
Okanogan Mouth
Brewster Dock
Brewster Bridge
Pateros Dock
Methow Mouth
Starr Access
Wells Forebay
Wells Tailrace
Wells Gateway
CCPUD Arrays
Wells Dam
Max Battery Life

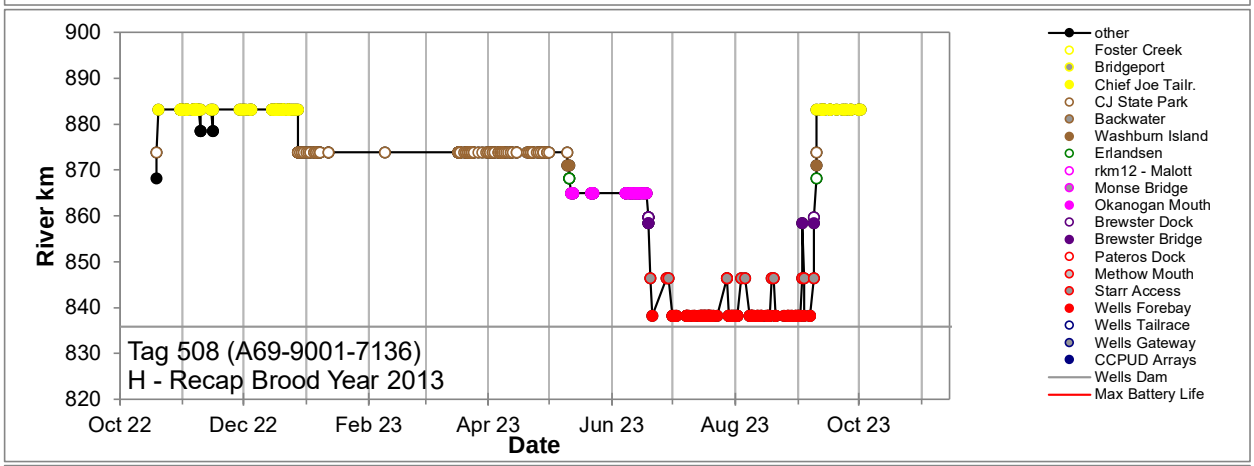

River km
900
890
880
870
860
850
840
830
820
Oct 22
Dec 22
Feb 23
Apr 23
Jun 23
Aug 23
Oct 23
Date
Tag 503 (A69-9001-7143)
H - Recap Brood Year 2013
other
Foster Creek
Bridgeport
Chief Joe Tailr.
CJ State Park
Backwater
Washburn Island
Erlandsen
rkm12 - Malott
Monse Bridge
Okanogan Mouth
Brewster Dock
Brewster Bridge
Pateros Dock
Methow Mouth
Starr Access
Wells Forebay
Wells Tailrace
Wells Gateway
CCPUD Arrays
Wells Dam
Max Battery Life

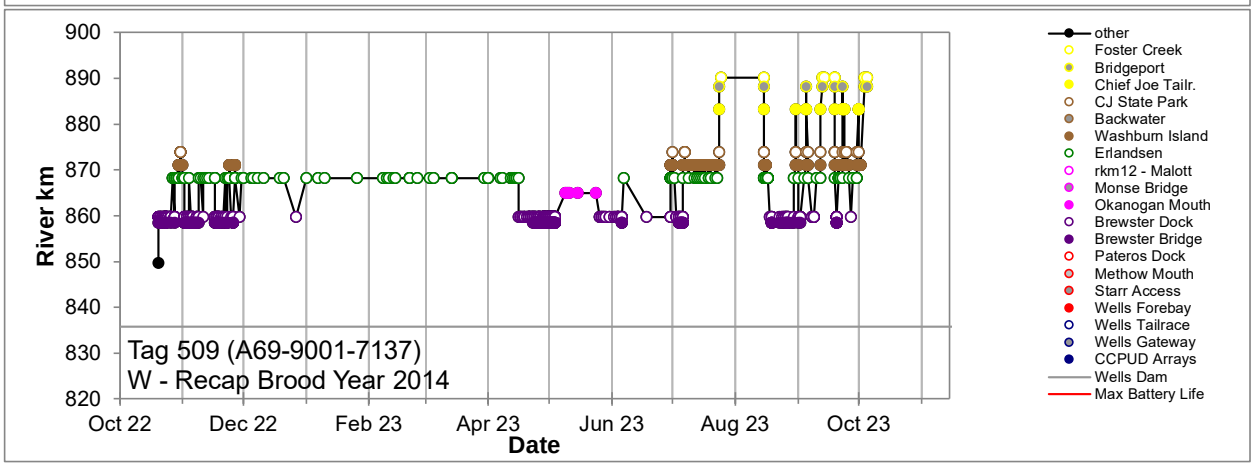

River km
900
890
880
870
860
850
840
830
820
Oct 22
Dec 22
Feb 23
Apr 23
Jun 23
Aug 23
Oct 23
Date
Tag 504 (A69-9001-7144)
W - Recap Brood Year 2013
other
Foster Creek
Bridgeport
Chief Joe Tailr.
CJ State Park
Backwater
Washburn Island
Erlandsen
rkm12 - Malott
Monse Bridge
Okanogan Mouth
Brewster Dock
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 22
Dec 22
Feb 23
Apr 23
Jun 23
Aug 23
Oct 23
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 22
Dec 22
Feb 23
Apr 23
Jun 23
Aug 23
Oct 23
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 22
Dec 22
Feb 23
Apr 23
Jun 23
Aug 23
Oct 23
Date
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 22
Dec 22
Feb 23
Apr 23
Jun 23
Aug 23
Oct 23
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


River km
900
890
880
870
860
850
840
830
820
Oct 22
Dec 22
Feb 23
Apr 23
Jun 23
Aug 23
Oct 23
Date
Tag 509 (A69-9001-7137)
W - Recap Brood Year 2014
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

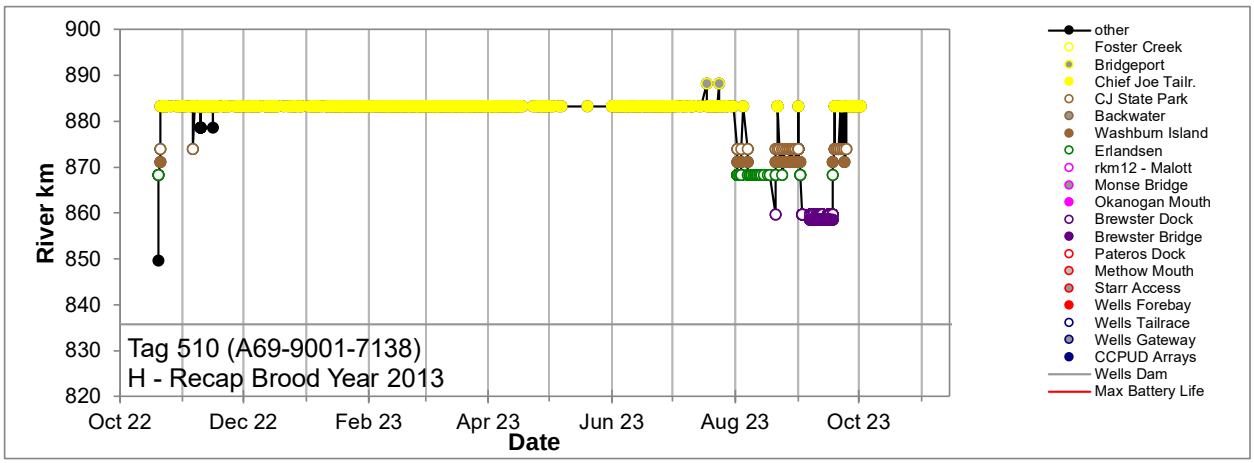


Figure 1. Movement histories of acoustic tagged adult and juvenile White Sturgeon from October 2022 to October 2023. Movement histories suggest that both adults and juveniles the entire length of the reservoir and often make seasonal movements into the Okanogan and Chief Joseph Tailrace.

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 sexually 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 2023 – 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 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 2023.

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 2023

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 2023, 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 2026 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 2024.

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

The most recent White Sturgeon indexing and monitoring occurred in the fall of 2022. Results from the monitoring can be found in the 2022 White Sturgeon Monitoring and Evaluation Report, which was approved by the Aquatic SWG in June 2023. In 2024, Douglas PUD will

complete a late summer/fall stock assessment study over a 3-5 week period. Methods used to capture white sturgeon will include similar methods that were employed in the most recent M&E effort.

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.

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 2023 – Educational Opportunities Coinciding with WSMP Activities

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

On May 14, 2014, the Aquatic SWG approved the Douglas PUD White Sturgeon Outreach Plan, which identifies selected WSMP activities as opportunities for education to public entities such as schools, cities, fishing and recreation groups, and other interested local groups. Instructional videos including community outreach activities as they relate to White Sturgeon actions were created in 2014 and are available at Douglas PUD's public webpage at www.douglaspud.org. In addition, during the development of the updated Wells Dam overlook, White Sturgeon educational material was installed in the 2017 project and consistent with requirements of the WSMP. Consistent with the 2014 approved White Sturgeon Outreach Plan, in June 2015 - 2018 Douglas PUD staff met with Bridgeport, Washington elementary and/or high school children to release 30-40 White Sturgeon juveniles into the Wells Project. During this activity students were given information about the supplementation program, White Sturgeon life history and biology, and monitoring and evaluation efforts that will continue in the Project area. In each year, prior to the release of the 11-month old Sturgeon, students tour the Wells Fish Hatchery and are introduced to the sturgeon rearing program along with other programs at the facility. Outreach activities with the Bridgeport students were not completed in 2019 due to scheduling conflicts. Outreach was expected to occur in 2020 but the Covid-19 pandemic prevented the in-person components of outreach. In 2021, outreach activities resumed with students from Bridgeport High School participating in the release of White Sturgeon at Bridgeport Marina Park on May 28, 2021 and May 25, 2022.

In 2023, two outreach activities were conducted. On March 20, 2023, a White Sturgeon teaching presentation was held for the 7/8 grades of Pinnacles Prep, and on June 1, 2023, the 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 2024.

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
13-50 (2025+)			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.

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Appendix D
2023 Bull Trout Management Plan and Incidental Take Annual Report

2023 BULL TROUT MANAGEMENT PLAN AND INCIDENTAL TAKE ANNUAL REPORT

WELLS HYDROELECTRIC PROJECT

FERC PROJECT NO. 2149

March 2024

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 2022 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 2023 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 nearest Service Law Enforcement Office (Redmond, Washington; telephone 425-883-8122) and reported to the Service's Central 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 2023 - 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 December 2023. 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).

Juvenile fish bypass operations were implemented consistent with the 2023 Bypass Operations Plan. In 2023, dates of bypass operation included initiation on April 9 at midnight with the bypass system operated continuously through July 24. The 2023 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 2023 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 2023 - Upstream Fishway Counts*

In 2023, 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 23 Bull Trout in 2023, 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.

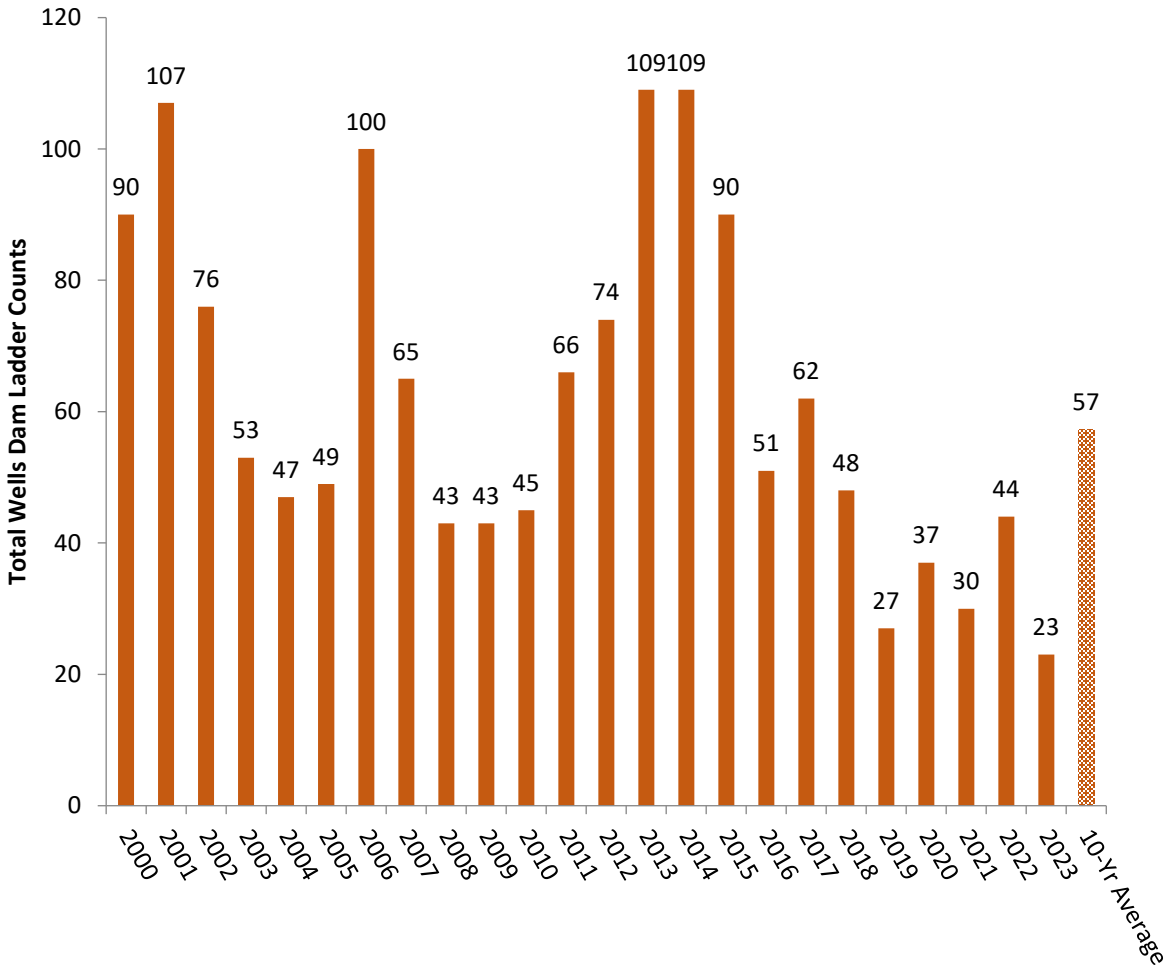

Figure 1. Bull Trout ladder counts at Wells Dam 2000-2023.

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 2023 - 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.

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 2023 - 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 2023 - 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 will be filed with the FERC (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 2023 - 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.

In 2023, there were five adult Bull Trout captured and PIT-tagged at the Twisp Weir as part of the Bull Trout Movement and Life History Investigation. Twisp Weir encounters in 2023 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 2023 - Sub-adult Bull Trout Monitoring*

During 2023, seven Bull Trout under 440 mm fork length were observed at Wells Dam. Since the count was less than ten, no new sub-adult monitoring is required in 2024 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 2023 - 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 2023. 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 2023 - 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.

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 2023 - Monitoring Other Aquatic Resource Management Plan Activities and Predator Control Program for Incidental Capture and Take of Bull Trout*

Three activities conducted under other Aquatic Resource Management Plan actions had the potential to encounter Bull Trout in 2023:

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 2023. 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 2023 Northern Pike and Resident Fish Monitoring Program*
    - *Over the summer of 2023, Douglas PUD captured resident fish within the Well 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 2023, 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.*

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 2023 - 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 contained herein Appendix A.

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 2023 - Information Exchange and Regional Monitoring Efforts*

In 2023, regional information and technical meetings continued pursuant to the five-year status review of threatened Bull Trout in the conterminous of the United States. Specifically, on January 26, 2023 the USFWS' Erin Kuttel hosted the "Upper Mid-Columbia Bull Trout Working Group - Threat Assessment Meeting via WebEx". The purpose of this meeting was to work with regional agencies and stakeholders to rank threats to Bull Trout in the Wenatchee, Entiat, Methow and Okanogan basins towards completing the USFWS' five-year status review. Douglas PUD will participate in regional information exchanges and recovery planning in 2024 as recovery planning and status review processes are expected to be ongoing throughout the year.

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 2023 - Bull Trout Monitoring During Hatchery Activities*

Hatchery actions in 2023 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 salmonid M&E program captured 23 Bull Trout. Five juveniles captured at the Methow River screw trap near Carlton, WA and 18 juveniles were captured at the Twisp River screw trap 2km upstream of confluence of the Twisp River and Methow River.

Five Bull Trout were captured at the Twisp Weir in 2023. None were encountered at the Methow Hatchery Outfall Trap and three encountered at the Wells Fish Hatchery adult collection facility and were returned to the river.

In 2023, Douglas PUD's License Actions collectively were well below 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 2023 and respective take limits are provided in Table 1.

Table 1. Summary of 2023 Bull Trout Incidental Encounters Under Douglas PUD's License Actions and Related Project Encounter Limits Under the 2012 Issued Section 7 Biological Opinion.

	Project Element	2012 ISSUED BIOLOGICAL OPINION (Table 14)				Incidental Take Totals			
		Lethal Take		Non-lethal Take		Lethal Take		Non-lethal Take	
		Adult	Sub-adult	Adult	Sub-adult	Adult	Sub-adult	Adult	Sub-adult
Operations	Turbine Operation (A-1)	4	1	31	30				
	Spillway Operation (A-2)	2	1	76	31				
	Reservoir Operation (A-3)	1	2	8	3				
HCP	Passage Survival Plan								
	Wells Dam Juvenile Passage Plan								
	-Fish Bypass Operation (A-1)	1	1	4	6				
	-Juvenile Survival Study (A-2)	2	2	4	6				
	Wells Dam Adult Passage Plan	1	3	76	31				
	Tributary Conservation Plan and Committee	-	-	-	-				
	Hatchery Management Plans								
	-Hatchery Management (A-1)	2	5	76	31			3	
	-Operation of the Twisp Weir (A-2)	1	1	118	50*			5	
	-HGMP Implementation (A-3)	2	2	76	31				
	-Juvenile Salmonid Release (A-4)	-	-	629	132*				23
	Predator Control Program	2	1	76	31				
ASA	Water Quality Management Plan	1	2	76	31				
	Bull Trout Management Plan	2	-	76	31			26	
	Pacific Lamprey Management Plan	1	1	2	5				
	White Sturgeon Management Plan	1	1	2	5				
	Resident Fish Management Plan	1	2	76	31				
	Aquatic Nuisance Management Plan	1	1	76	31				
TERRESTRIAL	Wildlife and Botanical Management Plan	-	-	-	-				
	Line Avian Protection Plan	no effect	no effect	no effect	no effect				
	Recreation Resources Management Plan	-	-	-	-				
	Historic Properties Management Plan	-	-	-	-				
	Land Use Policy	no effect	no effect	no effect	no effect				

Note: 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 2023

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 2023.

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 2023 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.

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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 A.

2022-2023 Bull Trout Movement and Life History Investigation Report

Appendix E
2023 Annual Report Water Quality Management Plan

2023 ANNUAL REPORT

WATER QUALITY MANAGEMENT PLAN

WELLS HYDROELECTRIC PROJECT

FERC PROJECT NO. 2149

March 2024

Prepared by:
Public Utility District No. 1 of Douglas County
East Wenatchee, Washington

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 2023. 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 2023 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:
From April to June:

- 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.

From July – August:

- 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 2023 - 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 2023 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 2023 - Spill Operations*

In early 2023, Douglas PUD developed a 2023 GAP along with the 2023 Bypass Operations Plan (BOP) and coordinated the review of these two documents with the HCP CC and the Aquatic SWG. Both plans were filed with the FERC on February 16, 2023 after being approved by Ecology, the NMFS and the USFWS.

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 2023 - Project Gas Abatement Plan and TDG Exemption*

On February 8, 2023, Ecology approved Douglas PUD's GAP and issued a fish passage TDG adjustment for the 2023 bypass season. Likewise, the Aquatic SWG approved the 2023 GAP and BOP on February 8, 2023 during the February conference call meeting. The HCP CC approved the 2023 GAP and BOP on February 9-13, 2023 via an email voting process. Douglas PUD submitted the approved 2023 GAP and BOP to the FERC on February 16, 2023.

The final 2023 GAP required Douglas PUD to monitor TDG in the forebay and tailrace of Wells Dam throughout the entire fish passage season (April – August). The 2023 GAP included Douglas PUD's Spill Playbook for 2023, 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 2023 TDG Annual Report to be filed with Ecology and the FERC in February 2024. The annual TDG report from

the 2022 spill season was reviewed and approved by Ecology and the Aquatic SWG on February 8, 2023 and subsequently filed with the FERC on February 16, 2023.

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 2023 - Measures to Address Non-Compliance*

During the 2023 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 2023.

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 is expected to be finalized in early 2024.

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 2023 - Monitoring*

Water temperature monitoring in 2023 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 2023, Douglas PUD submitted an annual Water Temperature Report to Ecology and the FERC as an appendix to the 2022 WQMP Annual Report, which described the monitoring that occurred during the calendar year 2022. The 2023 Water Temperature Report is attached as Appendix A to this 2023 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 2023 - 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 2023, and participated in a TMDL check in meeting with Ecology staff on March 1, 2023.

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 2023 - 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 2023 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 2023 - Compliance with Other Numeric Criteria*

In 2023, 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 2023 - 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.

Every five years, Douglas PUD reviews the SPCC plan and makes appropriate revisions. The first review period occurred in 2018. The updated version of the SPCC plan was shared with Ecology and filed with the FERC. Again, in 2023, the SPCC plan was reviewed and revised where key personnel, systems, and contact information was updated. On January 3, 2024, Ecology was notified of the most recent revision of the SPCC plan dated September 2023. Douglas PUD will again review the SPCC plan in 2028. The Wells Project is operated in strict compliance with the Spill Prevention and Control requirements of the WQMP, 401 Certification and the FERC license and, in 2023, there were no instances of spills.

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 2023 - 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 2023 - Inspections*

Douglas PUD allows access to the Project as required and as requested by Ecology. On May 2, 2023, Douglas PUD hosted a meeting with Ecology at Wells Dam that focused on a review of the first year of NPDES implementation. While the meeting was related to Douglas PUD's Clean Water Act section 402 Permit and not contained within the Aquatic Settlement Agreement, the meeting provided opportunity for Ecology staff to ask questions about Douglas PUD's Section 401 Certification and implementation of the WQMP. As a part of this meeting, Douglas PUD led Ecology representatives on a tour of the Wells Project.

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 2023 - Participation in Regional Water Quality Forums*

Consistent with the WQMP, 401 Certification, and Wells Project operating license, during calendar year 2023, 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 2023, Douglas PUD participated in National Oceanic and Atmospheric Administration's (NOAA) spring river and snowpack forecast webinars. Douglas PUD will continue to participate in regional forums in 2024.

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 2023 - 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 2023 - Study Plans*

No new QAPPs were developed in 2023 since no new monitoring was conducted. The QAPP developed and approved in 2013 for water temperature and TDG monitoring was used in 2023 as a guiding document to implement water quality monitoring in and around the Wells Project.

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APPENDIX A

2023 WATER TEMPERATURE ANNUAL REPORT

WELLS HYDROELECTRIC PROJECT

FERC NO. 2149

March 2024

Prepared by:

Public Utility District No. 1 of Douglas County
East Wenatchee, WA

Prepared for:
Washington Department of Ecology
Yakima, WA

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 2023. 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 2023 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).

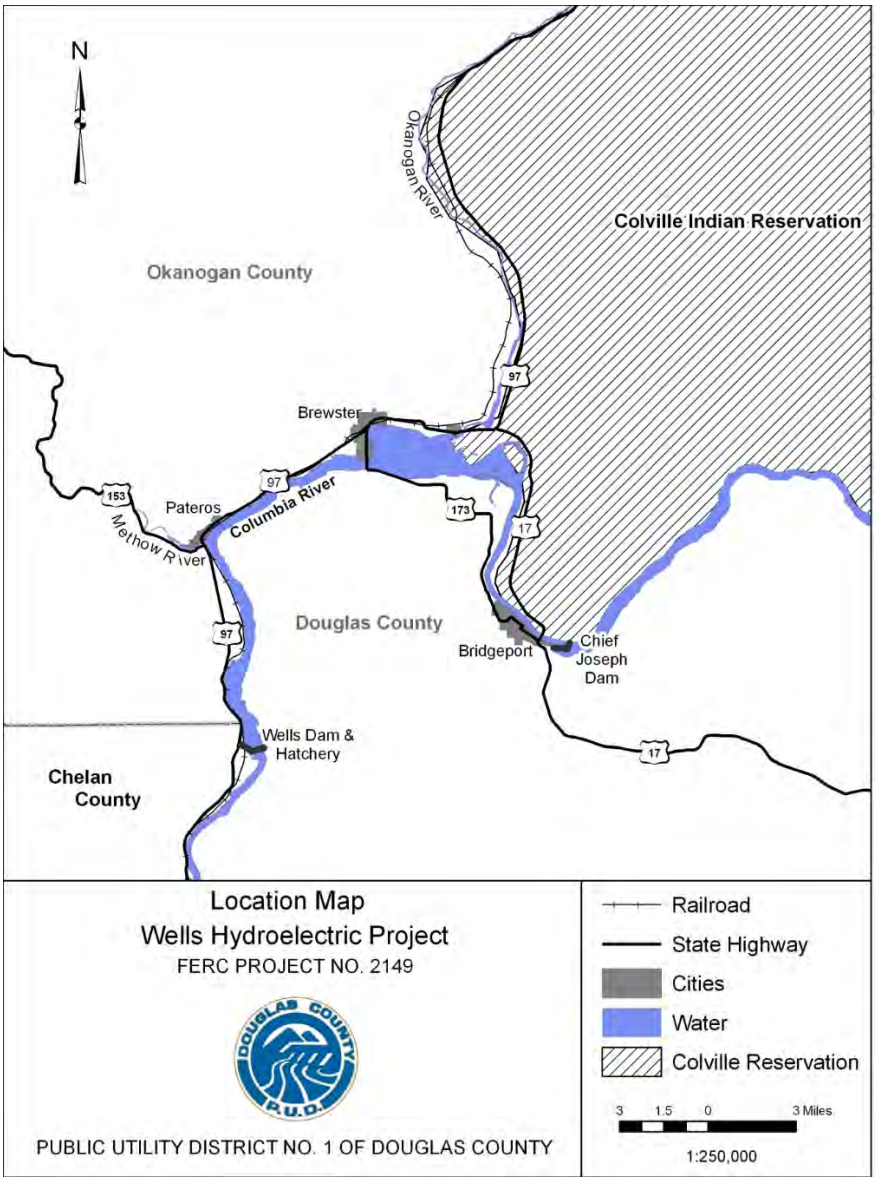

Figure 1. Location Map of the Wells Project.

2.2 Regulatory Framework

2.2.1 Temperature Water Quality Standard

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 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 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 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 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. Hydraulic and temperature influences from upstream storage dams complicate the evaluation of Project-related impacts. The only way to properly understand these impacts is to examine the river water temperatures more comprehensively through a system wide TMDL study such as that which is under consideration for development by EPA and the USACE.

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).

[1] Douglas PUD monitors water temperatures in the Wells Dam fishways during trapping periods in order to remain in compliance with hatchery permitting.

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.

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 the 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

[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.

webpage in real-time. The system is powered by battery and charged using a solar panel (Douglas PUD 2013).

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 2023 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 (2008-2023) but a short, early runoff led to earlier than normal peak water temperature and a fall the remained warmer than average well into October.

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 July 20, 2023 to October 22, 2023 (Figure 7).

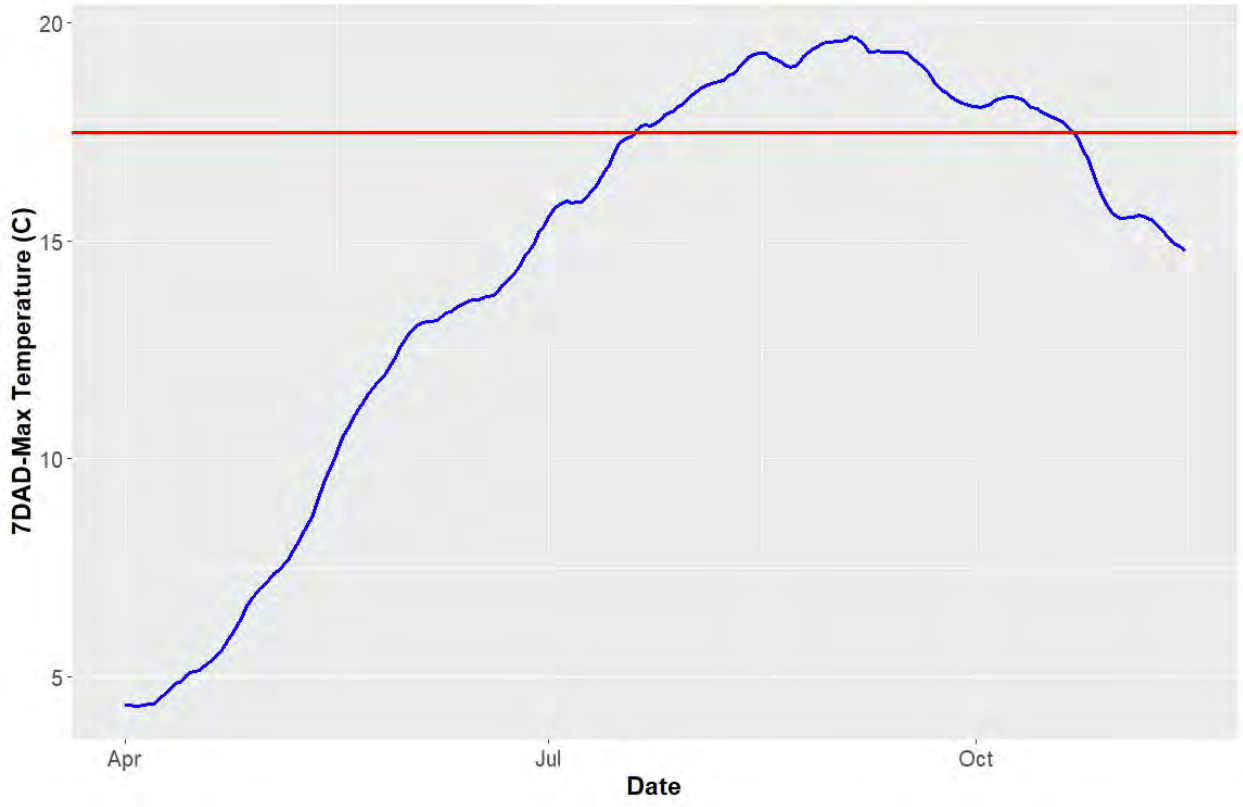

Figure 7. 2023 water temperature data collected in the Chief Joseph Tailrace at RM 544.5. Horizontal reference line indicates the 17.5°C WQS.

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 May 29, 2023 to September 20, 2023 (Figure 8).

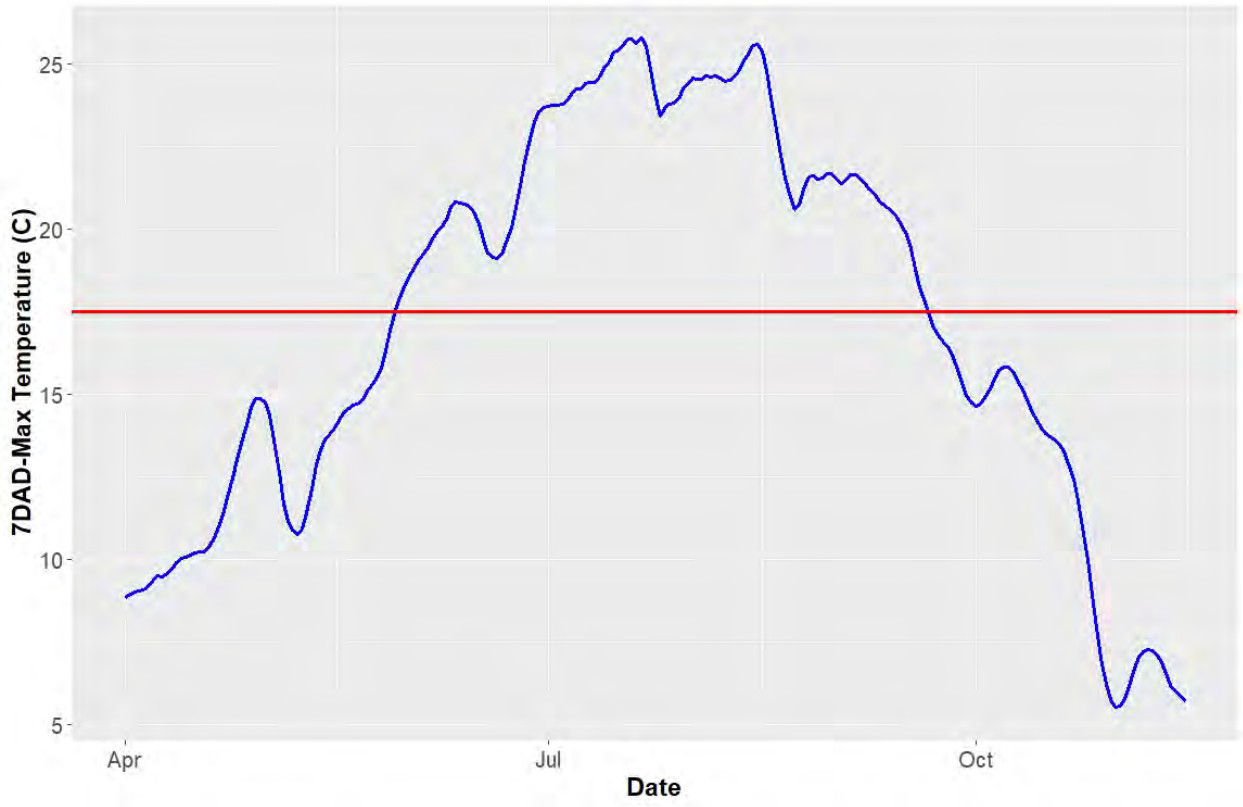

Figure 8. 2023 water temperature data collected in the Okanogan River Boundary at RM 10.5. Horizontal reference line indicates the 17.5°C WQS.

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. During 2023, the sensor was offline from May 20 to June 13, for unknown reasons. 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 2023, the natural flowing Methow River had daily average water temperatures that were at or above 13°C during two time periods: late May to June 15, 2023 (exact start date unknown due to equipment failure) and from October 1, 2023 to October 23, 2023. 7-DADMax temperature values at this location were above the WQS numeric criteria (17.5°C) from June 24, 2023 to September 17, 2023 (Figure 9).

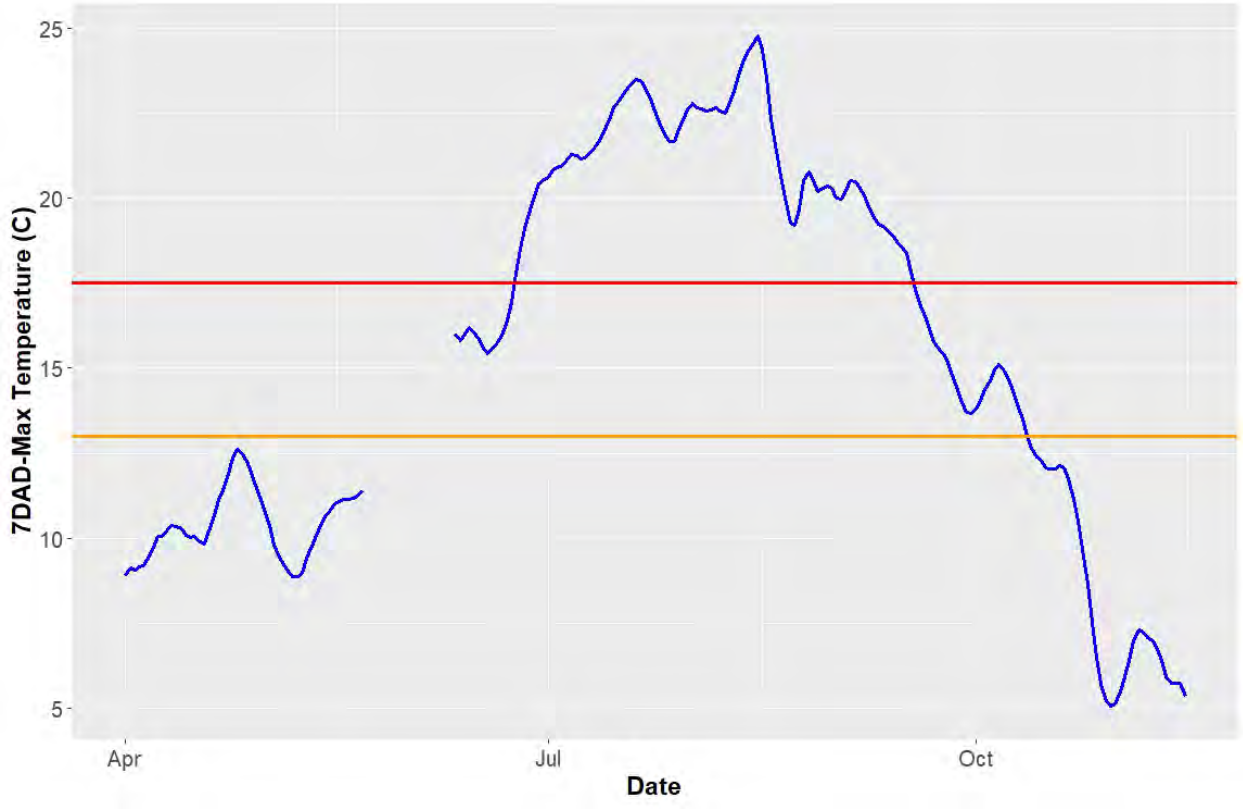

Figure 9. **2023 water temperature data from the Methow River Boundary at RM 1.5. Red reference line indicates the 17.5°C WQS. Criterion of 13°C applies only from October 1 - June 15 each year (bottom orange reference line).**

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 16, 2023 to October 19, 2023 (Figure 10), which is generally consistent with historic Wells Project temperature monitoring data.

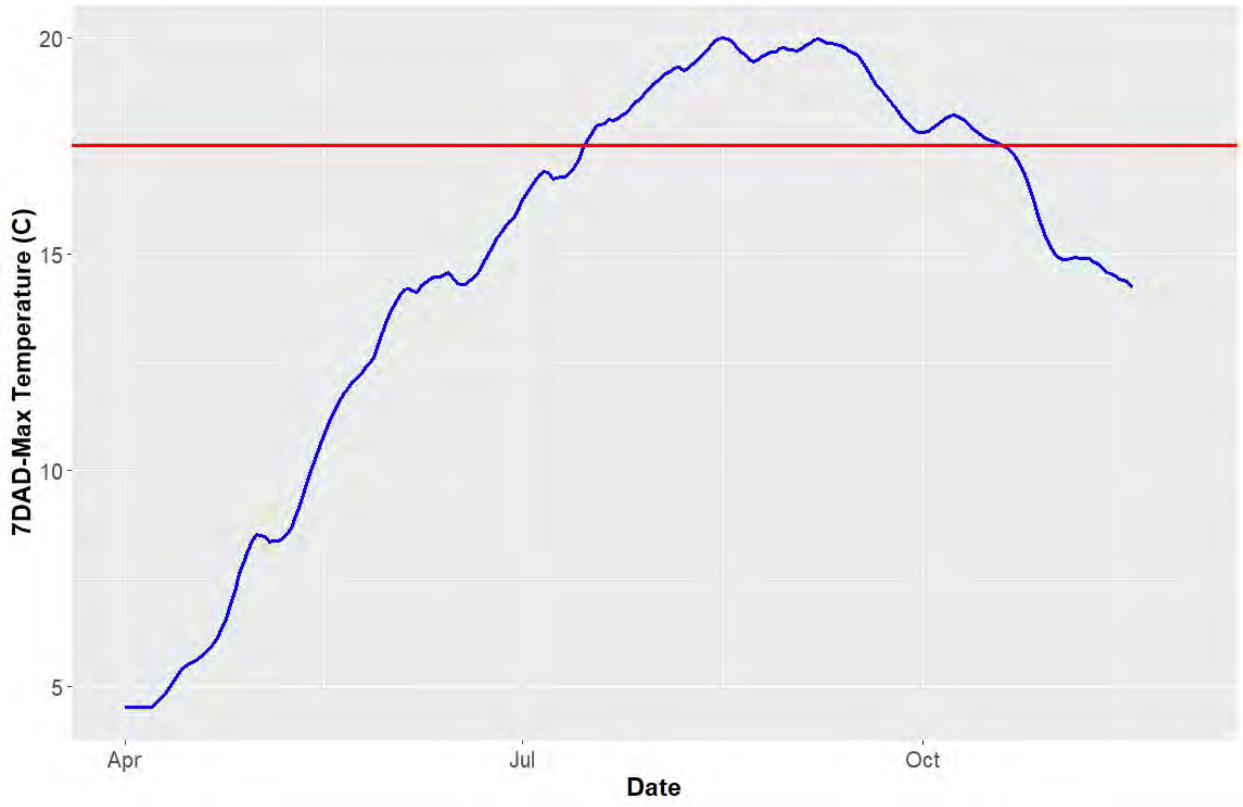

Figure 10. 2023 water temperature data collected in the Wells Dam Forebay at pier nose 6. Horizontal reference line indicates the 17.5°C WQS.

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 16, 2023 to October 18, 2023 (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.

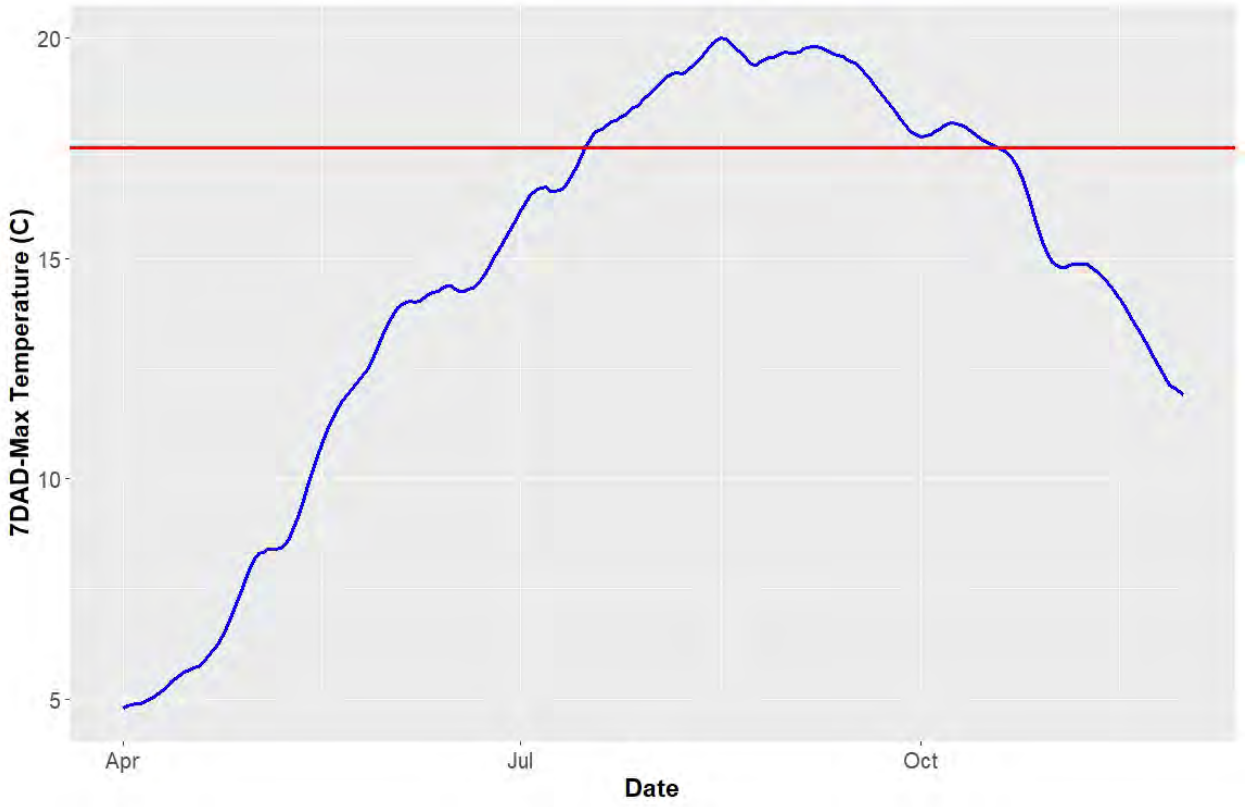

Figure 11. 2023 water temperature data collected in the Wells Dam Tailrace. Horizontal reference line indicates the 17.5°C WQS.

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 2013-2021 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 from July 15, 2023, and ending on October 19, 2023 (near surface sensor) and October 20, 2023 (middle and near bottom sensor; Figure 12). During this period, the differences between 7-DADMax temperatures between surface, middle, and bottom sensors ranged between 0.0 and 0.5°C. The average difference between these three depths was 0.12°C. These data confirm that consistent with previous years the Wells Project forebay does not thermally stratify.

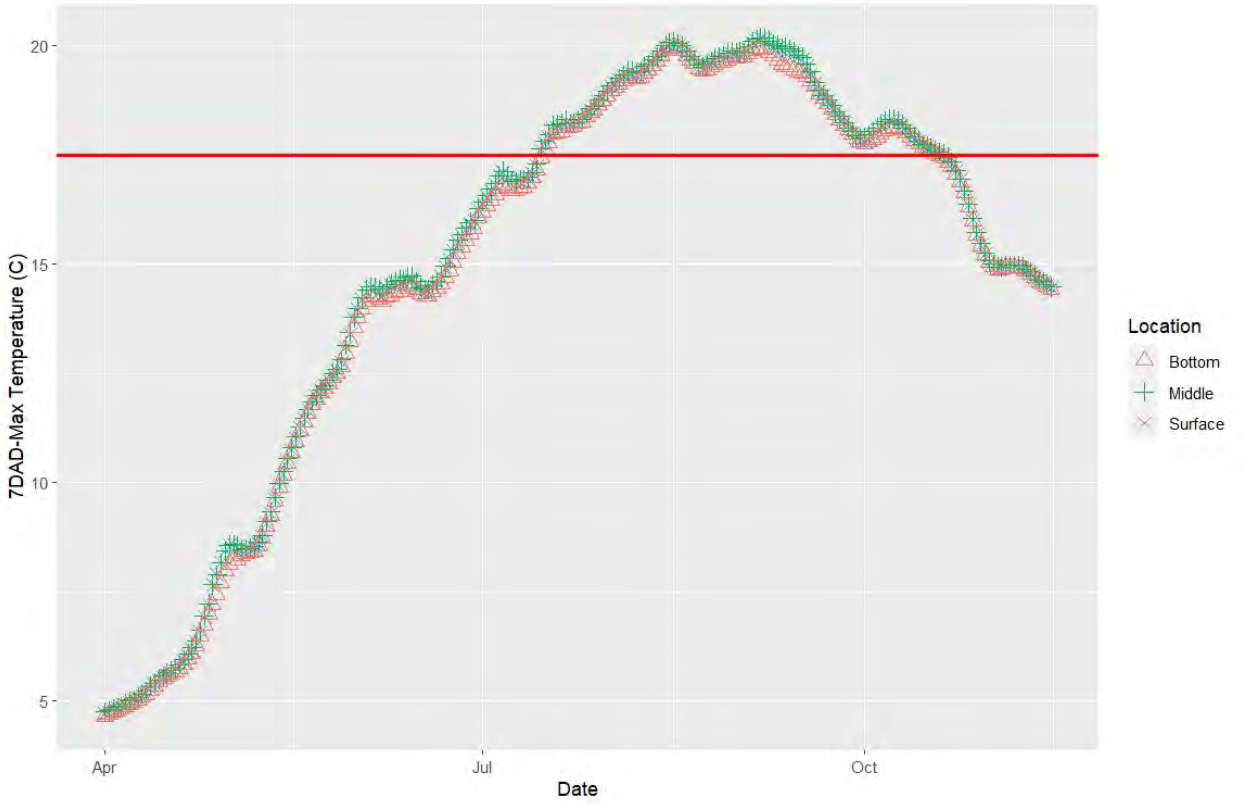

Figure 12. 2023 water temperature data collected in the Wells Dam Forebay at three depths. Temperature profiles show the lack of stratification in this location during this period. Horizontal reference line indicates the 17.5°C WQS.

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 16, 2023 to October 19, 2023 (Figure 13).

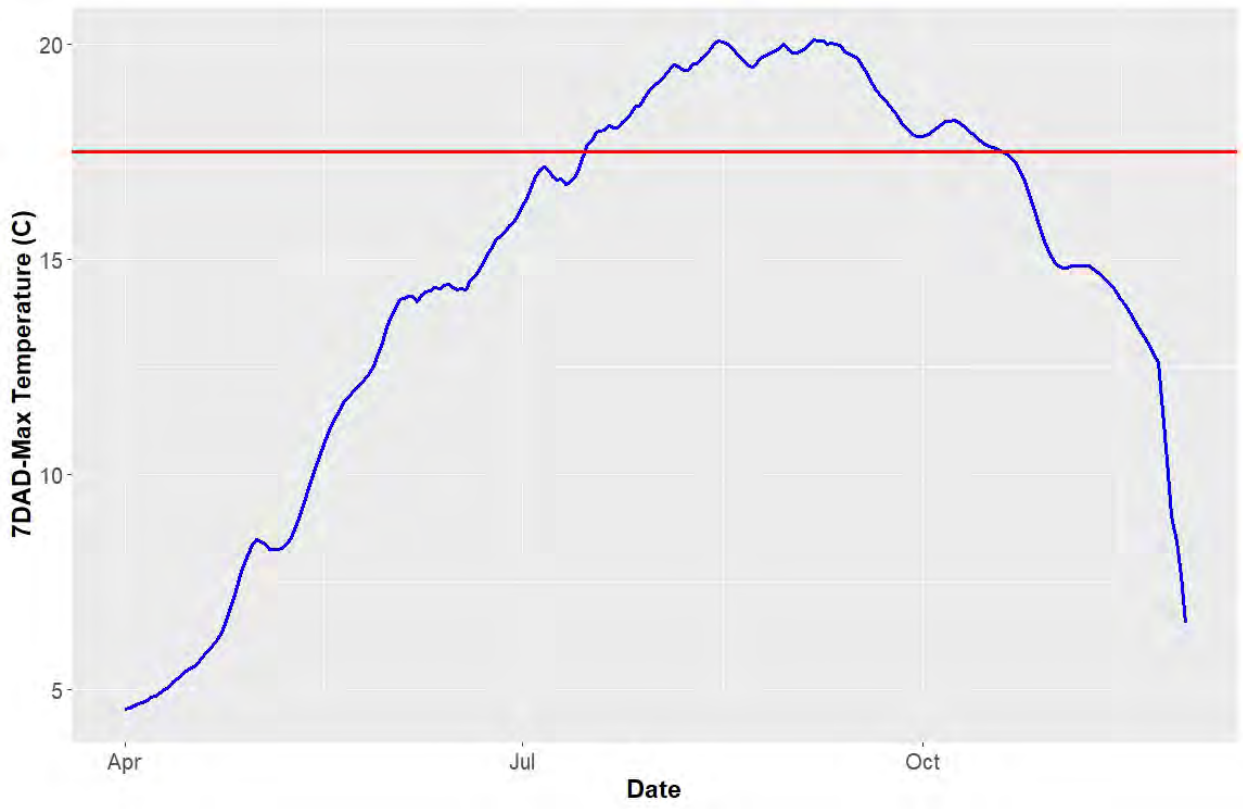

Figure 13. 2023 water temperature data collected in the Auxiliary Water Supply system at Wells Dam. Horizontal reference line indicates the 17.5°C WQS.

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 did not reach this threshold in 2023 with the highest water temperature being recorded as 20.3°C on August 15, 2023. In addition, temperatures were above the 7-DADMax (17.5ºC) from July 15, 2023 to October 22, 2023 (Figure 14).

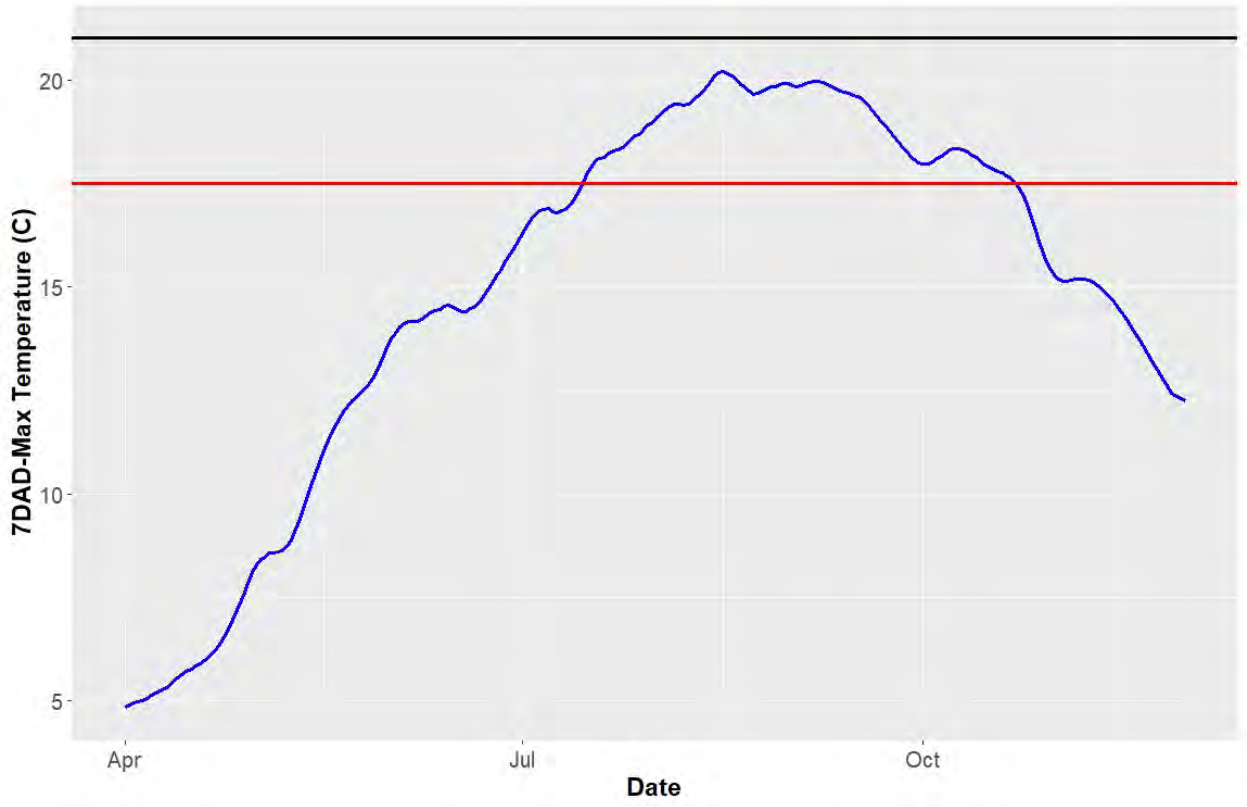

Figure 14. 2023 water temperature data collected in Pool 39 of the east fish ladder at Wells Dam. The horizontal line at 21ºC (black line) denotes the threshold whereby adult broodstock trapping at Wells Dam discontinues and the horizontal line at 17.5 (red line) denotes the 17.5ºC 7-DADMax.

3.3.9 Water Temperature Data by Location

Water temperature data from the 2023 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 2023 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	95	7/20/23 – 10/22/23
Okanogan RM 10.5	4/1 – 10/31 (n = 214)	214	115	5/29/23 – 9/20/23
Methow RM 1.5	4/1 – 10/31 (n = 214)	189	86	6/24/23 – 9/17/23
Wells Forebay Pier Nose 6	4/1 – 10/31 (n = 214)	214	96	7/16/23 – 10/19/23
Wells Tailrace	4/1 – 10/31 (n = 214)	214	95	7/16/23 – 10/18/23
Wells Forebay Surface	5/1 – 11/15 (n = 199)	199	97	7/15/23 – 10/19/23
Wells Forebay Mid	5/1 – 11/15 (n = 199)	199	98	7/15/23 – 10/20/23
Wells Forebay Deep	5/1 – 11/15 (n = 199)	199	98	7/15/23 – 10/20/23
Auxiliary Water Supply	5/1 – 11/15 (n = 199)	199	96	7/16/23 – 10/19/23
Pool 39 East Fish Ladder	5/1 – 11/15 (n = 199)	199	100	7/15/23 – 10/22/23

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 2023 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 2023 was continuous for most stations with the Methow River being the exception.

In general, data indicate that the thermal regime observed during the Wells Project relicensing process is still reflective of current observations. In 2023, temperatures warmed to above the WQS criteria of 17.5°C earlier than has been typical in recent years (mid-July rather than late-July) and remained so later into the year as well (Table 1). This was likely due to the short duration run-off that occurred in May leading to low water conditions beginning earlier in the summer. At each monitoring location, there was an increase of at least ten additional days over 17.5°C compared to 2022. 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 2023 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

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Appendix F
Pacific Lamprey Management Plan 2023 Annual Report

PACIFIC LAMPREY MANAGEMENT PLAN

2023 ANNUAL REPORT

WELLS HYDROELECTRIC PROJECT

FERC PROJECT NO. 2149

March 2024

Prepared by:
Public Utility District No. 1 of Douglas County
East Wenatchee, Washington

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 2023 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 2023

In 2023, the Wells Dam fishways were operated in accordance with the criteria outlined in the HCP. No modifications to fishway operating criteria were implemented therefore, no evaluation of effects on Pacific Lamprey passage were warranted.

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 2023

During the fish ladder maintenance period in 2023, 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 2023

During 2023, 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 2023 was 696 (Table 1).

Table 1. Total lamprey counts for the 2023 calendar year, ten-year (2014-2023) average, and range of counts for adult Pacific Lamprey at mid-Columbia River hydroelectric projects.

	Priest Rapids	Wanapum	Rock Island	Rocky Reach	Wells
2023	13,147	11,223	7,631	7,644	696
10-year Average	9,203	9,168	5,523	5,920	290
Range	1,750-26,012	1,502-28,463	481-21,137	319-23,986	0-1,684

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 2023

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 2023. 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 2023

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 2023 annual fishway maintenance period. Additionally in 2023, perforated plating was installed along the bottom of fishway weir 41 in both ladders in preparation for potential adult lamprey trapping during the 2024 season. A tour of the east fishway occurred on December 7, 2023, and was attended by Aquatic SWG members representing Yakama and 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 will fund four weeks of Lamprey trapping at Priest Rapids Dam and translocate up to 1000 Pacific Lamprey within or upstream of the Wells Project. In 2023, a total of 1007 adult Lamprey were translocated by Douglas PUD above Wells Dam.

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 2023

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 will be presented in a report provided to the Aquatic SWG in 2024.

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 2023

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 2023

In 2023, 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 2023

Douglas PUD conducted salvage activities during dewatering of the Wells Dam fishways for the 2023 fishway maintenance period. During the December 2023 winter maintenance outage, one larval lamprey and six juvenile lamprey were collected from the west fishway and four larval lampreys and forty juvenile lampreys were collected from the east fishway (Table 2). No adults were encountered. All larval and juvenile lampreys salvaged from the fishways were safely released into the Columbia River.

Table 2. Pacific Lamprey encountered during fishway salvage efforts in 2023.

LIFE STAGE	EAST FISHWAY	WEST FISHWAY
Larval	4	1
Juvenile	40	6
Total	**44**	**7**

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 2023

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 2023. 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 2023

Tag technologies and methodologies for use in studying downstream passage and survival of Pacific Lamprey are currently available. 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. This topic was discussed at length in the Aquatic SWG and within a juvenile lamprey passage informal workgroup comprised of the Rocky Reach and Priest Rapids Fishery Forums. Yakama 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 2023, 16,705 Pacific Lamprey (1 adult, 65 juveniles, and 16,640 larvae) were captured at the Methow River Smolt Trap at McFarland Creek Bridge in 2023 (Figure 1), of which 443 Pacific Lamprey (1 adult, 11 juveniles, and 431 larvae) were PIT tagged. This was the maximum number of total lamprey observed at the Methow River Smolt Trap (Figure 2). Additionally, in 2023, 23 larval Pacific Lamprey were captured at the Twisp River Smolt Trap, of which, 19 were PIT tagged and released (Figure 3). In 2023, for the first time since 2019, small larval lamprey (<60 mm) were found in the Twisp River Smolt Trap (D. Grundy, WDFW, personal communication). Two other smolt traps were run in the Methow basin in 2023, on the Chewuch River and the Methow River upstream of Winthrop (Upper Methow). A total of 295 lamprey were observed at the Chewuch River Smolt Trap (3 juveniles and 292 larvae). In the Upper Methow Smolt Trap, 102 larvae were observed. No PIT tags were implanted in any of the lamprey encountered in either of those traps.

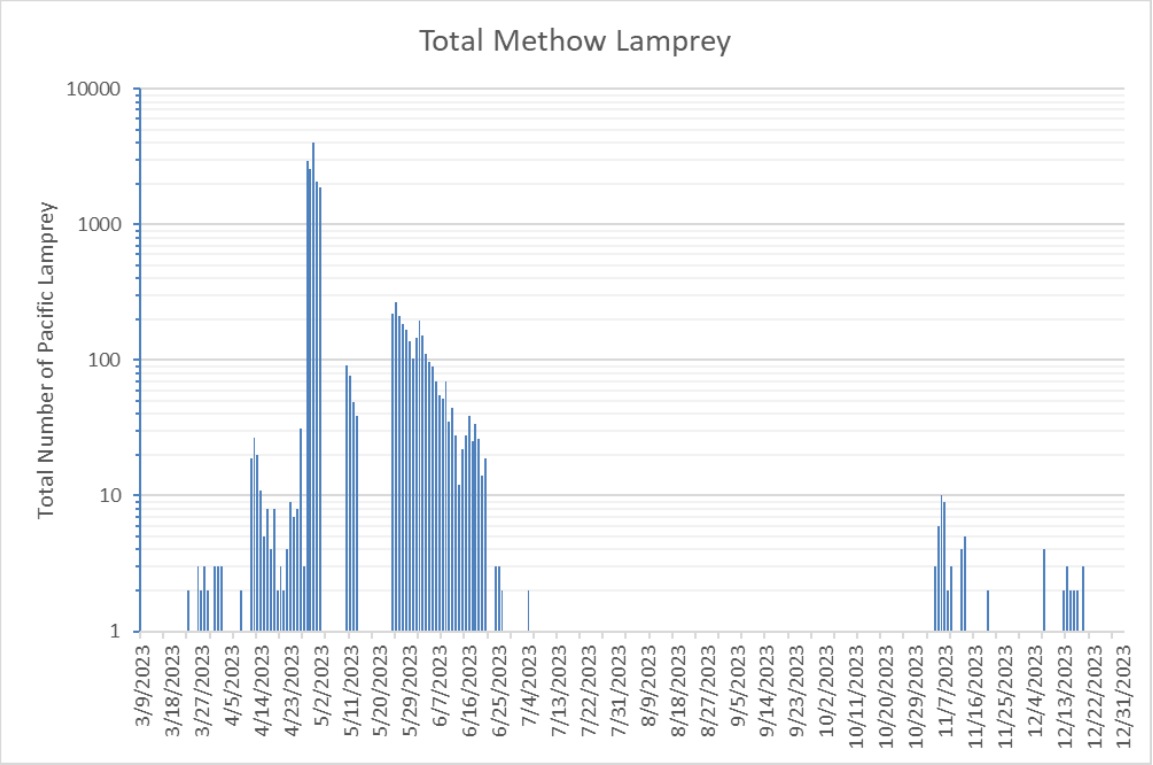

Figure 1. **Total daily Pacific Lamprey catch at Methow River Smolt Trap. Most lamprey are observed during the spring run-off period. Note the logarithmic scale of y-axis.**

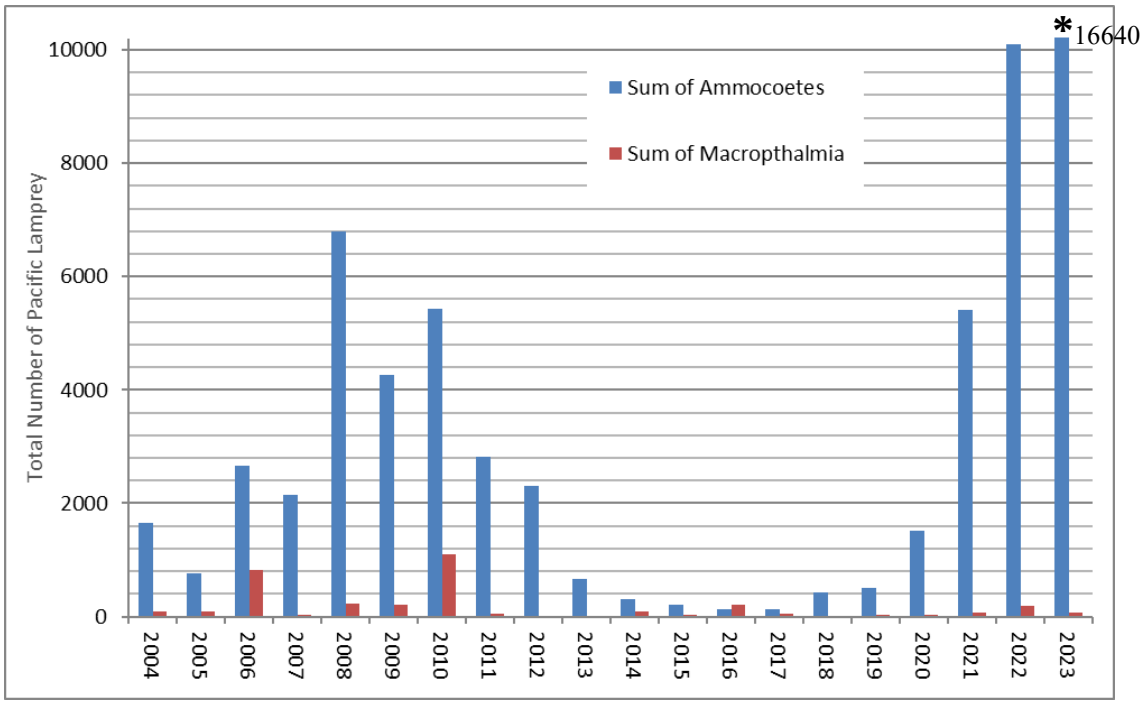

Figure 2. **Total annual lamprey observed at Methow River Smolt Trap from 2004 – 2023.**

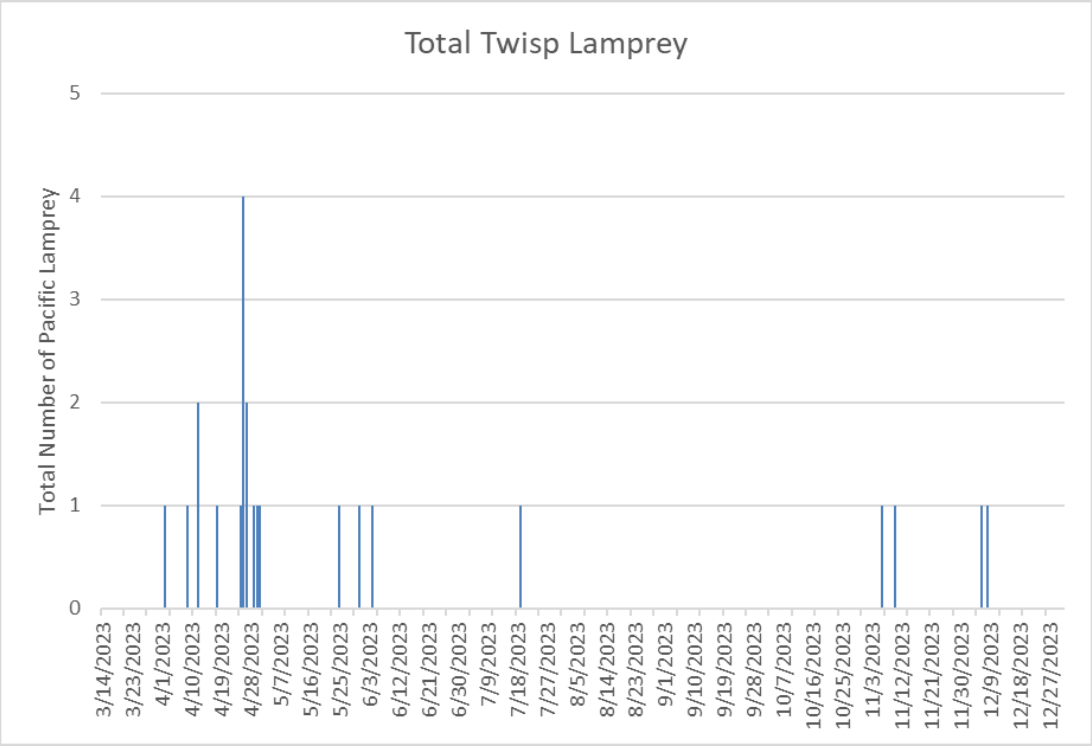

Figure 3. Total daily Pacific Lamprey catch at Twisp River Smolt Trap.

There was a statistically significant difference in length between fish captured at all of the Methow basin smolt traps except for the Twisp and Upper Methow traps (Figure 4 and 5): means of 106.5 mm in the Methow trap, 119.7 mm in the Chewuch trap, 140.0 mm in the Twisp trap, and 151.3 mm in the Upper Methow trap (Tukey HSD, all pairs significant to $p<0.005$ except Upper Methow and Twisp [$p=0.10$]).

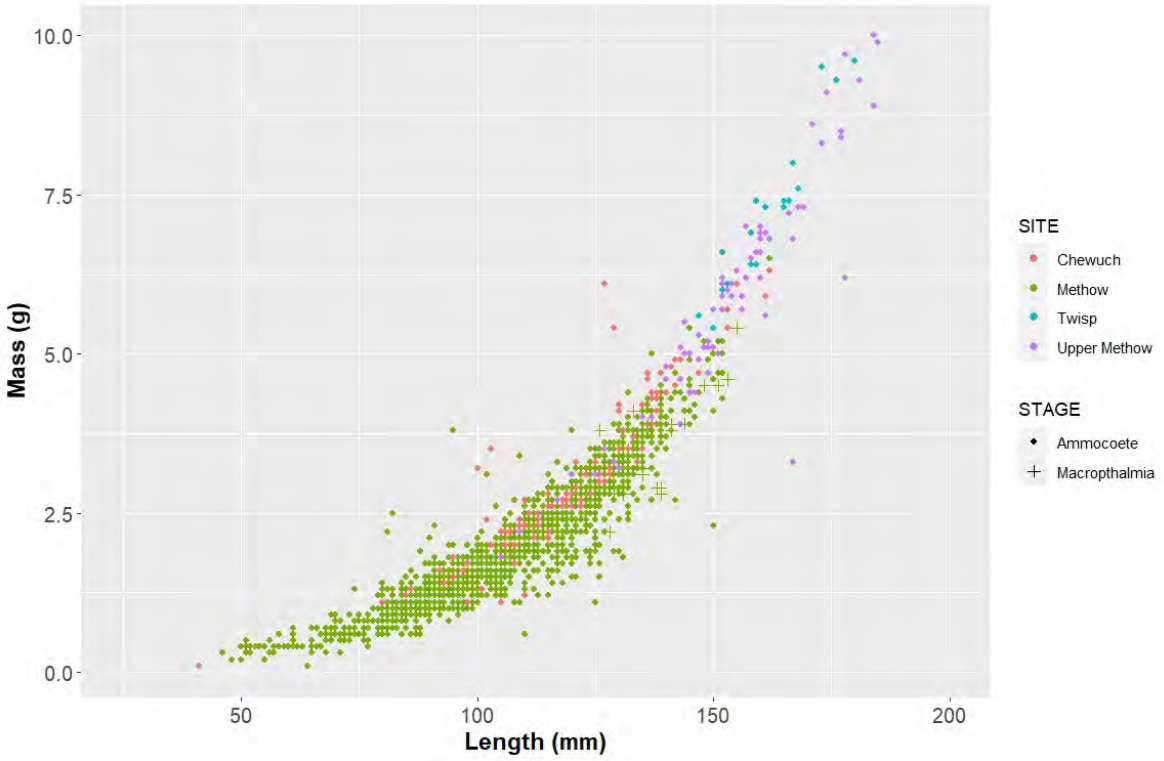

Figure 4. **Total length and mass of Pacific Lamprey captured and measured at the Methow River and Twisp River Smolt Traps in 2023.**

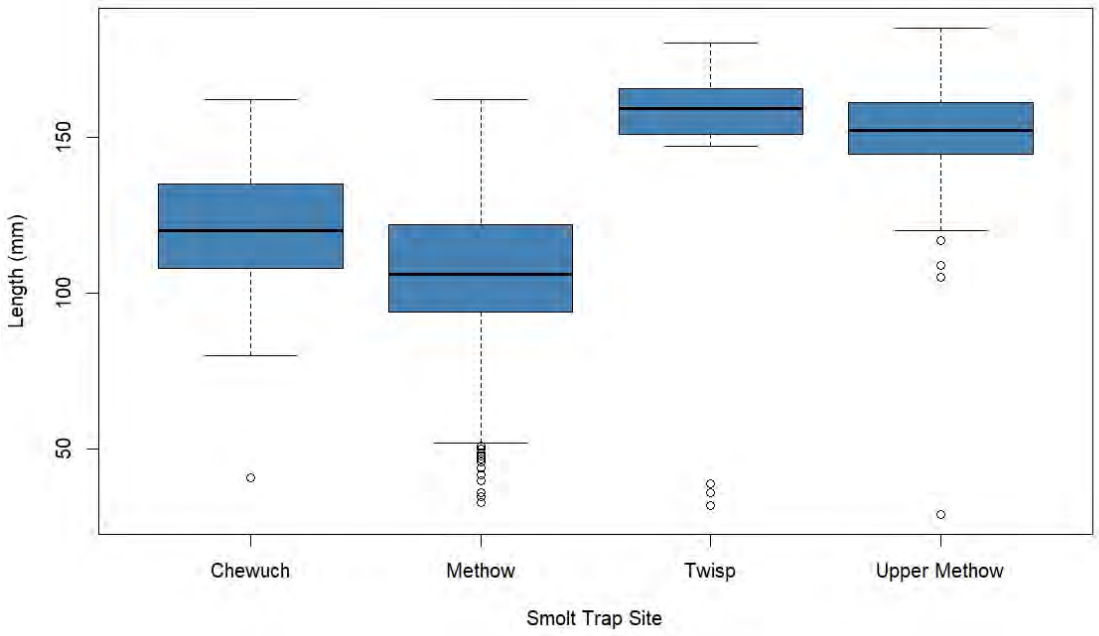

Figure 5. **Comparison of length of juvenile and larval Pacific Lamprey caught in 2023 Methow basin smolt traps.**

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 3). Three fish that were tagged in 2021 were not observed at the lower Methow River interrogation site until 2022. The lamprey PIT tagged at the Twisp River Smolt Trap have a much higher post-tagging detection rate: 26 (81.3%) of fish tagged in 2022 were detected downstream at the lower Twisp River interrogation site and two of those were observed in 2023 at Methow River interrogation sites (one at the lower Methow site and the other at the Methow River at Carlton site; Table 4). Complete tag histories and associated biometric data are publicly available at www.ptagis.org.

Table 3. 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
2021	627	9 (1.4%)	3 (0.5%)	--
2022	224	NA	16 (7.1%)	--
2023	429	NA	NA	1 (<1%)

Table 4. 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
2021	0	--	--	--
2022	32	NA	24 (75%)	2* (6.3%)
2023	19	NA	NA	9^ (47%)

**Both fish were observed in the lower Twisp River in 2022 and then in the Methow River in 2023. Both were larvae when tagged in 2022.*
^Eight fish observed at the Lower Twisp array; one in the Methow River at Carlton.

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 2022

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 2023

In 2023, 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 7th Annual Lamprey Information Exchange in Vancouver, Washington, in December 2023.

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 2023

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.

Appendix G
Aquatic Nuisance Species Management Plan 2023 Annual Report

AQUATIC NUISANCE SPECIES MANAGEMENT PLAN
2023 ANNUAL REPORT

WELLS HYDROELECTRIC PROJECT

FERC PROJECT NO. 2149

March 2024

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 2023. Within Section 3.1, a section entitled “Progress Towards Objective X in 2023” outlines actions taken in 2023 and other related information. To help differentiate between existing management plan language and actions taken in 2023, new information for 2023 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 2023

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

Between July 24, 2023 and July 28, 2023, 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 2023. 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 2023

Similar to previous years, Douglas PUD coordinated zebra and quagga mussel monitoring with WDFW during 2023. 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 (Figure 1). In addition, environmental DNA (eDNA) sampling was employed in 2023 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 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 74 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 2024, 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 2023 to determine if Northern Pike are present. eDNA samples were collected at five locations, two samples at each location for a total of 10 samples, throughout the Wells Project monthly March through October (Figure 1). The Northern Pike Monitoring and Response Plan was developed in the Aquatic SWG in May 2019 (see Aquatic Settlement Agreement 2019 Annual Report) that 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 2023 in the Wells Project.**

Table 1. Summary of zebra and quagga mussel monitoring efforts in 2023.

Date	Location	Sample Type	Zebra/Quagga Present
19-Jul	Pateros winter boat launch dock	Artificial Substrate	No
19-Jul	Brewster boat launch dock	Artificial Substrate	No
18-Jul	Bridgeport boat launch dock	Artificial Substrate	No
19-Jul	100 m downstream of Methow River mouth	Veliger Tow	No
19-Jul	100 m downstream of Brewster swimming area	Veliger Tow	No
18-Jul	100 m downstream of Bridgeport boat launch	Veliger Tow	No
19-Jul	Pateros winter boat launch dock	Shoreline Survey	No
19-Jul	Brewster boat launch dock	Shoreline Survey	No
18-Jul	Bridgeport boat launch dock	Shoreline Survey	No
14-Aug	Pateros winter boat launch dock	Artificial Substrate	No
14-Aug	Brewster boat launch dock	Artificial Substrate	No
15-Aug	Bridgeport boat launch dock	Artificial Substrate	No
14-Aug	100 m downstream of Methow River mouth	Veliger Tow	No
14-Aug	100 m downstream of Brewster swimming area	Veliger Tow	No
15-Aug	100 m downstream of Bridgeport boat launch	Veliger Tow	No
14-Aug	Pateros winter boat launch dock	Shoreline Survey	No
14-Aug	Brewster boat launch dock	Shoreline Survey	No
15-Aug	Bridgeport boat launch dock	Shoreline Survey	No
11-Sep	Pateros winter boat launch dock	Artificial Substrate	No
11-Sep	Brewster boat launch dock	Artificial Substrate	No
11-Sep	Bridgeport boat launch dock	Artificial Substrate	No
11-Sep	100 m downstream of Methow River mouth	Veliger Tow	No
11-Sep	100 m downstream of Brewster swimming area	Veliger Tow	No
11-Sep	100 m downstream of Bridgeport boat launch	Veliger Tow	No
11-Sep	Pateros winter boat launch dock	Shoreline Survey	No
11-Sep	Brewster boat launch dock	Shoreline Survey	No
11-Sep	Bridgeport boat launch dock	Shoreline Survey	No
24-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
24-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
24-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 (eFish) was used to monitor for the presence of Northern Pike. Monitoring occurred in two locations (Figure 2) on six occasions from April to June 2023 (Table 2). No Northern Pike were captured during these efforts.

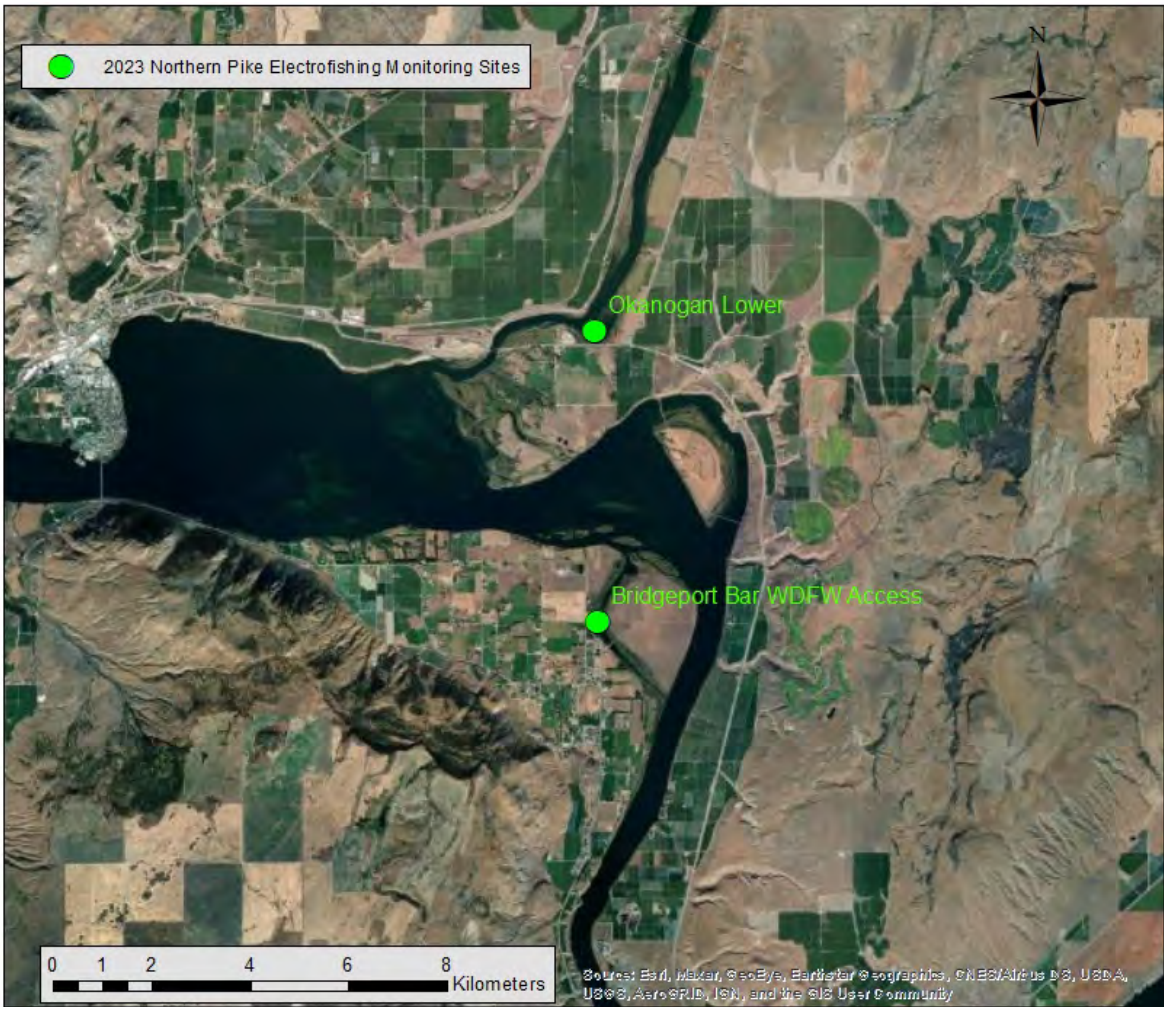

Figure 2. Locations of Northern Pike electrofishing monitoring sites in 2023.

Table 2. Northern Pike electrofishing monitoring efforts in 2023.

Location	Date	eFish Effort	Water Temp °C
Okanogan Lower	4/5/2023	0:28:09	9
Bridgeport Bar WDFW	4/27/2023	0:20:10	12
Bridgeport Bar WDFW	5/4/2023	0:21:10	14
Okanogan Lower	6/6/2023	0:24:43	18
Bridgeport Bar WDFW	6/6/2023	0:14:47	17
Bridgeport Bar WDFW	6/21/2022	0:10:37	17

In 2023, the Aquatic SWG compiled 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 2023

Douglas PUD monitored bycatch for ANS during aquatic resource management activities in 2023. Specific activities in which monitoring of bycatch occurred included: Northern Pikeminnow removal program and resident fish monitoring. Annual crayfish monitoring occurred from October 16 through October 25, 2023 (Figure 3). This monitoring effort utilized baited rectangular crayfish traps and resulted in the capture and removal of 121 non-native Northern Crayfish Orconectes virilis.

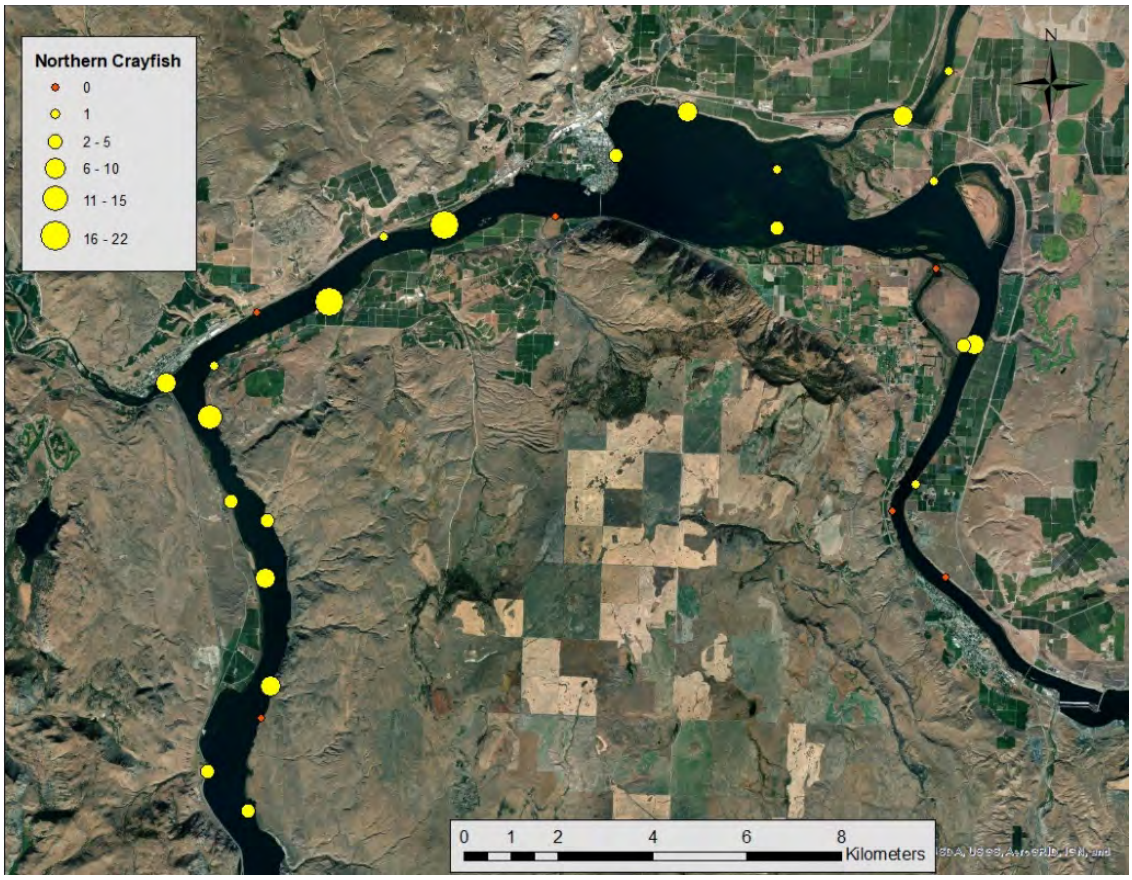

Figure 3. Map of crayfish sampling locations and number of non-native Northern Crayfish captured at each site.

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 2023

In 2023, 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 2024.

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 2023

No significant changes in Project operations occurred in 2023.

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 – 2023 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	3/24/2023	N	N
Side Channel West	Columbia River	11N	299865	5328165	3/24/2023	N	N
Bridgeport Left	Columbia River	11N	299280	5322462	3/24/2023	N	N
Bridgeport Right	Columbia River	11N	299599	5322484	3/24/2023	N	N
Starr Right	Columbia River	11N	284441	5318202	3/23/2023	N	N
Starr Left	Columbia River	11N	285514	5318239	3/23/2023	N	N
Mosquito Left	Okanogan River	11N	2398342	5331245	3/24/2023	N	N
Mosquito Right	Okanogan River	11N	298162	5331190	3/24/2023	N	N
Wakefield Right	Okanogan River	11N	298474	5342914	3/24/2023	N	N
Wakefield Left	Okanogan River	11N	298488	5342994	3/24/2023	N	N
Side Channel East	Columbia River	11N	299931	5328108	4/17/2023	N	N
Side Channel West	Columbia River	11N	299865	5328165	4/17/2023	N	N
Wakefield Right	Okanogan River	11N	298474	5342914	4/13/2023	N	N
Wakefield Left	Okanogan River	11N	298488	5342994	4/13/2023	N	N
Bridgeport Left	Columbia River	11N	299280	5322462	4/17/2023	N	N
Bridgeport Right	Columbia River	11N	299599	5322484	4/17/2023	N	N
Starr Right	Columbia River	11N	284441	5318202	4/18/2023	N	N
Starr Left	Columbia River	11N	285514	5318239	4/18/2023	N	N
Side Channel East	Columbia River	11N	299931	5328108	5/31/2023	N	N
Side Channel West	Columbia River	11N	299865	5328165	5/31/2023	N	N
Bridgeport Left	Columbia River	11N	299280	5322462	5/30/2023	N	N
Bridgeport Right	Columbia River	11N	299599	5322484	5/30/2023	N	N
Starr Right	Columbia River	11N	284441	5318202	5/31/2023	N	N

Site	Waterbody	Zone	Easting	Northing	Date Collected	Dreissenid mussels eDNA Detected?	Northern Pike eDNA Detected?
Starr Left	Columbia River	11N	285514	5318239	5/31/2023	N	N
Side Channel East	Columbia River	11N	299931	5328108	6/19/2023	N	N
Side Channel West	Columbia River	11N	299865	5328165	6/19/2023	N	N
Bridgeport Left	Columbia River	11N	299280	5322462	6/19/2023	N	N
Bridgeport Right	Columbia River	11N	299599	5322484	6/19/2023	N	N
Starr Right	Columbia River	11N	284441	5318202	6/20/2023	N	N
Starr Left	Columbia River	11N	285514	5318239	6/20/2023	N	N
Mosquito Left	Okanogan River	11N	298342	5331245	6/20/2023	N	N
Mosquito Right	Okanogan River	11N	298162	5331190	6/20/2023	N	N
Wakefield Right	Okanogan River	11N	298474	5342914	6/20/2023	N	N
Wakefield Left	Okanogan River	11N	298488	5342994	6/20/2023	N	N
Side Channel East	Columbia River	11N	299931	5328108	7/18/2023	N	N
Side Channel West	Columbia River	11N	299865	5328165	7/18/2023	N	N
Bridgeport Left	Columbia River	11N	299280	5322462	7/18/2023	N	N
Bridgeport Right	Columbia River	11N	299599	5322484	7/18/2023	N	N
Starr Right	Columbia River	11N	284441	5318202	7/19/2023	N	N
Starr Left	Columbia River	11N	285514	5318239	7/19/2023	N	N
Mosquito Left	Okanogan River	11N	298342	5331245	7/19/2023	N	N
Mosquito Right	Okanogan River	11N	298162	5331190	7/19/2023	N	N
Wakefield Right	Okanogan River	11N	298474	5342914	7/17/2023	N	N
Wakefield Left	Okanogan River	11N	298488	5342994	7/17/2023	N	N
Side Channel East	Columbia River	11N	299931	5328108	8/14/2023	N	N
Side Channel West	Columbia River	11N	299865	5328165	8/14/2023	N	N
Mosquito Left	Okanogan River	11N	298342	5331245	8/16/2023	N	N
Mosquito Right	Okanogan River	11N	298162	5331190	8/16/2023	N	N
Wakefield Right	Okanogan River	11N	298474	5342914	8/16/2023	N	N

Site	Waterbody	Zone	Easting	Northing	Date Collected	Dreissenid mussels eDNA Detected?	Northern Pike eDNA Detected?
Wakefield Left	Okanogan River	11N	298488	5342994	8/16/2023	N	N
Bridgeport Left	Columbia River	11N	299280	5322462	8/15/2023	N	N
Bridgeport Right	Columbia River	11N	299599	5322484	8/15/2023	N	N
Starr Right	Columbia River	11N	284441	5318202	8/14/2023	N	N
Starr Left	Columbia River	11N	285514	5318239	8/14/2023	N	N
Side Channel East	Columbia River	11N	299931	5328108	9/11/2023	N	N
Side Channel West	Columbia River	11N	299865	5328165	9/11/2023	N	N
Mosquito Left	Okanogan River	11N	298342	5331245	9/14/2023	N	N
Mosquito Right	Okanogan River	11N	298162	5331190	9/14/2023	N	N
Wakefield Right	Okanogan River	11N	298474	5342914	9/14/2023	N	N
Wakefield Left	Okanogan River	11N	298488	5342994	9/14/2023	N	N
Bridgeport Left	Columbia River	11N	299280	5322462	9/11/2023	N	N
Bridgeport Right	Columbia River	11N	299599	5322484	9/11/2023	N	N
Starr Right	Columbia River	11N	284441	5318202	9/12/2023	N	N
Starr Left	Columbia River	11N	285514	5318239	9/12/2023	N	N
Side Channel East	Columbia River	11N	299931	5328108	10/24/2023	N	N
Side Channel West	Columbia River	11N	299865	5328165	10/24/2023	N	N
Mosquito Left	Okanogan River	11N	298342	5331245	10/25/2023	N	N
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Bridgeport Left	Columbia River	11N	299280	5322462	10/23/2023	N	N
Bridgeport Right	Columbia River	11N	299599	5322484	10/23/2023	N	N
Starr Right	Columbia River	11N	284441	5318202	10/24/2023	N	N
Starr Left	Columbia River	11N	285514	5318239	10/24/2023	N	N

Appendix B – 2023 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

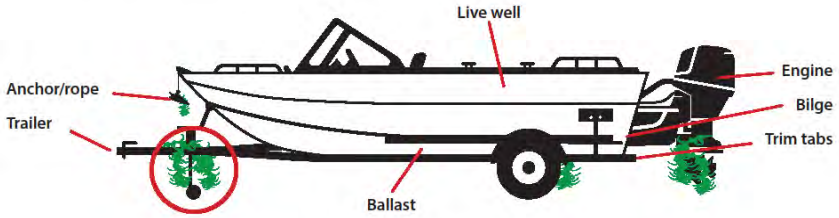
Clean interior/exterior of boat, trailer, & vehicle of any organic matter such as aquatic plants & mud. Dispose organic matter & unused bait in trash.

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 2023 Annual Report

RESIDENT FISH MANAGEMENT PLAN 2023 ANNUAL REPORT

WELLS HYDROELECTRIC PROJECT

FERC PROJECT NO. 2149

March 2024

Prepared by:
Public Utility District No. 1 of Douglas County
East Wenatchee, Washington

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 2023

Douglas PUD implemented predator control activities for Northern Pikeminnow in 2023. The Northern Pikeminnow control program resulted in the removal of 8,329 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 85% of the bycatch.

Table 4.1-1 Bycatch during the 2023 Northern Pikeminnow Control Program

Species	Number Captured
Peamouth (*Mylocheilus caurinus*)	699
Chiselmouth (*Acrocheilus alutaceus*)	702
suckers spp. (Catostomus spp.)	113
Burbot (*Lota lota*)	36
sculpin (Cottus spp.)	23
Redside Shiner (*Richardsonius balteatus*)	22
Northern Pikeminnow / Chiselmouth hybrids	22
White Sturgeon (*Acipenser transmontanus*)	6
Brown Bullhead catfish (*Ameiurus nebulosus*)	2

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 2023

Douglas PUD continued to implement its Land Use Policy in 2023.

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 2023

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). The next Resident Fish Assemblage Study is scheduled to take place in 2024.

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 2023

No major shifts in native resident fish populations were identified by the 2014 Resident Fish Assemblage Study.

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 2023

No significant changes in Wells Project operations occurred in 2023.

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

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Appendix I
2023 Aquatic Settlement Agreement and Workgroup Action Plan

2023 AQUATIC SETTLEMENT AGREEMENT AND WORKGROUP ACTION PLAN
APPROVED MARCH 8, 2023

A) Annual Report and Webpage

1. Distribute 2022 Aquatic Settlement Agreement (SA) Annual Report to Aquatic SWG, BIA and NMFS **March, 2023**
2. Final Annual Report approved by Aquatic SWG and NMFS **May 2023**
3. Annual Report filed with FERC **May 31, 2023**
4. Maintain Aquatic Settlement Web Portal/Database **Throughout 2023**
5. Maintain/Update public website **Throughout 2023**

B) White Sturgeon MP

1. Continue rearing BY2022 juvenile sturgeon **January-June 2023**
2. BY2022 Juvenile sturgeon tagging/marking and SAP screening **February 2023**
3. Incorporate 2022 White Sturgeon MP activities into Aquatic SA Annual Report to the FERC **May 2023**
4. 2022 Reproductive Assessment Report **February 2023**
5. Release n ~ 325 (≥200 g) juvenile sturgeon (BY2022) with Educational Outreach **May/June 2023**
6. Evaluation of Adult Passage Measures **June 2023**
7. Phase II larvae collection for BY2023 **June-July 2023**
8. Rearing of BY2023 juvenile sturgeon for 2024 release **June-December 2023**
9. Technical participation in regional forums **Throughout 2023**

C) Bull Trout MP

1. Enumerate bull trout in Wells Dam count windows **Throughout 2023**
2. Monitor (via counts) for sub-adults at Wells Dam (>10/year triggers additional measures) **Throughout 2023**
3. ESA bull trout Incidental Take Report to the FWS for review and approval **April 2023**
4. Incorporate 2022 Bull Trout MP activities and incidental take monitoring into Aquatic SA annual Report to the FERC **May 2023**
5. Continue Bull Trout Movement and Life History Investigation, Tag n = 60, >450mm FL Bull Trout at Wells Dam and the Twisp Weir **January-April 2023**
6. Track study fish throughout study range **Continue tracking from fall 2022-fall 2023**
7. Provide annual update to Aquatic SWG on PIT tag detection histories for 2022/2023 tagged adults **Ongoing**
8. Bull trout Movement and Life History Investigation draft report **December 2023**
9. Bull trout salvage during ladder maintenance **January 2023/December 2023**
10. Recovery planning participation/regional coordination **Throughout 2023**

D) Water Quality MP

1. 2022 Gas Abatement Plan (GAP) Report to ASWG and NMFS for review **January 2023**
2. 2022 Gas Abatement Plan Report approval **February 2023**
3. 2022 Gas Abatement Plan Report filed with the FERC **February 2023**
4. Update the QAPP at the request of the Aquatic SWG **Throughout 2023**
5. 2023 Gas Abatement Plan and Bypass Operating Plan Draft for review **January 2023**
6. 2023 Gas Abatement Plan approval **February 2023**
7. 2023 Gas Abatement Plan filed with the FERC for approval **February 2023**
8. Draft 10-year Water Quality Attainment Plan Report **June 2023**
9. Biological monitoring of resident and salmonid fishes for Gas Bubble Trauma **April-August 2023**
10. Year-round TDG monitoring at three locations (hourly with web-accessibility) **Throughout 2023**
11. Real-time temperature monitoring at n = 6 locations (hourly with web-accessibility) **Throughout 2023**
12. 2022 Water Temperature Report to Aquatic SWG and HCP CC for comments **March 2023**
13. 2022 Water Temperature Report approval **May 2023**
14. 2022 Water Temperature Report to the FERC **May 2023**
15. Water Quality Attainment Plan (WQAP) implementation **Throughout 2023**
16. Water Quality Protection Plan, as needed (60 d before action), for Future Construction Activities **Throughout 2023**
17. Participate in WQ forums (e.g.,TMDL, Columbia River Treaty, STT-WQ, CSR-SRI, etc.) **Throughout 2023**
18. Incorporate Water Quality MP Activities into Aquatic SA Annual Report to the FERC **May 2023**
19. Participate in the implementation of final EPA issued water temperature TMDL **Throughout 2023**

E) Pacific Lamprey MP

1. Continued implementation of Adult Approach and Passage Study **January – July 2023**
2. Draft Adult Approach and Passage Report to Aquatic SWG **September – November 2023**
3. Update PIT Tag Detection "last seen table" History tables **December 2023**
4. Juvenile lamprey PIT tagging and migration monitoing Methow River at Carlton RST and annual update of PIT tag detection histories to Aquatic SWG **March-August 2023**
5. Ladder salvage during winter maintenance **January 2023 and December 2023**
6. Regional participation in forums and technical information sharing **Throughout 2023**
7. Incorporate Pacific Lamprey MP activities into Aquatic SA Annual Report to the FERC **May 2023**
8. Update lamprey literature review document libraries **November 2023**

F) Aquatic Nuisance Species MP

1. Apply ANS Best Management Practices for all in-water construction work **Throughout 2023**
2. Verify condition of ANS signs at boat launches and add Northern Pike signage **Throughout 2023**
3. ANS pamphlets at Wells Project boat launches and visitor overlook **Throughout 2023**
4. Zebra mussel monitoring with substrate mats and plankton tows **June-October 2023**
5. Crayfish incidental captures database management **Throughout 2023**
6. Crayfish monitoring **October 2023**
7. Northern Pike monitoring – eDNA and ASWG approved suppression **March-October 2023**
8. Update, as needed, the Northern Pike Rapid Respose and Erradication Plan **Throughout 2023**
9. Cyanobacteria monitoring and if needed public health advisories **Thoughout 2023**
10. Regional coordination e.g. Northwest Regional Northern Pike Coordination Forum **Throughout 2023**
11. Incorporate 2022 ANSMP activities into Aquatic SA Annual Report to the FERC **May 2023**

G) Resident Fish MP

1. 2022 Pikeminnow Report to Aquatic SWG and HCP CC for review **January 2023**
2. 2021 Pikeminnow Report incorporated into Aquatic SA Annual Report to the FERC **May 2023**
3. Resident Fish Electrofishing monitoring **April-August 2023**
4. 2023 Pikeminnow control activities **March-November 2023**
5. Regional coordination including Yakama Nation/CRITFC if lamprey found in stomach analysis or other monitoring **Throughout 2023**
6. Incorporate Resident Fish MP activities into Aquatic SA Annual Report to the FERC **May 2023**
7. Draft 2024 Resident Fish Assemblege Study Plan to Aquatic SWG for review **December 2023**

Appendix J
White Sturgeon Supplementation and Management Plan Implementation in the Wells Reservoir, 2022

White Sturgeon Supplementation and Management Plan Implementation in the Wells Reservoir, 2022

David Robichaud[1] and Chas Kyger[2]

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Prepared for:
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East Wenatchee, WA

LGL LIMITED
environmental research associates

On the cover: Emily Vinge, Senior Fish Hatchery Specialist, with a White Sturgeon captured during indexing in September 2023.

Suggested Reference:
Robichaud, D. and C. Kyger. 2023. White Sturgeon Supplementation and Management Plan Implementation in the Wells Reservoir, 2022. Report for Public Utility District No. 1 of Douglas County, East Wenatchee, WA.

EXECUTIVE SUMMARY

In 2012, Public Utility District No. 1 of Douglas County (Douglas PUD) began implementing its White Sturgeon Management Plan (WSMP). Phase I components of the WSMP included supplementation releases, an acoustic telemetry program, an index monitoring program, and research toward determining natural reproduction potential.

For population supplementation, Douglas PUD has released 22,149 hatchery-produced juvenile White Sturgeon (*Acipenser transmontanus*) into the Wells Reservoir since 2014. From 2014-2017, more than 5,000 fish were released annually. Based on modelling conducted in consultation with the Aquatic Settlement Workgroup, the stocking strategy was changed: starting in 2018 and continuing through 2022 the goal has been to release ~325 fish annually at ~200 g per fish. Since 2018, the number of hatchery sturgeon released has totaled 1,676, and the average lengths and weights of fish released since 2020 have been significantly larger than in any previous year. All of the hatchery fish were affixed with a Passive Integrated Transponder (PIT) tag and marked by the removal of specific lateral scutes.

Monitoring and evaluation (M&E) of released fish and the wild population has taken place in years 2015 through 2019, and from 2021-2022. In all years of the M&E, the index monitoring program included stratified-random setline sampling. For the M&E, two setline configurations have been used, one ('juvenile' gear) with smaller hooks (2/0 and 4/0), and the other ('adult' gear) with larger hooks (size 14/0, 16/0, 18/0, and 20/0), thicker lines, and heavier anchors. Juvenile and adult gear has been used to varying degrees in the Wells Reservoir since 2015 and 2016, respectively, although no sampling occurred in 2020. For each set, the total number of sturgeon caught was recorded. All captured sturgeon were scanned for PIT tags, measured (fork length, weight), and any fish without a PIT tag or scute mark (including 3 wild-origin fish in 2022) had one applied. In 2022, there were 427 White Sturgeon capture events with catch rates of 1.087 fish per line on the juvenile gear, and 1.760 fish per line on the adult gear. The tag loss rate was 1.60% overall, and 0.00% for wild-origin sturgeon.

For the acoustic telemetry program, a portion of hatchery-produced juvenile White Sturgeon were outfitted with acoustic tags prior to release from the hatchery; and longer-life acoustic tags were applied *in situ* (upon recapture) to some larger hatchery sturgeon, including 10 in 2022. Moreover, 18 wild-origin fish, encountered in the indexing setlines, were also acoustic-tagged. Acoustic tracking was completed using an array of receivers distributed throughout the Wells Project from Chief Joseph Dam to Wells Dam, in the Columbia River mainstem between Wells and Rocky Reach dams, and in the Okanogan River. Also, PIT-tag detection arrays were deployed in the Methow and Okanogan rivers, and at Rocky Reach Dam and Wells Dam fish ladders. All telemetry data were processed using LGL's proprietary software, *Telemetry Manager*. The overall emigration rate for acoustic tagged hatchery sturgeon was 11.1%, whereas no wild-origin acoustic tagged fish have been detected downstream of Wells Dam.

Tracking results from 2012-2018 have been summarized in previous reports (e.g., Robichaud and Gingerich 2018, 2019). Most of the acoustic tags used in this study have since expired, except for 8 wild-origin and 11 hatchery fish that were tagged with large (10-year battery life) tags, all of which have been tracked throughout the post-tagging period. One fish held a stable position except for one foray up the Okanogan River. All others made frequent movements but showed reduced activity in the late winter. General seasonal movements were observed, including the use of the Okanagan River mouth (and possibly in the river as well) in the summer (May-June), followed by major use of the most upstream areas of the Wells Reservoir, including the Chief Joseph tailrace, Bridgeport, and the Foster Creek zone

from June through mid-September. Tracked adults did not make long-distance movements over the winter season and were generally detected on receivers in relatively localized areas.

Apparent survival rates were estimated using Cormack-Jolly-Seber models, based on the PIT tag mark and recapture data. Several model forms were tested, and in most cases the most parsimonious model for hatchery sturgeon was that which allowed both survival and detection probability to vary over time. True survival was calculated by taking emigration and tag loss into account. Survival of the BY2013 immediately after release was considerably higher than subsequent cohorts (this is also reflected in the CPUE data). True survival of BY2013 fish from release to 2015 (13 months) was 33.8% per year (SE = 1.1%), whereas initial survival for BY2014 (1 month from June to July 2015) was 23.3% (SE = 6.3%) per month. After the initial period in the reservoir, survival rates improved considerably (89.0 to 95.5% annually for BY2013, and 76.0 to 99.5% per month for the other cohorts). For wild-origin fish, model averaging produced annual survival estimates that were relatively high, but with large error bounds.

Abundance of White Sturgeon in the Wells Reservoir, exclusive of the 2021 and 2022 release years, was estimated using closed population models to be 2,056 fish (CL = 591 to 23,054). Several model forms were tested, and model averaging was used to weigh the results from each model form when calculating the final abundance estimates. Results suggested that 32% of the fish in the Reservoir were from BY2013, 34% from BY2014, and 17% from BY2016.

Hatchery fish released in 2022 saw changes in length (average = 42 mm increase) and weight (average = 18.2 g) within the first few months after release. These rates were some of the lowest of any cohort to date, except for the fish released in 2021, possibly owing to the their large size upon release. Growth of wild-origin fish averaged 9.5 cm/year.

In terms of the natural reproduction potential in the Wells Reservoir, we note the continued existence of spawning-sized adults. Acoustic-tracking of eight adult-sized (> 1.5 m) wild-origin sturgeon will continue into the future.

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1 INTRODUCTION

White Sturgeon (*Acipenser transmontanus*) populations in the Columbia River are facing challenges, including the fragmentation of the once-continuous habitat into individual reservoirs. As part of the relicensing of Wells Dam, attention was given to the White Sturgeon residing in Wells Reservoir (Reservoir), and a White Sturgeon Management Plan (WSMP) was drafted. The goal of the WSMP is to increase White Sturgeon abundance in the Wells Reservoir to a level that can be supported by the available habitat, and for the population to be characterized by a diverse age structure consisting of juveniles and adults from multiple cohorts.

Pursuant to the WSMP, the Public Utility District No. 1 of Douglas County (Douglas PUD) has been conducting supplementation, monitoring, and evaluation activities. Phase I of the WSMP spans from 2014 to 2022. Details of the supplementation and monitoring activities that occurred between 2014 and 2021 can be found in Robichaud and Gingerich (2018, 2019, 2020, 2022). Described in this report are details including methodology and results of our 2022 activities, including: 1) annual supplementation releases of Passive Integrated Transponder (PIT)-tagged hatchery-reared juvenile White Sturgeon; 2) monitoring of survival, growth, distribution, and emigration of the hatchery-reared fish; 3) indexing of large and naturally-produced sturgeon; and 4) continued monitoring of acoustic-tagged sturgeon in the reservoir.

2 BACKGROUND

2.1 White Sturgeon Management Plan

The 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 Wells Project license. Together with the Wells Anadromous Fish Agreement and Habitat Conservation Plan (HCP), the plans function in support of the Clean Water Act Section 401 Water Quality Certification for the Wells Hydroelectric Project (Project) and are required to meet the terms and conditions of the Projects federal FERC license (Project 2149).

To ensure active stakeholder participation and support, Douglas PUD developed all of the resource management plans in close coordination with agency and tribal natural resource managers (i.e., the Aquatic Settlement Work Group [SWG]). Active 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. During the development of this plan, the Aquatic SWG focused on developing management priorities for resources potentially impacted by Project operations.

Based upon the information available as of December 2006, the Aquatic SWG determined that an assessment of 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 to increase the number of fish within the

Wells Reservoir. In addition to initial supplementation activities, implementation of a Monitoring and Evaluation (M&E) program was prescribed to accurately assess natural recruitment, juvenile habitat use, emigration, carrying capacity, and the potential for natural reproduction, so as to inform the scope of a future, longer-term supplementation strategy. 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.

All objectives of the WSMP were developed to meet the WSMP goal. All PMEs presented within the WSMP are designed to meet the WSMP's objectives. The specific objectives of the WSMP are:

- *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;
- *Objective 5*: Evaluate whether there is biological merit to providing safe and efficient adult upstream passage; and
- *Objective 6*: Identify White Sturgeon educational opportunities that coincide with WSMP activities.

2.2 Monitoring and Evaluation

As part of Douglas PUD's implementation of the WSMP contained within the Agreement, Douglas PUD has implemented White Sturgeon M&E from 2015 to 2021. The '*Phase I: White Sturgeon Management Plan Monitoring and Evaluation Study*' Plan was approved by the Aquatic SWG in December 2013 and January 2014 (Douglas PUD 2014).

Components of White Sturgeon monitoring and evaluation include:

- an *Index Monitoring Program* (section 4.2.1 of the WSMP);
- an *Acoustic-Tracking Program* (section 4.2.2 of the WSMP); and
- research towards *Determining Natural Reproduction Potential* (section 4.2.3 of the WSMP).

The current report details the progress made and results generated in 2022. Details of the M&E activities that occurred between 2014 and 2021 can be found in Robichaud and Gingerich (2018, 2019, 2020, 2022).

2.3 Broodstock and Breeding Plan (Supplementation Plan)

Following the November 2012 Federal Energy Regulatory Commission (FERC) license issuance, and consistent with requirements found in Section 4.1.1 of the WSMP, Douglas PUD and Aquatic SWG partners developed a Broodstock and Breeding Plan (BSBP) for the purposes of determining how Douglas PUD will meet stocking goals for White Sturgeon. Once approved by the Aquatic SWG, Douglas PUD filed the BSBP and the associated consultation record with the FERC on February 13, 2013. The FERC subsequently approved the BSBP on May 28, 2013. Following review and approval within the Aquatic SWG, on May 14, 2018, Douglas PUD filed an updated White Sturgeon

Supplementation Plan (WSSP) with the FERC (Douglas PUD 2018). The WSSP has been used since 2019 to meet supplementation goals outlined in section 4.1.2 of the WSMP and as approved by the Aquatic SWG through various statements of agreement (SOA).

As identified in the WSMP, stocking targets are outlined as follows: within two years following issuance of the new license, Douglas PUD was required to release up to 5,000 yearling White Sturgeon into the Wells Reservoir annually for four consecutive years (20,000 fish total; years 2014-2017). The number of juvenile sturgeon to be stocked during the remainder of Phase I (years 2018-2022) is not to exceed 15,000 (a maximum of 35,000 juvenile sturgeon during all of Phase I). After reviewing the available M&E data from the Wells Project (i.e., Robichaud and Gingerich 2016) and elsewhere (e.g., Robichaud et al. 2016, BC Hydro 2016), and after a modeling exercise was performed, the Aquatic SWG agreed (SOA, dated January 11, 2017) that 325 fish weighing 200 g would be stocked in each of the remaining years of Phase I (i.e., from 2018 to 2022).

Beginning in June of 2013, direct gamete (produced from broodstock eggs) and larval-origin (raised from wild-caught larvae) sturgeon were obtained to meet stocking targets for the first release in 2014. Under these actions, juvenile sturgeon obtained by implementing the BSBP and WSSP were reared at the Wells Fish Hatchery for approximately 11 months prior to release into the Wells Reservoir. During the stocking years 2014-2017, at least 5,000 fish were released annually and the supplementation targets were met. Starting in 2015, stocking within the Wells Reservoir has used only fish raised from wild-caught larvae, as per the Aquatic SWG recommendation and agreement.

2.4 Previous Research

From 2001-2003, Douglas PUD implemented a study to examine the White Sturgeon population within the Project (Jerald 2007). Prior to the implementation of this study, little information on White Sturgeon was available for the Wells Reservoir[1]. 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. During the summers of 2001 and 2002, setlines were deployed in the Wells Reservoir. Captured White Sturgeon were measured, marked with PIT tags and with removals of lateral scutes, and released. Additionally, a subsample was fitted with radio-transmitters to track movements, and some had pectoral fin rays sampled for age analysis (Rien and Beamesderfer 1994). 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. 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 (95% confidence interval ranged from 13 to 218 individuals; Skalski and Townsend 2005). The fork lengths of the 13 fish that were captured from 2001-2003 ranged from 60-202 cm. Two of the fish were classified as juveniles (< 90 cm

[1] WDFW catch record card returns for 1993 and 1994 indicated that legal size White Sturgeon were present in the Wells Reservoir (Brad James, WDFW, pers. comm.). Additionally, information from previous studies in upstream and downstream reservoirs supported the existence of a population.

fork length) while 11 were classified as sub-adults or adults. It is important to note that the capture methodology was not designed to provide accurate sampling of fish under 50 cm. Captured fish ranged in age from 6 to 30 years old (n = 11), 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 through: 1) spawning within the Wells Reservoir; and/or 2) immigration into the Wells Reservoir from populations upstream.

From 2014-2021, a total of 21,817 hatchery-produced juvenile White Sturgeon were released into the Wells Reservoir. From 2014-2017, more than 5,000 fish were released annually, but starting in 2018 and continuing through 2022, the goal was to release fewer (~325) but larger (~200 g) fish annually. All of the hatchery fish were affixed with a PIT tag and marked by the removal of specific lateral scutes; and 99 of these fish were outfitted with an acoustic tag prior to release. Larger, longer-life acoustic tags were applied *in situ* to 51 recaptured hatchery-reared fish, and to 18 fish that were apparently of wild-origin. Acoustic-tracking was completed using an array of 18-23 receivers distributed throughout the Wells Project from the Chief Joseph Dam tailrace to the Wells Dam tailrace. Additional receivers were deployed by Chelan PUD throughout the Rocky Reach Reservoir. PIT-tag detection arrays were deployed in the Methow and Okanogan rivers, and at Rocky Reach Dam and Wells Dam fish ladders. Indexing monitoring that targeted juvenile fish was conducted using small hook setlines (size 2/0 & 4/0 circle hooks) from 2015 to 2017 and in 2019 and 2021 (which included 441 capture events in 2015, 723 in 2016, 610 in 2017, 836 in 2019, and 298 in 2021). Indexing monitoring that targeted larger (subadult, adult, natural production) sturgeon was conducted using large-hook setlines (size 14/0, 16/0, 18/0, and 20/0 circle hooks) from 2016 to 2019 and in 2021 (which included 86 capture events in 2016, 267 in 2017, 319 in 2018, 267 in 2019, and 407 in 2021). Survival of the hatchery-reared juvenile sturgeon varied by release year and by time since release (Robichaud and Gingerich 2022). Data from the acoustic tagged wild-origin fish suggest 100% annual survival. Small fish that were tagged at the hatchery appeared to spread out from their release site, without marked subsequent movements (Robichaud and Gingerich 2018). Whereas the larger, *in-situ* tagged fish were relatively active throughout the year (with reduced activity in winter) and appeared to make longer-distance movements relative to smaller fish (Robichaud and Gingerich 2022). Growth rates tended to decline with age, and were, on average, faster than those observed in nearby Columbia River impoundments (Robichaud and Gingerich 2022). Abundance of White Sturgeon in the Wells Reservoir (exclusive of the 2020 and 2021 release years) was estimated to be 2,432 fish (CL = 1,466 to 5,426), and suggested that 48% of the fish in the Reservoir were from BY2013, and 24% from BY2016. Ageing of wild-origin captures produced evidence of recruitment (brood years 2011 and 2012). Other monitoring activities (adult indexing, side-scan sonar) proved the continued existence of spawning-sized adults (Robichaud and Gingerich 2018).

3 METHODS

3.1 Study Site

The core study area extended from the tailrace of Chief Joseph Dam to the tailrace of Wells Dam. Wells Dam (Figure 1) is located at river mile (RM) 515.6 on the Columbia River in the State of Washington,

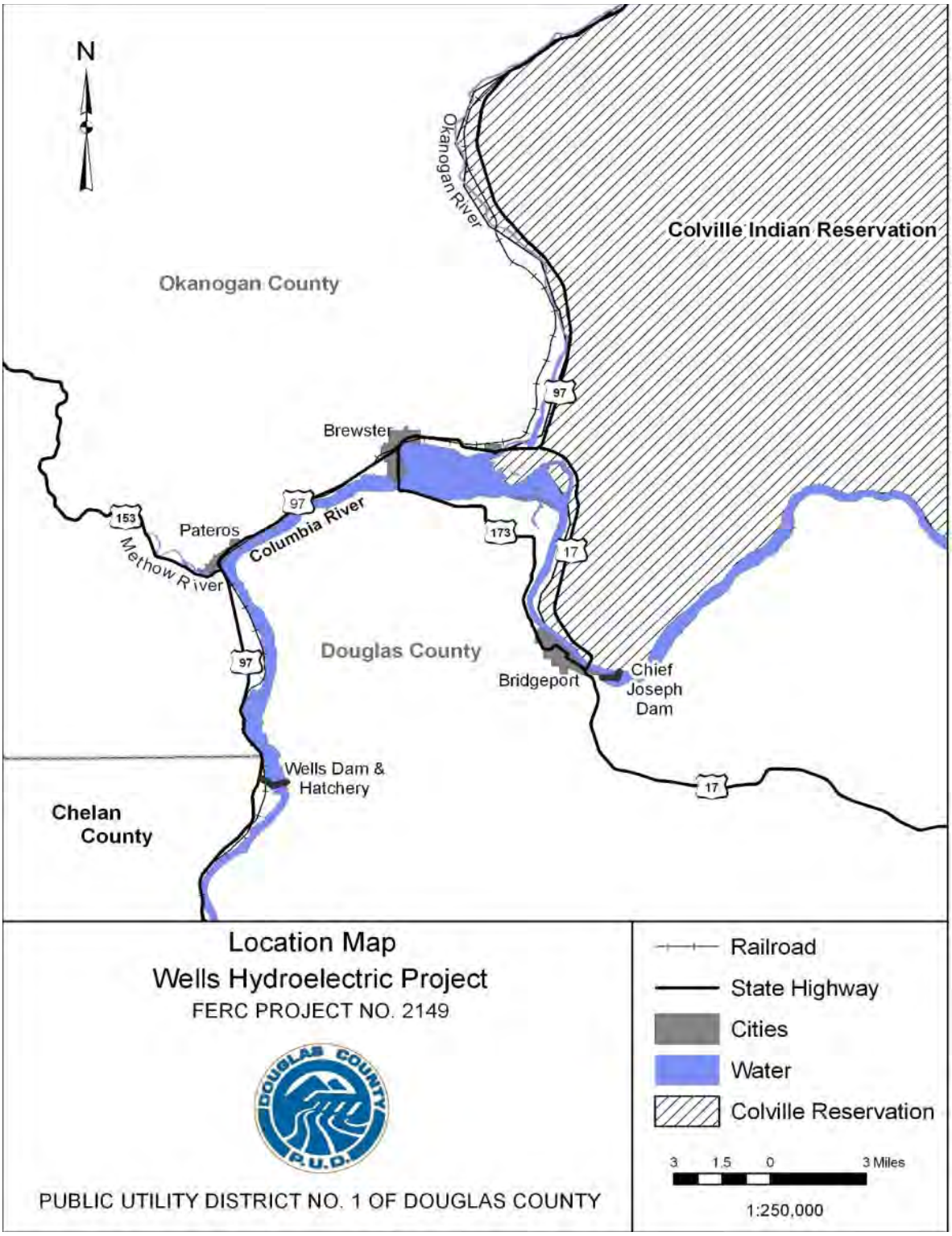

Figure 1. Location map of the Well Project.

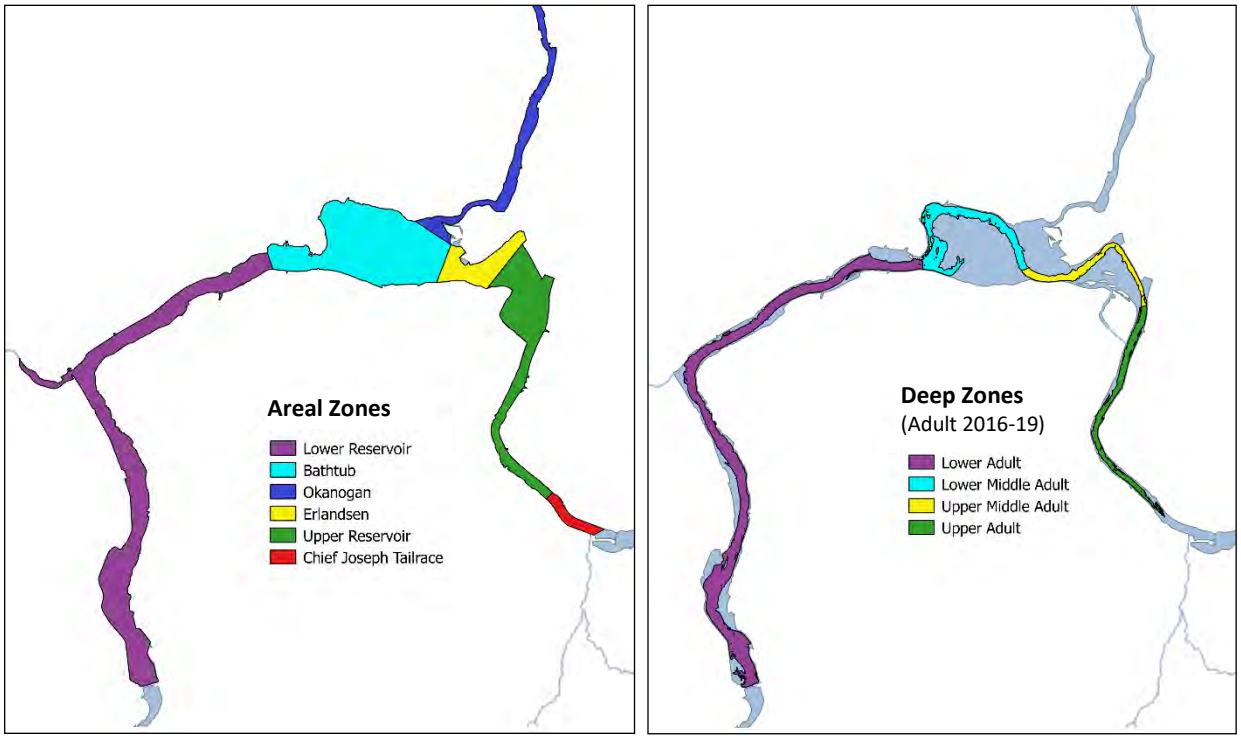

Figure 2. **Locations and boundaries of the sampling zones into which the Wells Reservoir study area was partitioned. The full area of the reservoir was partitioned into six zones (left; for juvenile indexing, and also for adult indexing starting in 2021). The deep parts of the reservoir were partitioned into four zones (right; for adult indexing from 2016 to 2019).**

approximately 30 river miles downstream from the Chief Joseph Hydroelectric Project, which is owned and operated by the United States Army Corps of Engineers; 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 Reservoir is approximately 30 miles long. The Methow and Okanogan rivers are tributaries of the Columbia River within the Wells Reservoir (Figure 1). 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. For the purposes of M&E, the Reservoir was divided into six sampling zones (Figure 2, left), but note that from 2016-19, the adult indexing research used four sampling zones (Figure 2, right).

3.2 Supplementation

Under the WSMP, the supplementation stocking plan was to differ between the first part of Phase I (2014-2017), and the second part (2018-2022). From 2014 to 2017, ~5,000 PIT-tagged hatchery-reared juvenile sturgeon were released into the Wells Reservoir annually (Table 1). Based on modelling conducted in consultation with the Aquatic Settlement Workgroup, the annual stocking goal since 2018 has been to

Table 1. Douglas PUD's releases of PIT-tagged sturgeon, by release date, brood year (BY), location (Washburn Island vs. Bridgeport), and origin (wild-caught larval fish vs. direct gamete fish).

	Washburn Island		Near Bridgeport, WA		TOTAL		
Release Date (BY)	Wild-caught Larvae	Direct Gamete	Wild-caught Larvae	Direct Gamete	Wild-caught Larvae	Direct Gamete	GRAND TOTAL
2014 (BY 2013)							
15 Jan	16	1	0	0	16	1	17
10 Apr	0	2,881	0	30	0	2,911	2,911
12 Jun	2,116	0	0	0	2,116	0	2,116
2014 TOTAL	**2,132**	**2,882**	**0**	**30**	**2,132**	**2,912**	**5,044**
2015 (BY 2014)							
1-2 Jun	4,985	0	24	0	5,009	0	5,009
2015 TOTAL	**4,985**	**0**	**24**	**0**	**5,009**	**0**	**5,009**
2016 (BY 2015)							
1 Jun	5,248	0	41	0	5,289	0	5,289
2016 TOTAL	**5,248**	**0**	**41**	**0**	**5,289**	**0**	**5,289**
2017 (BY 2016)							
2 Jun	0	0	5,131	0	5,131	0	5,131
2017 TOTAL	**0**	**0**	**5,131**	**0**	**5,131**	**0**	**5,131**
2018 (BY 2017)							
30 May	0	0	35	0	35	0	35
1 Jun	0	0	302	0	302	0	302
2018 TOTAL	**0**	**0**	**337**	**0**	**337**	**0**	**337**
2019 (BY 2018)							
30 May	0	0	99	0	99	0	99
2019 TOTAL	**0**	**0**	**99**	**0**	**99**	**0**	**99**
2020 (BY 2019)							
31 May	0	0	570	0	570	0	570
2020 TOTAL	**0**	**0**	**570**	**0**	**570**	**0**	**570**
2021 (BY 2020)							
28 May	0	0	338	0	338	0	338
2021 TOTAL	**0**	**0**	**338**	**0**	**338**	**0**	**338**
2022 (BY 2021)							
31 May	0	0	332	0	332	0	332
2021 TOTAL	**0**	**0**	**332**	**0**	**332**	**0**	**332**
GRAND TOTAL	**12,365**	**2,882**	**6,872**	**30**	**19,237**	**2,912**	**22,149**

release ~325 fish annually at ~200 g per fish (Table 2). In 2018, a total of 337 fish were released, whereas very poor hatchery survival the following winter resulted in 99 fish being released in 2019 (Table 1). To make up for it, a larger number (n=570) of sturgeon was released in 2020. In a 'return to schedule', 338 and 332 PIT tagged sturgeon were released per year in 2021 and 2022 (Table 1). The average size of released fish has varied significantly among years (length: $F = 4320$; $P < 0.0001$; weight: $F = 10920$, $P < 0.0001$; Table 2). Fish released since 2020 have been significantly larger on average than any previous release group (e.g., average weight of fish in 2020 and 2022 was 1.4 and 1.3 times heavier than in 2019; and that of fish released in 2021 was significantly (1.8 times) heavier than in 2020).

Table 2. **Average length and weight of Douglas PUD's releases of PIT-tagged sturgeon, by release year and origin. Standard errors in brackets. Statistically different years, in terms of overall mean values, are indicated using red letters.**

	Wild-caught Larvae		Direct Gamete		Overall	
Rls Year	Length (mm)	Weight (g)	Length (mm)	Weight (g)	Length (mm)	Weight (g)
2014	304.9 (0.8)	198.3 (1.5)	265.1 (0.5)	143.2 (0.7)	281.9 (0.5) E	166.5 (0.8) E
2015	234.2 (0.5)	97.6 (0.5)			234.2 (0.5) H	97.6 (0.5) H
2016	276.4 (0.5)	147.0 (0.8)			276.4 (0.5) F	147.0 (0.8) F
2017	256.6 (0.5)	118.4 (0.7)			256.6 (0.5) G	118.4 (0.7) G
2018	344.7 (1.1)	281.0 (2.9)			344.7 (1.1) D	281.0 (2.9) D
2019	367.9 (5.4)	364.7 (13)			367.9 (5.4) C	364.7 (13) C
2020	408.5 (1.3)	495.7 (4.9)			408.5 (1.3) B	495.7 (4.9) B
2021	487.0 (1.8)	916.7 (10.8)			487.0 (1.8) A	916.7 (10.8) A
2022	408.7 (1.3)	488.1 (5.6)			408.7 (1.3) B	488.1 (5.6) B

In 2014-2016, >99% of the fish were released at Washburn Island (48° 5' 17.76" N, 119° 40' 34.51" W). However, a small number of fish in 2014-16, and all fish beginning in 2017 were released near the town of Bridgeport, WA (48° 0' 53.21" N, 119° 40' 40.66" W). The Bridgeport location better accommodated an annual community outreach event where local high school and grade school students participated[2] in the release of fish (Table 1). In addition, Douglas PUD and the Aquatic SWG elected to discontinue the release of fish at Washburn in hopes of minimizing avian predation (measured as the relative number of PIT tag recoveries on the Great Blue Heron *Ardea herodias* and Double-crested Cormorant *Phalacrocorax auratus* rookery near the mouth of the Okanogan River).

3.3 Acoustic Tracking

3.3.1 Acoustic Tag Applications

All tags were uniquely-coded transmitters, manufactured by Vemco (model V9, V13 and V16 tags; Table 3), and programmed to ping once every 150-300 s (see model-specific ping rates in Table 3). The small model V9 tags were applied to age-1 fish at the hatchery, the V13 tags were applied to BY2012 and BY2013 fish caught *in situ* in 2015 during the *Indexing Monitoring Program*, and the V16 tags were used on larger-sized (> 60 cm) recaptures and wild-origin fish. Acoustic tags applied at the hatchery ensured that a fixed portion of the Brood Year (BY) was marked, whereas *in situ* tagging allowed for fish to be tagged at a larger size, hence bear a larger, more powerful tag with longer battery life (Table 3), which allowed for investigation of movement behavior of different size/age fish. Minimum, mean, and maximum lengths and weights of the acoustic-tagged fish varied by release group (Table 4).

In 2015 and 2016, one percent of the hatchery-produced juvenile sturgeon were acoustic-tagged (in addition to being PIT-tagged) prior to their release (Table 3). Only small V9 tags (with 487 d battery life) could be applied to these hatchery fish given the small size of the fish. All of these smaller tags have since expired (Table 3). Details of these releases are in Robichaud and Gingerich (2018).

[2] The following URL provides video footage of the District's white sturgeon outreach and related programs: http://dcpud.org/wells-project/aquatic-settlement-agreement/white-sturgeon-management-plan

Table 3. **Douglas PUD's releases of acoustic-tagged sturgeon, by year and tag type. Tag sets shown in red expired prior to 2018. Tag in blue expired in late 2017 or in 2018. Only the ten-year (3650 day) tags (n=29), shown in green, were still active during 2021-22.**

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	Tag's Estimated Battery Life (days)			
							487 [a]	904 [b]	1070 [c]	3650 [d]
Natural	na	7 †	1 †	8 †	2†					18 †
2012 ‡	2013	1 †							1 †	
2013	2014	50 †				9†		25 †	24 †	10 †
2014	2015	49 *				1†	49 *			1†
2015	2016		50 *				50 *			
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

‡ fish released by Chelan PUD into Rocky Reach Reservoir in 2013, and was caught and acoustic tagged in Wells Reservoir in 2015.

[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.

Table 4. Descriptive statistics of the acoustic-tagged sturgeon by release group.

BY	Acoustic Tagging Year	Tag Location	n	Fork Length (mm)			Weight (g)		
				Min	Mean	Max	Min	Mean	Max
Natural	2015	in situ	7	696	791.4	905	2,868	6,959 †	22,383 †
Natural	2016	in situ	1	1040	1040	1040	*	*	*
Natural	2017	in situ	8	1160	1889.3	2362	†	†	†
Natural	2018	in situ	2	1803	1854	1905	*	*	*
2012 ‡	2015	in situ	1	711	711	711	2,478	2,478	2,478
2013	2015	in situ	50	401	490.6	640	392	791.8	2,028
2014	2015	Hatchery	49	250	277.6	330	99.5	138.5	227.7
2015	2016	Hatchery	50	296	352.2	392	183	290.0	409.0
2013	2022	in situ	9	1,238	1,313	1,436	18,400	21,389	32,100
2014	2022	in situ	1	1,199	1,199	1,199	13,500	13,500	13,500

† the largest fish were not weighed. * no fish weighed.

‡ fish released by Chelan PUD into Rocky Reach Reservoir in 2013; was caught and acoustic tagged in Wells Reservoir in 2015.

From 2015-2018, a total of 69 acoustic tags were implanted *in situ* during the *Indexing Monitoring Program* (Table 3). In 2015, acoustic tags were implanted into 50 BY2013 fish (fish released in 2014), one BY2012 fish (a Chelan PUD Release), and 7 wild-origin fish. Additional wild-origin fish were acoustic-tagged in 2016 (n =1), 2017 (n = 8), and 2018 (n = 2). Details of these releases are in Robichaud and Gingerich (2018, 2019, 2020). No sturgeon were acoustic tagged in 2019, 2020, or 2021. In 2022, ten V16 tags were applied to BY2013 (n=9) and BY2014 (n=1) fish caught *in situ* during the *Indexing Monitoring Program.*

3.3.2 Acoustic Tracking Infrastructure

In 2022, an array of 22-26 acoustic receivers (Vemco Model VR2W) were operated by Douglas PUD to monitor White Sturgeon movement in and around the Wells Project (Appendix A, Figure 3). Specifically, receivers were positioned in order to assess emigration of released juvenile sturgeon, assess tributary use, to assess natural reproduction potential, and to focus on areas where sturgeon were thought to concentrate in the Wells Reservoir given previous research. Receivers were fixed to docks or piers, or deployed in recoverable bottom-frames. Detection ranges for the initial set of receivers were tested for each receiver in April 2015, and most were found to detect fish across the channel except for dead zones (see Singh et al. 2009, Kessel et al. 2015) in areas immediately adjacent (i.e., too close) to the receivers. Most deployments involved a pair of receivers, one located on each riverbank (Figure 3). In addition to those owned and operated by Douglas PUD, detection data from all of Chelan PUD's receivers (Figure 4, Appendix A), were also obtained, which included two in the Wells tailrace. The number of receivers deployed downstream of Wells Dam was maximized to increase the probability of tag detection in that noisy environment.

Douglas PUD initially deployed 20 receivers in the spring of 2015 at the start of the tracking study (Figure 3, Appendix A). Since then, several changes have been made to the array (see Robichaud and Gingerich 2018, 2020) either because: a) the receiver location was deemed unsuitable because of river

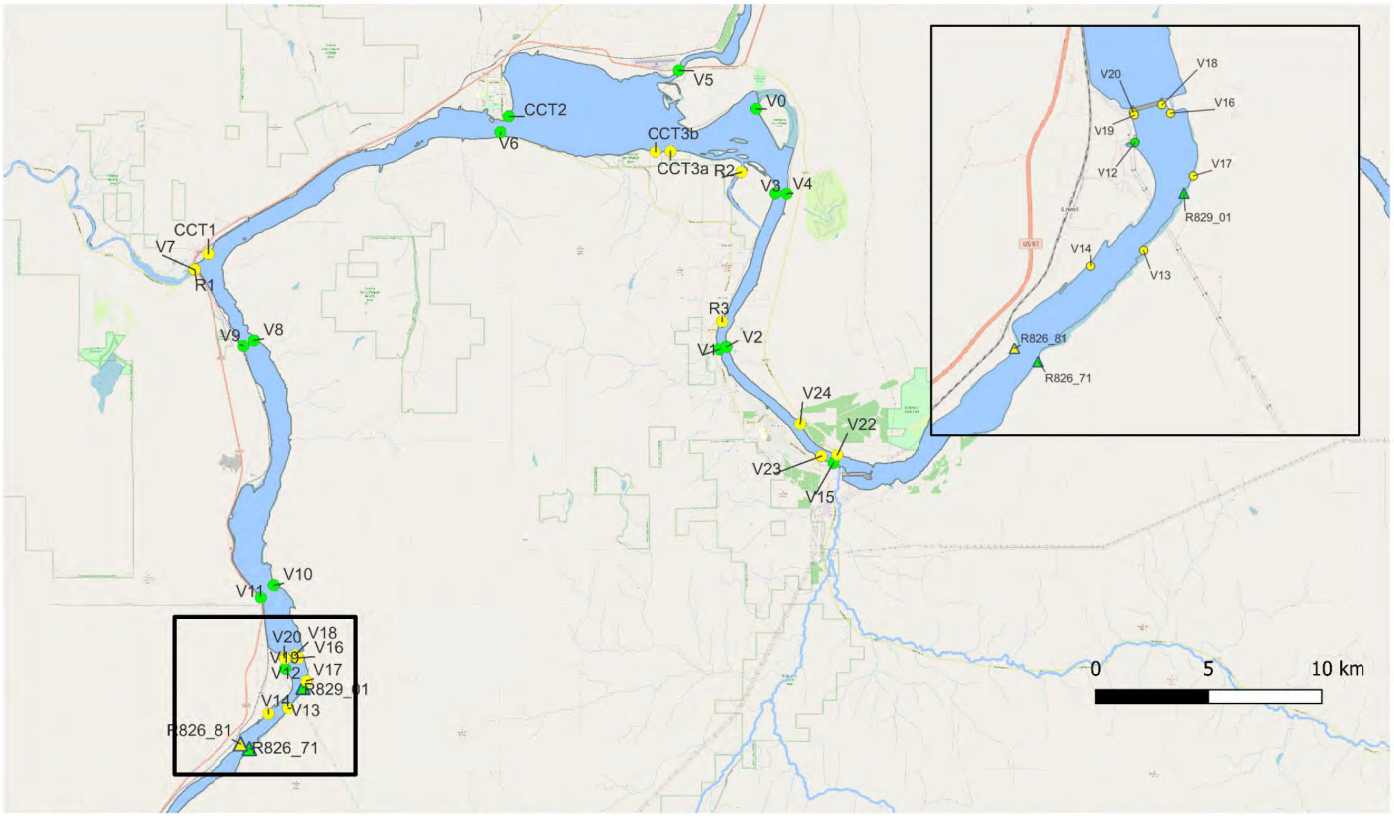

Figure 3. **Douglas (circle) and Chelan (triangle) PUD receiver locations in the study area. Inset: detail of the Wells tailrace area. Some receivers sited have full-study coverage (green) while others (yellow) were removed, lost, or added partway through the study. Not shown: three receivers in the Okanogan River. See Appendix A for deployment schedule and to decipher label abbreviations.**

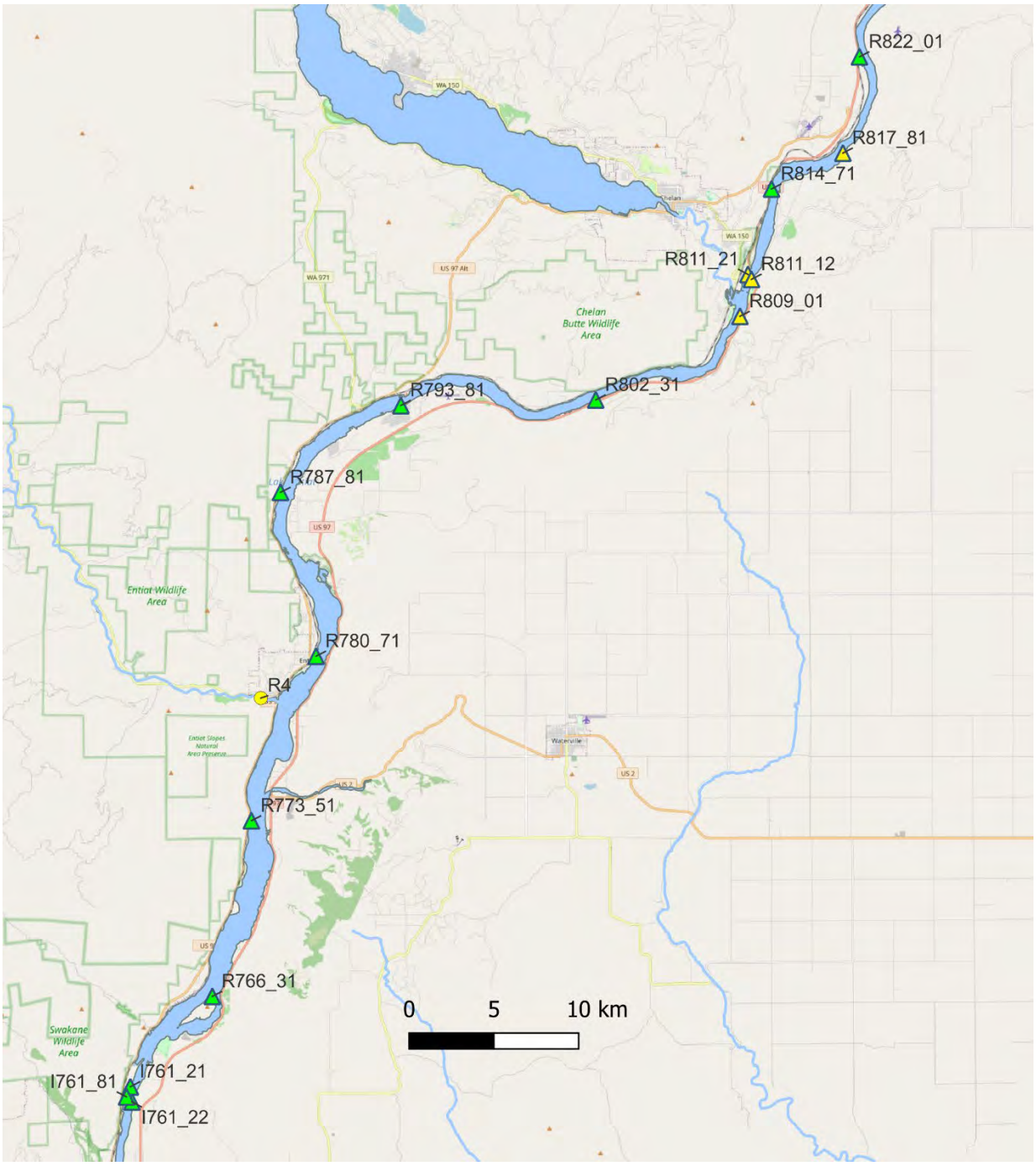

Figure 4. **Douglas (circle) and Chelan (triangle) PUD receiver locations in the Rocky Reach Reservoir, downstream of the Wells tailrace array. Some receivers (yellow) were added partway through the study. See Appendix A for deployment schedule and to decipher label abbreviations.**

conditions; b) the receiver was deemed redundant with other nearby receivers; or c) better coverage of the Project area was achieved. By the end of 2021, there were 22 Douglas County receivers in place throughout the Wells Project (Robichaud and Gingerich 2022). An additional receiver was deployed in April 2022 (Figure 3, Appendix A) to increase coverage in areas where acoustic-tagged resident fish

(Burbot *Lota lota* and Smallmouth Bass *Micropterus dolomieu*) might be detected, and three additional receivers were deployed in areas where acoustic-tagged Pacific Lamprey (*Entosphenus tridentatus*) might be detected. One receiver (near the Chief Joseph Tailrace) discovered missing in April 2022, but it was replaced in October 2022. There was a total of 26 Douglas County receivers in place by the end of 2022.

Twice annually during the study period, each receiver was pulled to the surface, inspected, and its data were downloaded. Receiver batteries have been replaced annually since the acoustic telemetry array was installed, most recently in April 2022. The most recent data download from the Wells Reservoir receivers occurred in October 2022. At that time, one of the two Chief Joseph State Park receivers was accidentally deleted prior to downloaded (data from April 13 to October 31 2022 were lost), so detection efficiencies at that gate may have suffered as a result. Appendix A provides details of the data used in this report.

3.3.3 Telemetry Data Processing

All receiver data were downloaded to a field laptop running Vemco VUE software and then subsequently transferred to LGL's proprietary processing software, *Telemetry Manager*. *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 detections in each 60 minute period; those that occurred in a sequence which was not probable[3]) 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[4] in that location. Quality Assurance/Quality Control (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.

For this report, acoustic telemetry detections were binned into the six sampling zones (Figure 2) to simplify the picture of sturgeon distributions and movements in the Reservoir. A seventh zone (Foster Creek) was added for further definition. On every date during the study period, we determined the number of sturgeon in each of the sampling zones, and plotted the proportions over time. During periods when fish were not detected, they were presumed to be in the vicinity of their most recent detection, and to be residing there until they were detected at another receiver.

3.4 Emigration

Emigration was defined as movement out of the Reservoir, including downstream movements through Wells Dam and unidirectional movements into tributary areas. Insight into emigration behavior was derived from the VR2W acoustic-receiver array, PIT tag receivers, and from PIT tags detected in fish caught as setline recapture events in Rocky Reach Reservoir. Acoustic-tagged fish had much higher detection probability, but there were fewer tagged fish. Conversely, nearly all fish in the Reservoir were expected to bear PIT tags, but their detection probability was much lower.

[3] Improbable detection sequences included those with improbable swim speeds, and those where a fish would have had to pass a large number of high-detection-probability receivers without detection.
[4] When more than two hours elapsed between sequential detections, a new record was written.

One of the goals of the acoustic tracking was to study emigration patterns such that the mark-recapture survival model could be adjusted to account for tags that permanently departed from the study area. Acoustic telemetry data were used to determine: a) the portion of tags that emigrated within the first few months after release; and b) the portion of tags that emigrated in each subsequent year.

To estimate emigration, the number of observed emigrants was divided by the number of active tags available for detection. For each acoustic tag, expected battery expiration date was noted along with the time since its original release date (i.e., release as age 1 from hatchery), and whether the fish emigrated. For each time interval of interest, the percent emigration was calculated based on the average number of active tags and the total number of emigration events.

3.5 Index Monitoring

Two indexing surveys are being carried out by Douglas PUD. First, a juvenile-targeted index-monitoring program was started in 2015 to assess the success of the hatchery supplementation program. The juvenile indexing program was designed to determine size structure, survival rates, abundance, density, condition factor, growth rates, and to identify the distribution of the hatchery-released juvenile sturgeon. The second indexing survey, using bigger hooks to target larger (possibly adult) White Sturgeon, was started in 2016. The goal of the adult indexing was to collect information on the numbers or distributions of adults in the Reservoir, and to determine size structure, survival rates, and growth rates of larger-sized natural-origin sturgeon in the reservoir. The adult indexing surveys also provided opportunities to apply 10-year acoustic tags to large individuals to help track their movements into the future, which will assist with studies of natural reproduction that will be required later during license implementation.

As the hatchery-released juvenile sturgeon fish grow in size over time, they gradually become vulnerable to the adult indexing gear, thus providing continued monitoring opportunities. Many hatchery-produced sturgeon have already been captured in adult setline gear; their lengths and weights were compared to those caught in the juvenile indexing surveys. Comparisons of fish size caught on the different hook sizes were made using ANOVA and a Tukey-Kramer *post hoc* test.

3.5.1 Juvenile Indexing Fishing Effort

A stratified-random setline sampling design was used, with sampling in summer (July/August) and fall (September/October) of 2015, 2016, 2017, and 2019, from late July through September in 2021, and from mid-September to late October in 2022 (Table 5). The Reservoir was divided into six sampling zones (Figure 2), and random fishing locations were generated within each zone, with elevated effort allocated to zones in which sturgeon catches were expected to be more productive (in 2022, 41.7% of sets were in Erlandsen; 8.3% in Lower Reservoir; 25% in Bathtub; 16.7% in Upper Reservoir; 8.3% in Chief Joseph Tailrace; and none were in Okanogan). Setline methods were the same as those used since 2017 (see Robichaud and Gingerich 2018). Lines were anchored with small lead weights (1 kg) and were 122 m (400 ft) long with 40 small circle hooks (Gamakatsu 2/0 and 4/0) baited with pickled squid.

3.5.2 Adult Indexing Fishing Effort

A stratified-random setline sampling design was used, with adult indexing occurring in August or October of each year from 2016-2019, from late July through September in 2021, and from mid-September to late October in 2022 (Table 5). From 2016-2019, the Reservoir was divided into four sampling zones, with sampling only in depths >10 m (Figure 2). Starting in 2021, the six-zone ‘full reservoir’ (“juvenile”) sampling zones were also used for adult sampling. Random fishing locations were generated within each

Table 5. Timing and sample sizes for ten 'juvenile' and seven 'adult' sampling sessions from 2015 to 2022.

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
	- - - - - - - - - - (no juvenile sampling in 2018) - - - - - - - - - -		
Summer 2019	July 7	August 2	240
Fall 2019	September 8	October 4	240
	- - - - - - - - - - (no juvenile sampling in 2020) - - - - - - - - - -		
Juvenile 2021	July 25	September 30	294
Juvenile 2022	September 18	October 20	150
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
	- - - - - - - - - - (no adult sampling in 2020) - - - - - - - - - -		
Adult 2021	July 25	September 30	294
Adult 2022	September 18	October 20	150

† includes 5 setlines (Oct 15-19) deployed with the goal of acoustic-tagging larger-sized sturgeon.

zone, with elevated effort allocated to zones in which sturgeon catches were expected to be more productive. In 2022, the distribution of adult indexing lines exactly matched that for juvenile indexing. Adult indexing used setline gear that was similar to that described for juvenile indexing, but deployed with larger hook sizes (sized 14/0, 16/0, 18/0, and 20/0 circle hooks) and heavier anchors (13-18 kg) to target larger White Sturgeon within the Project area.

3.5.3 Sturgeon Processing

For each set, the latitude, longitude, and deployment and retrieval times were recorded along with the total number of sturgeon caught. Whenever a sturgeon was caught, water depth (m) and temperature (°C) were recorded.

All captured sturgeon were scanned for PIT tags, measured (fork length in mm), weighed[5] (g), and checked for scute marks. Any fish without a PIT tag had one applied on the left dorsal side, just posterior of the head. During 2022, PIT tags were applied *in situ* to 3 fish, all of which were naturally-produced (wild-origin) fish. There were no documented instances of tag loss (hatchery fish whose PIT tag could not

[5] Some of the larger fish in 2018 were not weighted (see details in Robichaud and Gingrich 2019).

Figure 5. Second left lateral scute is removed from a wild-origin fish captured in 2015. Along with the scute mark, the fish was given a V16 acoustic tag and was PIT-tagged before being released at the point of capture.

be detected – either shed or broken) in 2022. The new PIT tag numbers were recorded, and all data were uploaded to PTAGIS. Captured fish that were without scute marks had one applied ('second left lateral' for wild-origin fish that received a PIT tag; Figure 5) that was different from those used for the hatchery-produced fish ('first three right-side lateral scutes anterior to the anterior dorsal fin insertion' for fish raised from wild-caught larvae; or 'first three left-side lateral scutes anterior to the anterior dorsal fin insertion' for fish of direct-gamete origin).

During setline sessions, a subsample of fish (including those that were of wild-origin or from release-years prior to 2015) were acoustic-tagged before release (see Section 3.3.1). In 2022, this included nine fish that were originally released as part of the BY2013 hatchery release group, and one fish that was originally part of the BY2014 release group.

Starting in 2016, whenever a wild and untagged fish was encountered, a 1 cm^2 piece of pectoral fin tissue was collected and preserved in 100 proof (i.e., 50%) ethanol for future DNA analysis. If the fish was ≤150 cm FL, a pectoral fin section was removed for non-lethal aging (pectoral fin sections were not taken from fish >150 cm FL, since aging of large adult White Sturgeon may not be accurate; Rien and Beamesderfer 1994). Details are in Robichaud and Gingerich (2018). In 2022, three wild origin individuals were newly encountered and PIT-tagged, but they were not acoustic tagged and they did not have fin ray samples taken.

3.5.4 Waterbird Colony PIT Tag Surveys

During 16 surveys (one in 2016; one in 2017; four in 2018, four in 2019, two in 2020, three in 2021, and one in 2022) the guano underneath the Okanogan River heron and cormorant colony was scanned for PIT tags. Survey protocols were not consistent among years, as the design of the most recent surveys was changed to permit future estimation of detection efficiency. All detected PIT tag numbers were recorded, and lengths and weights of the fish at the time of release were queried from the release database. We also

checked each of the predated PIT tag numbers to see if any of the fish had ever been detected in the indexing studies.

The cumulative frequency distributions of length and weight were plotted for each release cohort and were compared to the size distributions of the predated sturgeon. Kolmogorov-Smirnov two-tailed two-sample tests were used to test if the waterbirds were feeding indiscriminately, or if they were selecting for fish of a certain size profile.

3.5.5 Survival Estimation

PIT tag mark and recapture data were used to estimate survival rates of each of the hatchery-reared juvenile sturgeon cohorts, and for wild-origin fish. Survival was assessed using a generalized Cormack-Jolly-Seber (CJS) model (Lebreton et al. 1992). The CJS method allows the simultaneous estimation of the probability of detection during survey events (p) and the apparent survival (Φ) between events, as long as some individual fish are captured in more than one sampling session and at least two sampling event occurs after the survival period of interest.

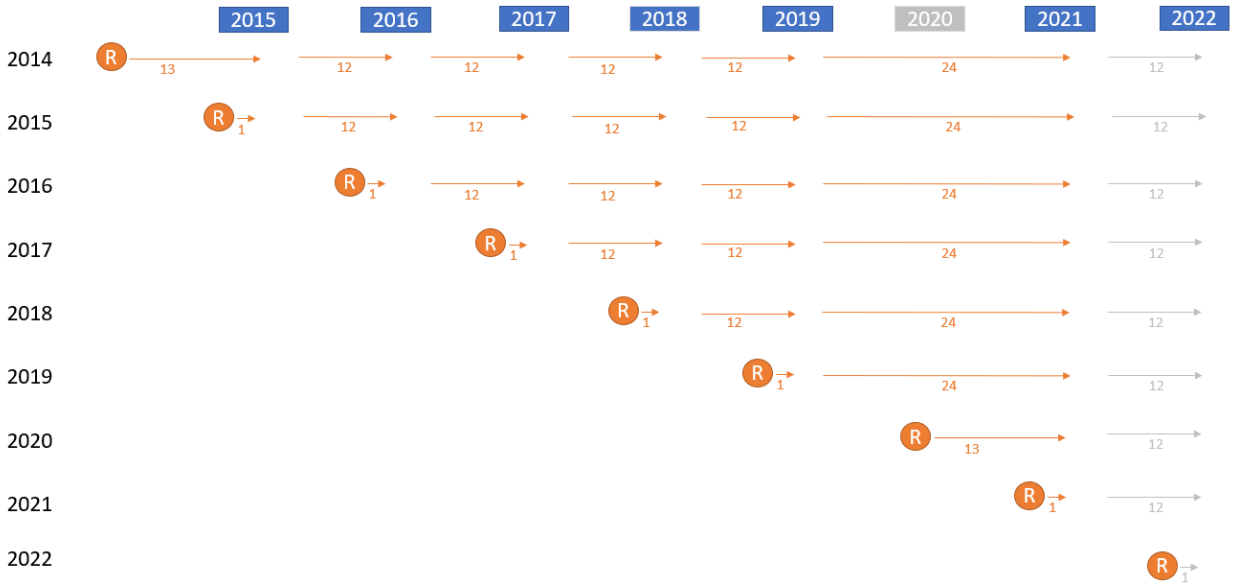

Figure 6. **Schematic showing the release (circle) and survey (numbered boxes) timeline (horizontal dimension) for juvenile indexing, by release cohort (vertical dimension). Arrows indicate inter-survey periods during which survival would be estimated (numbers show length of time in months; grey arrows show periods for which additional data are required in order to estimate survival). There was no indexing in 2020 (numbered box is grayed-out). Survival rates for the last two survey periods (2019 to 2021, and 2021 to 2022) were not independent from each other.**

Figure 7. Schematic showing the release (circle) and survey (numbered boxes) timeline (horizontal dimension) for wild fish survival model. Arrows indicate inter-survey periods during which survival was estimated (values show length of time in months).

3.5.5.1 Hatchery Survival

For analysis of hatchery fish survival, both the juvenile and adult indexing data for each year were considered together as single annual set of mixed-gear indexing data. This is a departure from the methods used previously (see Robichaud and Gingerich 2020), made necessary by the change, starting in 2021, of the timing of adult and juvenile gear deployments. For analysis of hatchery fish survival, we had mixed indexing surveys annually from 2015 to 2019 and from 2021-2022 (Figure 6). The 'missing' survey in 2020 was not included in the model as an event, but the 'inter-survey' duration period was adjusted accordingly. The time between each successive survey was considered to be 12 months (or 1 year), for simplicity, even though the annual surveys lasted several months in duration. As in all CJS modelling, survival rates for the two last periods (2019 to 2021, and 2021 to 2022) were not independent, and were estimated together. Note that the release events in 2014 and 2020 occurred 13 months prior to the next juvenile indexing survey, whereas all others occurred about one month prior to the start of the year's indexing survey.

The survival model described above does not explicitly allow for emigration or tag loss. Emigration was estimated using PIT and acoustic telemetry data (see Section 3.4). Tag loss (or tag failure) was calculated using the proportions of scute-marked fish that were caught without PIT tags (see Section 4.3.2). Once tag loss and emigration were accounted for (by 'reducing' the total number of fish being modeled), 'True' survival rates (S) were estimated using modeling methods described above.

For each cohort, four models were fit: 1) one in which survival and detection probability were both allowed to vary among estimation periods; 2) one in which only a single survival rate and a single detection probability were estimated, and assumed to have applied equally over time; 3) one in which survival varied over time but detection probability did not; and 4) one in which detection probability varied among years but survival did not. For each model, AICc (the small-sample-size corrected version of Akaike information criterion, AIC) was calculated following Burnham and Anderson (2002). AICc, a measure of model support, attempts to find a balance between model fit (i.e., minimizing the information loss) and the number of modelling parameters (i.e., avoiding over-fitting). Model ranking was determined by ordering the AICc scores from smallest to largest, with the top-supported model having the lowest AICc score in the candidate model set. Model support and Model Weight were calculated as in Burnham and Anderson (2002). A derivative measure, Delta AICc (ΔAICc) shows the distance (in AICc units) between the top model and all other models in the candidate set. Models with a ΔAICc score between 0 and 2 were generally considered to have similar support. Delta AICc scores between 2 and 5 are considered plausible, while models with ΔAICc scores higher than 7 were considered to have minimal support (see Cooch and White 2013). When more than one of the four models received support, model averaging was used to calculate 'final' parameter estimates (i.e., Φ's and p's). Models were first fit using

an annual time step (the 13, 12, and 1-month periods were entered as 1.08, 1, and 0.08 years, respectively), but if convergence issues arose, models were re-fitted using a monthly time step. Survival models were fit using the program 'MARK' (White and Burnham 1999).

3.5.5.2 Survival of Wild Fish

Survival of tagged wild fish was assessed using the same modelling approaches as described above. Models were fit using an annual time step, set to 1 for each inter-survey period. Data from both the juvenile and adult indexing surveys were used (Figure 7). Because no tag loss or emigration has been observed for wild fish (see Sections 4.1.1 and 4.3.2), Apparent (Φ) and True (S) survival rates were equal.

3.5.6 Abundance Estimation

Reservoir abundance was estimated using a Closed Capture Model (Otis et al 1978). The method allows the simultaneous estimation of the probability of capture (p) or recapture (c), and the number of fish never encountered (f_0). Overall abundance, N, a derived parameter, was calculated as the sum of f_0 and the total number of unique individuals that were encountered.

The 2022 indexing data were divided into five 5-day sessions (with 2 days between each session). Since the sampling locations for each session were selected based on a stratified random design, each was considered a replicate effort. The duration of the 2022 indexing study (5 weeks) was relatively short, and thus may not violate the model assumption of no change in population abundance over the duration. The most recent release cohorts (fish released in 2021 and 2022) were excluded because they were not well recruited into the setline gear (there were few captures and no recaptures), and because their elevated short-term post-release mortality meant that they might violate the model assumption of no change in abundance over the duration.

Detection histories were defined for each of the encountered individual sturgeon, where each history was expressed as a series of five digits (i.e., one digit for each session), and where each digit could either be a 0 (not encountered during the session) or a 1 (encountered at least once during the session). It is important to note that release events were not considered in this model (no fish were released during the five-week indexing period), and although most sturgeon in the Reservoir are PIT tagged, we considered the first encounter of an individual during the 2022 indexing period as a 'capture' event, and all subsequent encounters of those same individuals were treated as 'recapture' events.

For each cohort, three abundance models were tested. In one (M_t), the capture and recapture probabilities were allowed to vary among the five sessions. In another, the capture and recapture probabilities were not permitted to vary among sessions (M_0). For the third model (M_b), capture probabilities were allowed to vary in response to capture (i.e., fish could be "trap happy" or "trap shy"). The abundance models were fit using the program 'MARK' (White and Burnham 1999). For each model, AICc, Model Weight, and ΔAICc were calculated. Models that failed to produce meaningful f_0 parameter estimates (large or zero SE) were discarded regardless of AICc. When more than one of the three models received support, model averaging was used to calculate 'final' parameter estimates for N.

The overall abundance was apportioned into size categories based on the size distribution of sturgeon captured in the 2022 indexing survey (where the lengths of individuals captured on multiple occasions in 2022 were averaged).

3.5.7 Condition, Size and Growth

Condition of the recaptured sturgeon was assessed using, despite its issues[6], the relative weight (W_r) index (Beamesderfer 1993). For the hatchery fish, relative weight of the release groups at tagging and at recapture were shown using boxplots, and average values calculated for each hatchery-reared juvenile sturgeon cohort during each survey year. Condition of the wild-origin sturgeon was not assessed, since there was a large portion (especially the largest fish) that were not weighed.

Growth of recaptured sturgeon (in terms of absolute changes in length and weight, and average annual rates of change) was described for each of the hatchery-reared juvenile sturgeon cohorts. The size (length and weight) structure of the release groups at tagging and upon recapture were displayed using relative frequency distributions. For individuals that were recaptured more than once in a given year, only the first capture event was used for size and growth analyses.

For hatchery and wild-origin sturgeon that were tagged *in situ*, growth (change in length per year) was calculated for individuals that were measured on multiple occasions. To avoid pseudoreplication, wherever one of these individuals was recaptured more than once, only the first (mark event) and last (most recent) detections were used when calculating growth rates.

3.6 Distribution

Telemetry detections and physical recaptures were used to examine patterns of distribution in terms of the relative abundance of sturgeon within each of the sampling zones. Moreover, the distribution data from the indexing surveys were analyzed statistically, by using Generalized Linear Models (GLM) to test for differences in catch per unit effort (CPUE, in terms of sturgeon per setline) among sampling zones. Models were initially run with a Poisson-distributed error structure, but if residual deviances were large relative to the degrees of freedom (suggesting overdispersion), then alternative (i.e., quasipoisson) models were used. Catch rates were plotted (along with a boxplot showing the first and third quartiles, and with vertical bars extending to the highest value that was within 1.5 times the distance between the first and third quartiles) to reveal patterns. Differences in distribution among sampling sessions were examined using GLMs, by testing for a significant 'zone × session' interaction term.

Tributary use was documented by querying the acoustic tracking data and the within-tributary fixed PIT arrays.

4 RESULTS

4.1 Acoustic-Tracking

4.1.1 Emigration

White Sturgeon moved between the Wells Reservoir and the Okanogan River, yet opportunities to record acoustic detections from within the Okanogan River proper were limited to two periods: 1) prior to November 2015 when a receiver was present at the Monse Bridge; and 2) after February 2018 when a receiver was deployed near Malott, WA. No acoustic-tagged sturgeon were detected at Monse Bridge.

[6] The index was built for use with fish larger than the smallest hatchery fish in this study; and was derived using summarized rather than raw data.

Since installing an acoustic receiver at Malott, two acoustic-tagged sturgeon have been detected there (including detections in 2022).

One sturgeon detected in the Okanogan River was a wild adult (PIT tagged by Jerald in 2002, and later acoustic tagged by Douglas PUD in 2017 [Tag 306 was 190.5 cm when tagged in 2017]). This fish was detected at the mouth of the Okanogan River in May and June of 2018, and the timing and pattern of detections were suggestive of tributary migrations, but the fish was not actually detected by the receiver in the tributary in 2018. In 2019, it was detected at the mouth on May 17th, followed by detections at Malott on May 23rd, and then back at the mouth the next day. It re-entered the Okanogan later that year: it was detected at the mouth on May 29th, and moved upriver to Malott by June 1st (it was also detected on the instream PIT array on this date), and promptly returned to the Columbia River, where it was detected (at RE's Dock) on June 5th. In the next year (2020), the fish returned again to the instream PIT array (detected June 4th, 10th, and 18th, with detections at the mouth interspersed between them). No indications were found for Okanogan entry in 2021. But in 2022, the fish was detected at the mouth on May 27th, and then at the instream PIT array on June 23rd and 25th, and then back at the mouth on June 29th.

The other sturgeon that was acoustically detected in the Okanogan was a smaller wild-origin fish (Tag 302 was 118.5 cm when tagged in 2017). It was detected at the mouth of the Okanogan in May and June of both 2018 and 2019 in a manner that was suggestive of tributary migrations. In 2020, it was detected at the mouth of the Okanogan on July 12th, then was detected at Malott and on the instream PIT array on July 13th, and returned to the Columbia River on July 16th. In May and June of 2021 it was again detected at the mouth of the Okanogan in a manner that was suggestive of tributary migrations. In 2022, the fish was detected at the instream PIT array on June 22nd, at the Malott receiver on July 2nd, at the river mouth on July 7th, and then returned to Malott and the instream array on July 8th, before returning the Columbia River by July 17th.

In addition to the detections recoded at the Malott receiver, the timing of detections at the mouth of the Okanagan River, and the PIT array in the lower Okanogan River also contributed to our assessments of movements into the Okanagan River. To date, 20 acoustic tagged sturgeon have detections in (or that are suggestive of movements into) the Okanogan River, of which 13 have displayed repeated migration behaviors (Table 6).

For the purposes of true survival estimation, fish that moved into the Okanagan River were not considered to have emigrated (i.e., they were not "lost" to the local population). However, there have to date been at least eight acoustic-tagged fish have permanently emigrated from the study area by moving downstream past Wells Dam. See Robichaud and Gingerich (2018, 2019) for details. No new emigration events were recorded in 2022.

Table 6. Months in which acoustic-tagged fish were detected either in the Okanogan River (at the instream PIT array, light green, or at the Malott acoustic receiver, dark green), or were detected at the Okanogan mouth receiver with a pattern that was suggestive of movement into the tributary (i.e., fish was detected at the mouth, and then disappeared for at least two weeks before reappearing at the mouth). Months: 4 = April; 5 = May; 6 = June; 7 = July. Also, BY = brood year; nm = not measured.

Fish			Detection Year						
ID	Release Type	FL (cm)	2016	2017	2018	2019	2020	2021	2022
101	Wild Origin	90.5	4-5	4-5, 6-7	5			5	5
108	Wild Origin	73.1		7					
110	BY2013	44.4		6-7					
114	BY2013	46.1		6					
118	BY2013	48.3	5-6	3-7					5-6
130	BY2013	47.2	5-6						6
136	BY2013	40.1							
138	Wild Origin	86.6			6				
139	Wild Origin	69.6							6
140	Wild Origin	75.3	5-6	4-7					
152	Wild Origin	85.9	5-6	6-7	5-6		5-6		5-6
153	BY2013	64.0		6-7					
155	BY2013	51.7		5-6, 6-7					5
157	BY2012	71.1	6						
159	Wild Origin	104.0		5,6-7					5-6
302	Wild Origin	118.5			4-5,5-6	5-6	7	5-6	5-6,6-7
303	Wild Adult	225.4			5-6		5		5-6
304	Wild Adult	215.9			4-5			4-5	
305	Wild Origin	116					6-7	5	5-6
306	Wild Adult	190.5			5-6	5-6	6		5-6
401	Wild Adult	nm				5-6		5-6	5-6

4.1.1.1 Emigration Rates

The number of active tags in hatchery-released fish varied widely over time, and increased in 2022 with the addition of ten new 10-year tags deployed on BY2013 and BY2014 fish (Figure 8). The average number of hatchery-reared sturgeon with tags that were active during each of the periods of interest ranged from 101.6 to 1.0 (Table 7).

No new emigration events were detected in 2022, so the estimated emigration rate for hatchery release supplementation fish was the same as that calculated in 2021 (see Robichaud and Gingerich 2022), i.e., 11.1% (Table 7). Three of the eight emigration events may have been the result of handling stress, since they occurred within a few days (≤9) of acoustic tagging. With these three removed from the calculations in Table 7, the estimated emigration rate reduced to 8.2%.

Since no emigration of wild-origin fish has been observed to date, the emigration rate for these fish is likely close to 0%.

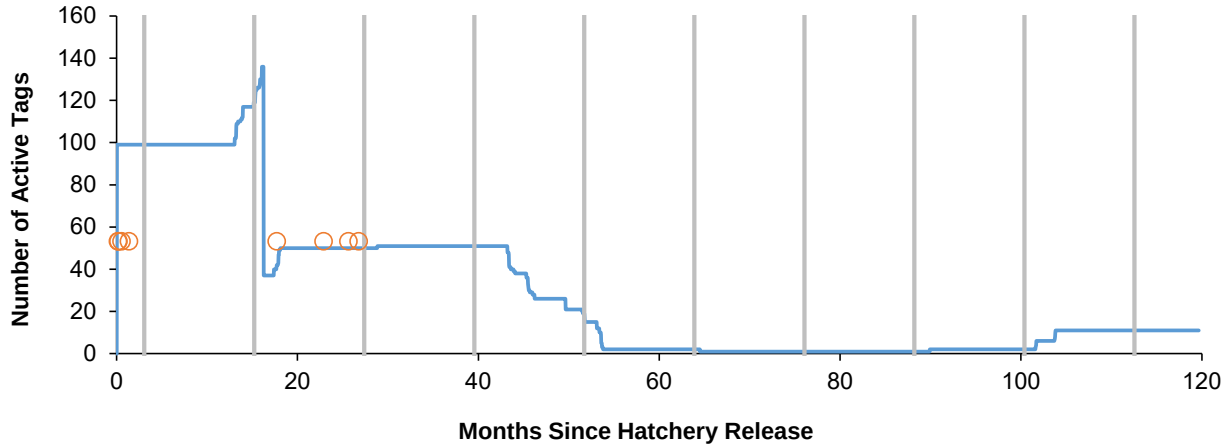

Figure 8. **The number of active acoustic tags, by day, relative to the original hatchery release date for each of the acoustic-tagged sturgeon in the Wells Reservoir. Orange circles indicate days on which emigration events occurred (Y positions are meaningless). Grey bars indicate the timing of the intervals used in Table 7.**

Table 7. **Average numbers of active tags, and total numbers of observed emigration events in each time interval. On the right is a hypothetical 10,000 fish population that shows how emigration steps can be compounded over time to calculate an overall emigration proportion of 11.1%.**

Months After Release from Hatchery	Average Number of Active Tags	Total # of Emigration Events	Emigration Proportion	Equivalent Emigration Rate (%/yr)	*Hypothetical: 10,000 Fish Released*	
					Emigrated	*Remained*
1-3	97.9	4 †	4.08%	16.34%	*408*	*9,592*
4-15	101.6	0	0.00%	0.00%	*0*	*9,592*
16-27	55.0	4 ‡	7.27%	7.27%	*698*	*8,894*
28-39	50.9	0	0.00%	0.00%	*0*	*8,894*
40-51	35.3	0	0.00%	0.00%	*0*	*8,894*
52-63	3.9	0	0.00%	0.00%	*0*	*8,894*
64-75	1.1	0	0.00%	0.00%	*0*	*8,894*
76-87	1.0	0	0.00%	0.00%	*0*	*8,894*
88-99	1.9	0	0.00%	0.00%	*0*	*8,894*
100-111	9.2	0	0.00%	0.00%	*0*	*8,894*
112+	11.0	0	0.00%	0.00%	*0*	*8,894*
		8			***1,106 of 10,000 (11.1%)***	

† including two that emigrated within 6 days of hatchery release

‡ including one that emigrated within 9 days of acoustic-tagging (531 days after hatchery release)

4.1.2 Movements and Distribution

Binning the acoustic telemetry detections into seven sampling zones smoothed the picture of sturgeon distributions and movements, allowing general patterns to emerge (e.g., Figure 9). Complete detection histories for BY2014 and BY2015 fish (whose acoustic tags expired before the end of the last reporting period) are provided in Robichaud and Gingerich (2018). Complete detection histories for BY2012 and BY2013 fish, which were tagged over the course of the summer of 2015 and given tags that have since expired[7], are provided in Robichaud and Gingerich (2019).

The only fish that had tags active during 2022 were the 29 fish that were marked *in situ* with 10-year tags. These includes 18 wild-origin fish (Appendices B and C), of which eight were considered to be adults (based on fork length > 165 cm at the time of tagging), and the remaining ten were smaller at the time of tagging (69-120 cm FL). The 11 non-wild fish with active tags included one BY2013 fish that has been tracked since it was tagged in 2015, and ten fish that were tagged in 2022 (nine BY2013 fish, one BY2014 fish) with only a few months of tracking history to date (see Appendix D).

4.1.2.1 Small Wild Fish

Complete detection history plots for the ten smaller-sized (69-120 cm FL at the time of tagging) wild-origin fish are in Appendix B. All ten were tracked throughout the study period, making frequent among-zone movements, and showing reduced activity in the mid-Nov to mid-Mar period. One fish (tag 9001-22685) was consistently only detected by one receiver throughout the tracking period, except for one foray up the Okanogan River (detected at the RM 12 PIT array). Six of the remaining nine small wild-origin fish made movements spanning the full length of the Reservoir, having been detected at least once in each of the main reservoir zones, and the last three fish made movements spanning all zones except the Lower Reservoir. Since being acoustic tagged, eight of the ten fish have been recaptured in setlines (15 events involving seven fish caught 1 to 3 times each), though none were recaptured in 2022. For small-sized wild-origin fish, the Erlandsen and Bathtub zones were the most used, with the Upper Reservoir being next most important (Figure 9; note that this figure shows an apparent deviation from the consistent wintertime distribution pattern in 2018-19: this is probably an artefact of data loss, due to the loss of the Erlandsen receiver from October 2018 to May 2019). In general, use of the Lower Reservoir, and Erlandsen was proportionally higher in winter months. Use of the Bathtub zone was highest in late/summer-fall. In summertime there was increased use of the Okanogan mouth (April-June), and the Chief Joseph Tailrace/Foster Creek Delta (July-August) zones (Figure 10). Use of the Upper Reservoir was highest in the late fall or early winter. Movements into the Okanogan River were inferred (from detection sequences at the Okanogan Mouth) or detected (PIT array at rkm 12; Malott Receiver) during all seven summers (three fish in 2016; five fish in 2017: four fish in 2018; one fish in 2019; three fish in 2020, three fish in 2021, and six fish in 2022; Table 6, Figure 9, Appendix B).

4.1.2.2 Adult Wild Fish

The eight wild-origin adults (Figure 11, Appendix C) had a distribution pattern that was qualitatively similar to the smaller-sized wild-origin group (compare to Figure 9). All eight adult fish were tracked consistently since release, and made frequent among-zone movements. One fish made movements spanning all zones except the Lower Reservoir and the Bathtub – this fish was last detected in August

[7] one of the BY2013 fish was given a ten-year tag, and is included in Appendix D.

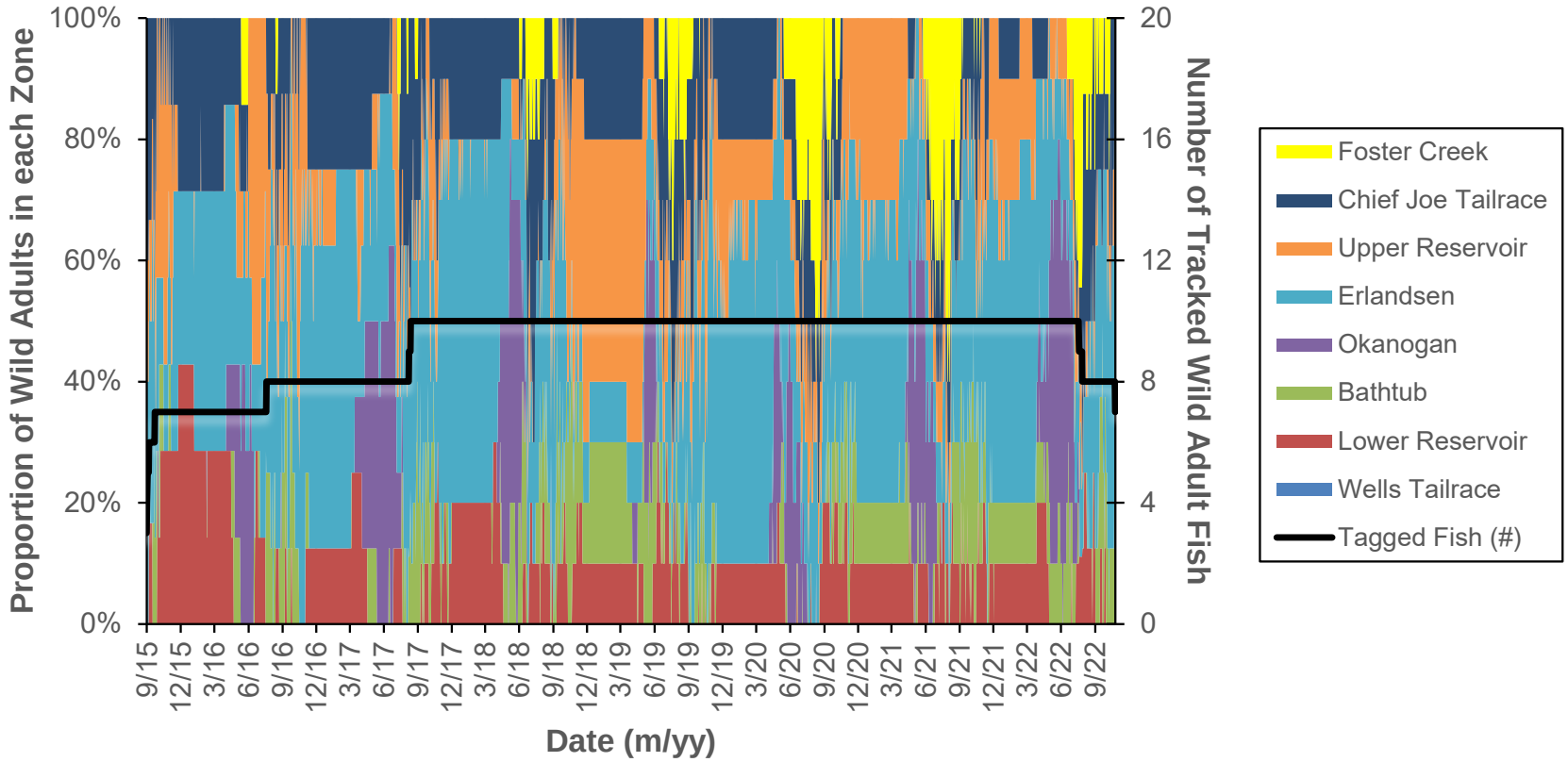

Figure 9. **Proportions of smaller-sized (69-120 cm) acoustic-tagged wild-origin White Sturgeon, tagged *in-situ*, by sampling zone and date. Proportions calculated when n ≥ 4. Black line (plotted on right axis) shows the total number of subadult wild-origin fish being tracked. Receiver loss (no data from Erlandsen, Oct 2018 to Mar 2019) may affect this plot. Note, the apparent drop off in the black line in late 2022 is related to fish going undetected (not making movements among receivers) until the end of the study period, rather than tag failure or fish death.**

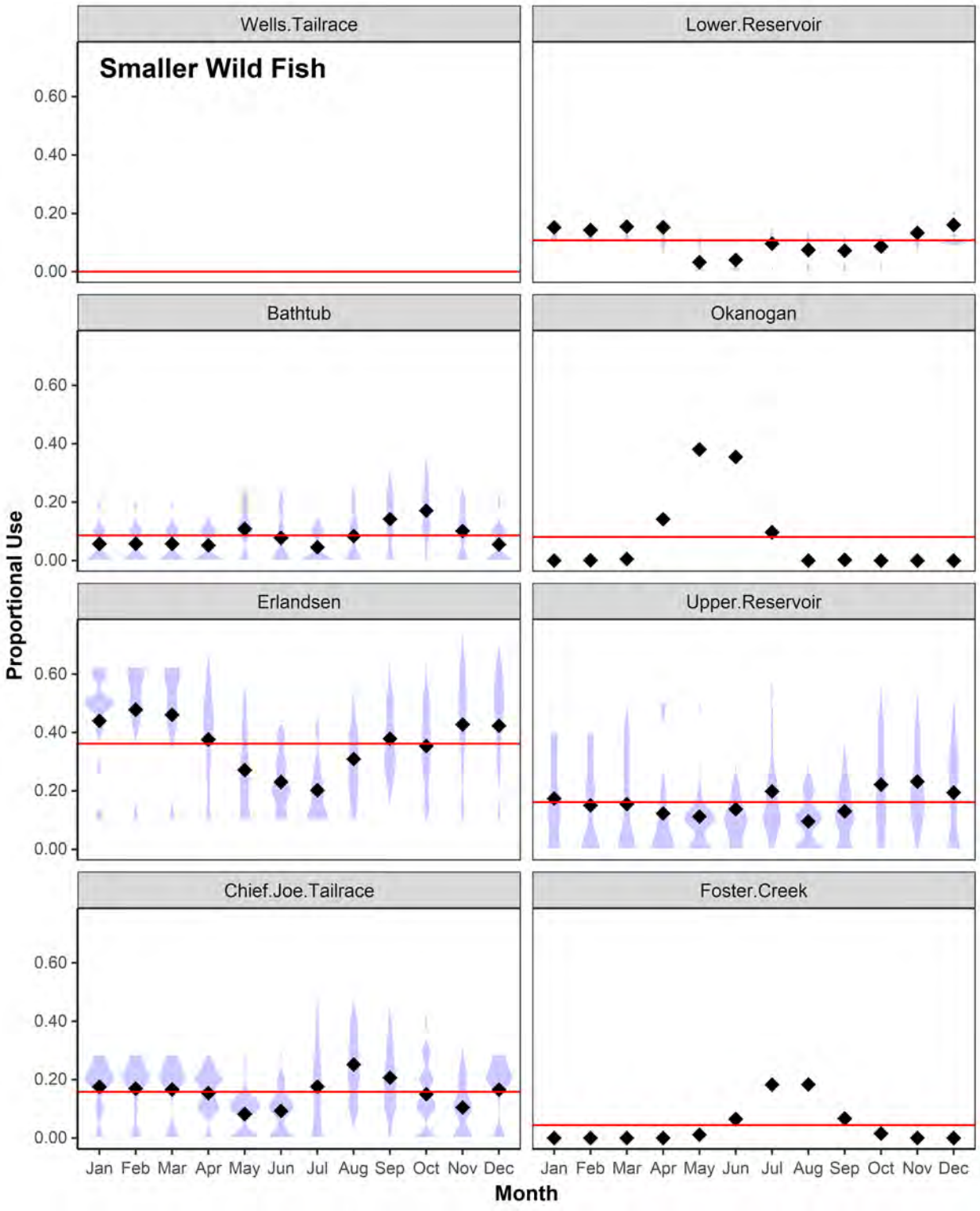

Figure 10. **Mean (black diamond) and distribution (blue polygon) of daily proportional use of zones by smaller-sized (69-120 cm) acoustic-tagged wild-origin sturgeon, by sampling zone and month. Proportions calculated when n ≥ 5. Red line showed overall mean value for the zone. Receiver loss (no data from Erlandsen, Oct 2018 to Mar 2019) may affect this plot.**

2021, and its fate is unknown at this time. Of the seven other fish, three made movements spanning the full length of the reservoir, and four others made movements spanning all zones except the Lower Reservoir (Appendix C). None of the tracked adults made long-range movements (detections only at Erlandsen and in the Upper Reservoir) during the winters (mid-Nov to mid-Mar; Figure 12, Appendix C). The majority of movements occurred in summertime (Figure 13, Appendix C). In general, use of Erlandsen and the Upper Reservoir was proportionally higher in winter months. In summertime there was increased use of the Okanogan mouth (April to June), Chief Joseph Tailrace (June to October), and Foster Creek (June to August) zones (Figure 14). Since being acoustic tagged, one of the eight adult fish was recaptured in setlines (one event in 2018) – none were recaptured in 2022.

Movements of wild-origin adults into the Okanogan River were inferred or detected in the early part of the summer in all five years since tagging of adults began (three fish in 2018, two fish in each of 2019, 2020, and 2021, and three fish in 2022; Table 6, Figures 11, 13 and 15). The duration residency in the Okanogan zone was longer in 2022 than in 2020 or 2021, extending from early April in the early July.

The period of Okanogan residency was followed from June through mid-September by major use of the upstream-most zones of the reservoir, including areas near the Chief Joseph Tailrace and Foster Creek arrays (Figure 11). In 2020, as many as six of the eight tagged adults were present in these uppermost reaches on various days between late June and late August (Figure 13, top). In 2021, seven of eight study fish were in this uppermost area from July 6-21 (Figure 13, middle). In 2022, the use of the Chief Joseph

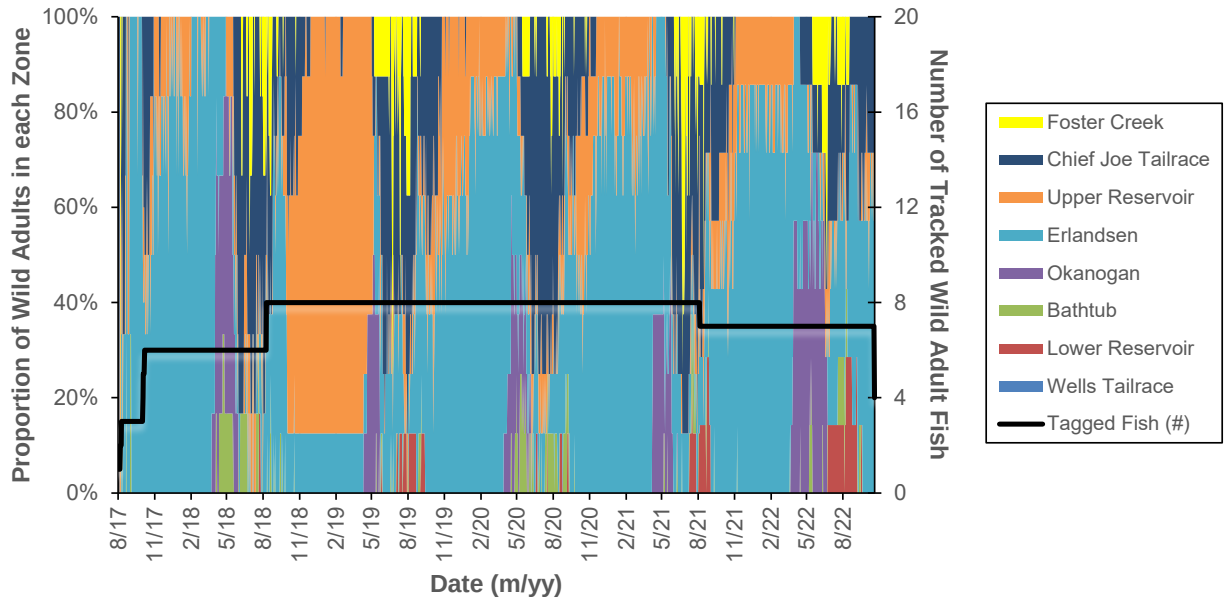

Figure 11. Proportions of the in situ acoustic-tagged adult wild-origin White Sturgeon, by sampling zone and date. Black line (plotted on right axis) shows the total number of wild-origin adults being tracked. Receiver loss (no data from Erlandsen, Oct 2018 to Mar 2019) may affect this plot. Note, the apparent drop off in the black line in late 2022 is related to fish going undetected (not making movements among receivers) until the end of the study period, rather than tag failure or fish death.

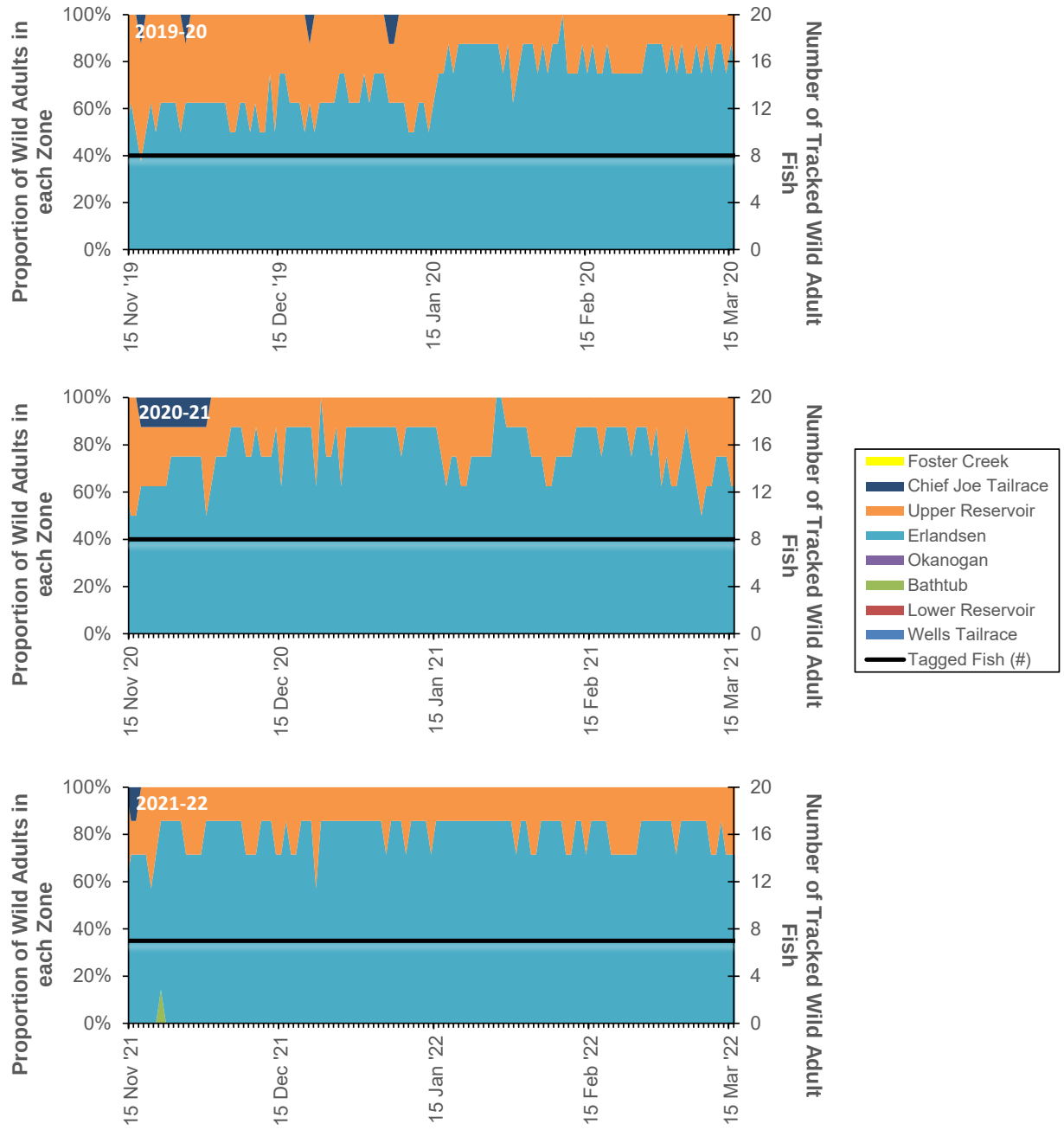

Figure 12. **Proportions of the *in situ* acoustic-tagged adult wild-origin White Sturgeon, by sampling zone and date in the winters (mid-Nov to mid-Mar) of 2019-20 (upper panel), 2020-21 (middle panel), and 2021-22 (lower panel). Black line (plotted on right axis) shows the total number of wild-origin adults being tracked.**

Tailrace and Foster Creek areas was less pronounced, as compared to 2020 and 2021 (Figure 13, bottom) – at most in 2022, three of seven acoustic tags were observed simultaneously (June 30th to July 8th) in the Chief Joseph Tailrace and Foster Creek area.

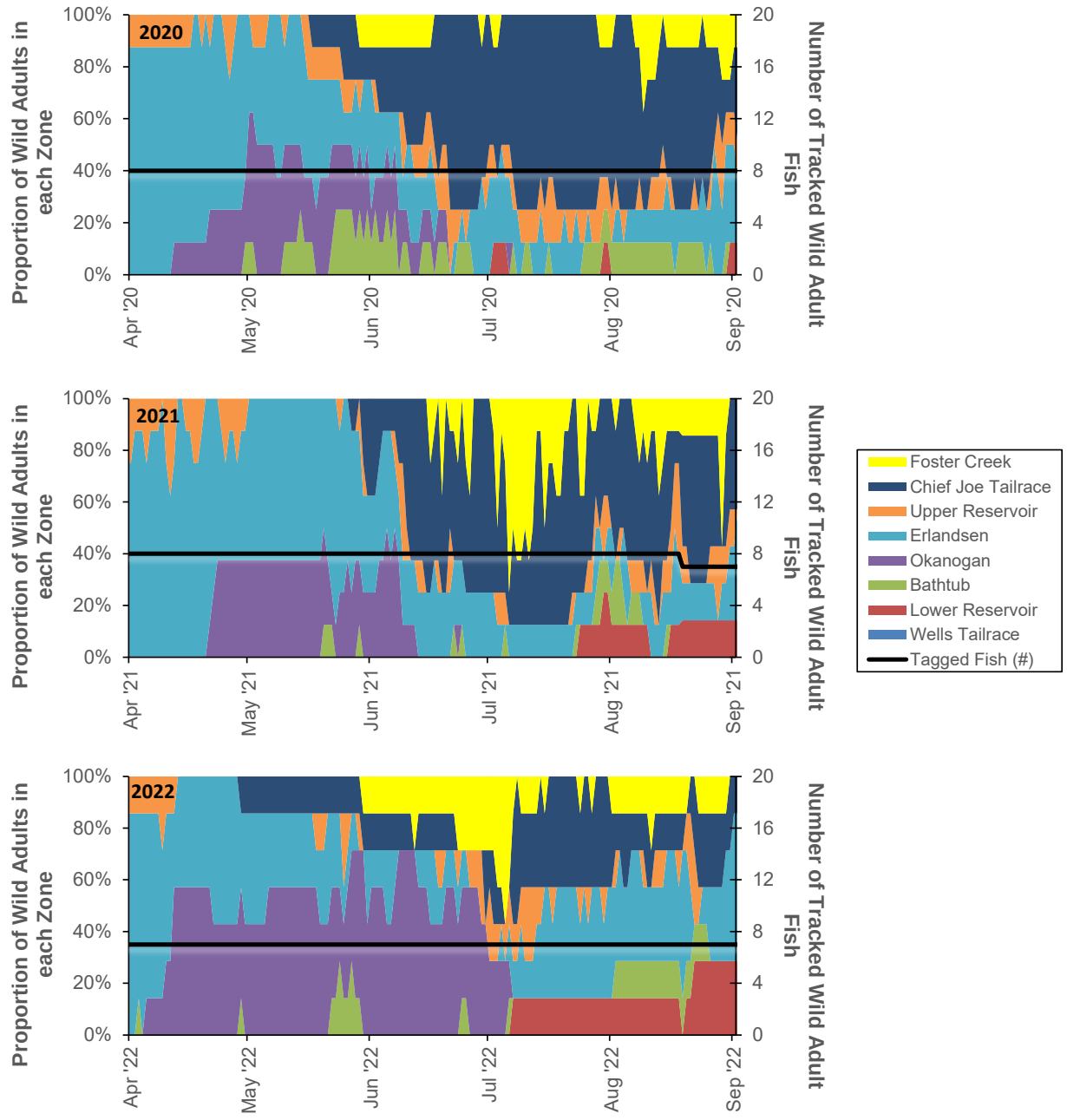

Figure 13. **Proportions of the *in situ* acoustic-tagged adult wild-origin White Sturgeon, by sampling zone and date in the summers (April to Sep) of 2020 (upper panel), 2021 (middle panel), and 2022 (lower panel). Black line (plotted on right axis) shows the total number of wild-origin adults being tracked. Note, the apparent drop off in the black line in late 2022 is related to fish going undetected (not making movements among receivers) until the end of the study period, rather than tag failure or fish death.**

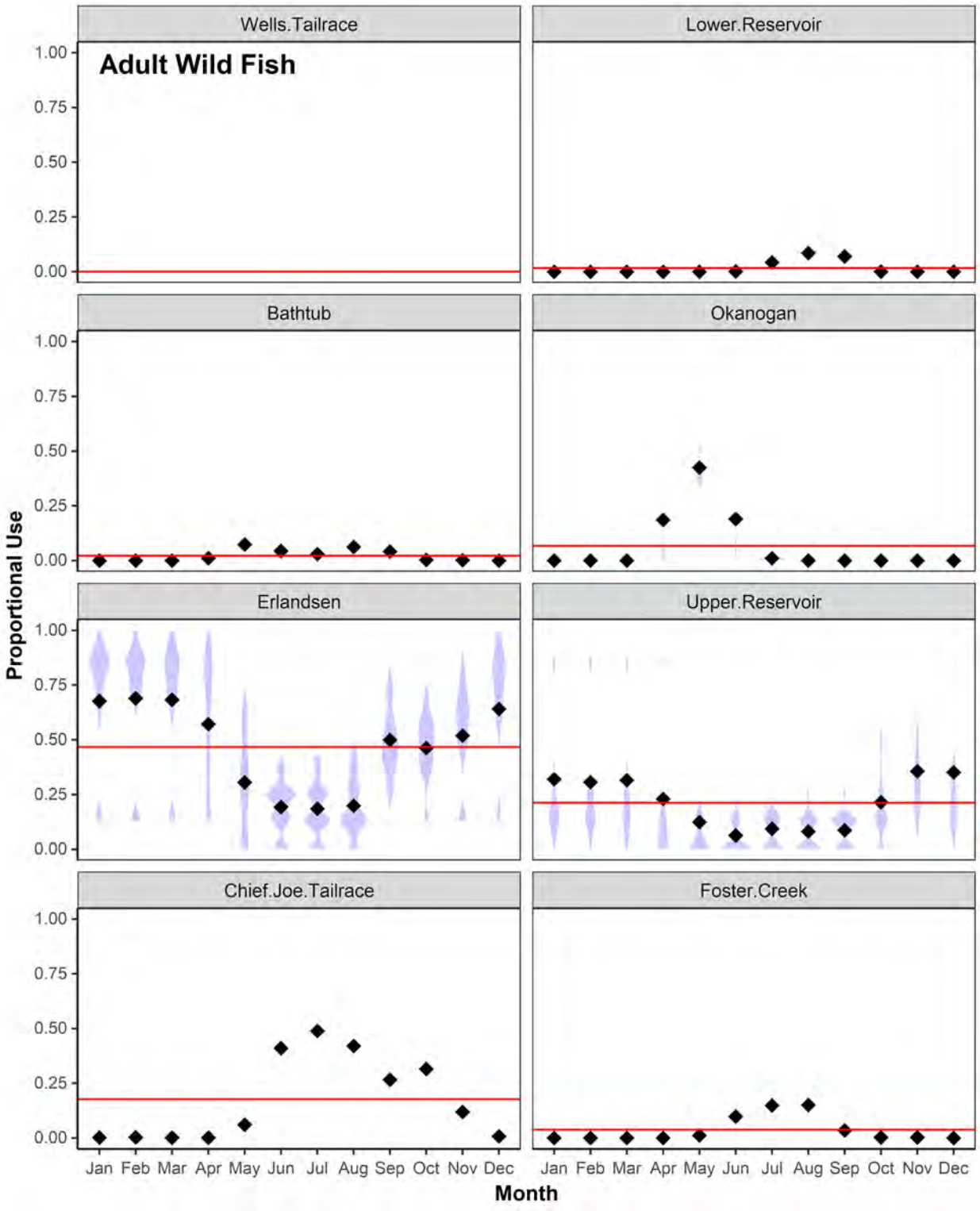

Figure 14. **Mean (black diamond) and distribution (blue polygon) of daily proportional use of zones by adult acoustic-tagged wild-origin sturgeon, by sampling zone and month. Proportions calculated when n ≥ 5. Red line showed overall mean value for the zone. Receiver loss (no data from Erlandsen, Oct 2018 to Mar 2019) may affect this plot.**

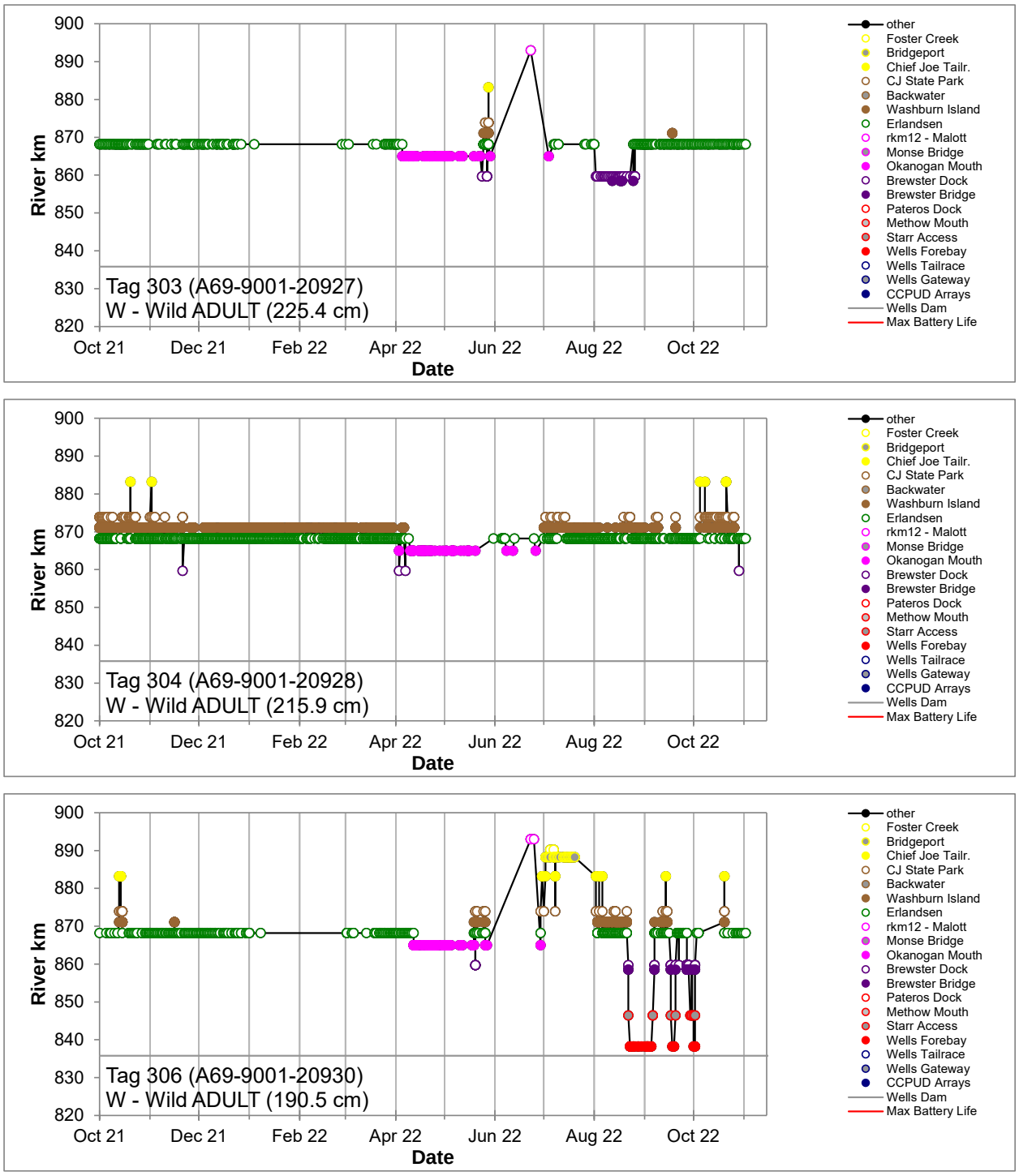

Figure 15. **Detection history plots for seven acoustic-tagged wild-origin adult White Sturgeon that were tracked in the Wells Reservoir in the Oct 2021 – Nov 2022 study year. Colored-symbols and Y-axis position indicate the location of the fish. Fork length (cm) of fish at time of tagging at bottom of each panel.Continued on next two pages.**

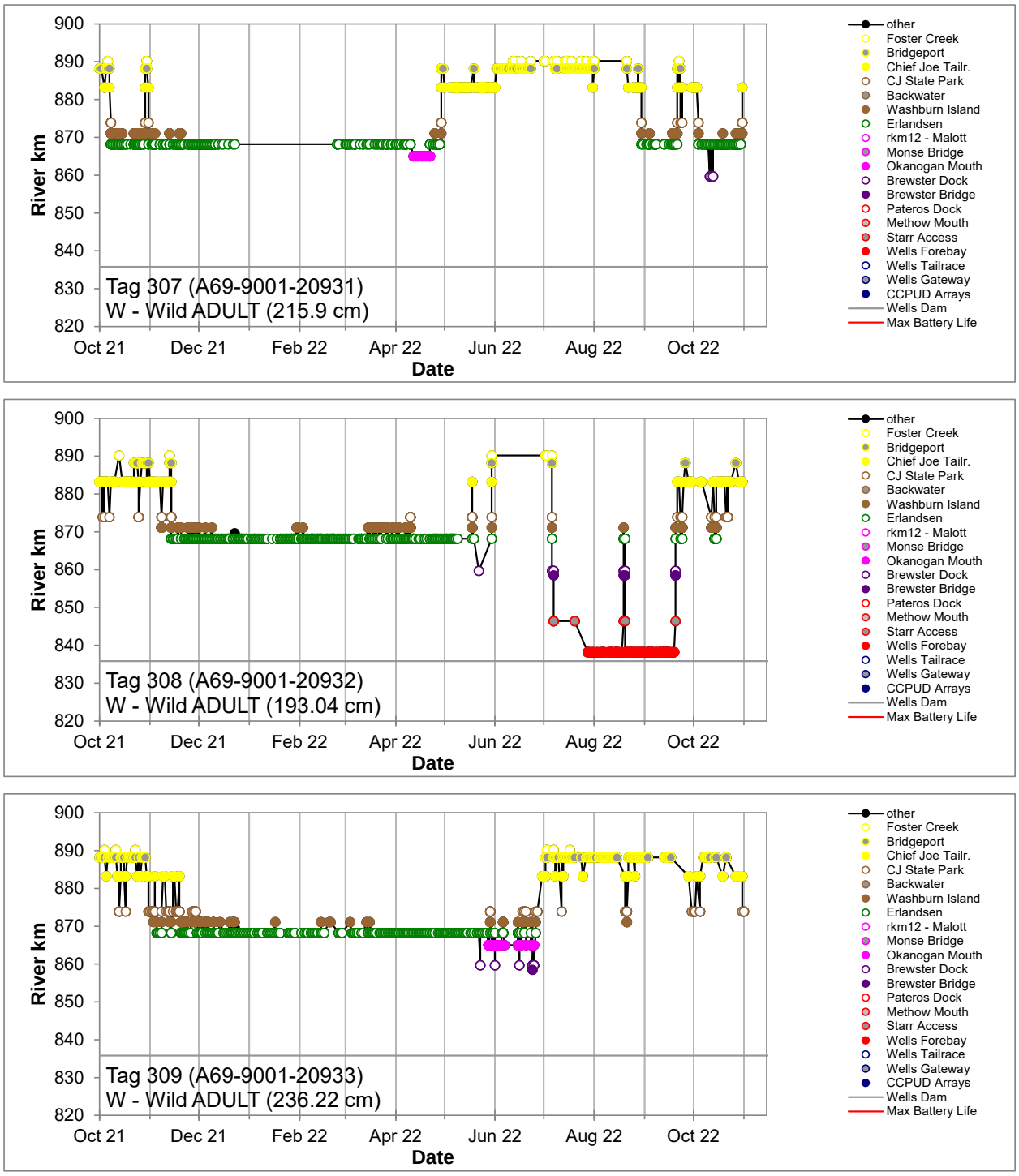

Figure 15 continued.

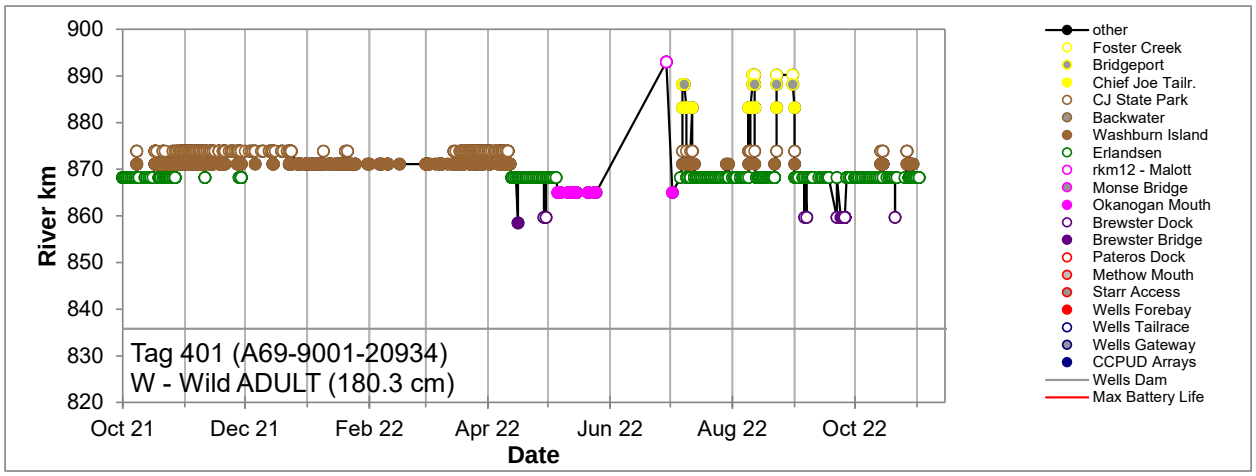

Figure 15 continued.

4.1.2.3 Hatchery Fish

Ten hatchery-produced sturgeon from brood years 2013 (n=9) and 2014 (n=1) that were recaptured in 2022 were marked with acoustic tags and released from October 17-20. The fish measured between 119.9 and 143.6 cm at the time of release. All have been tracked since releasee (Appendix D), but none for long enough during this study period to draw any immediate conclusions. All of these fish were marked with tags that had 10-year battery life, so will provide tracking data about how movements may change over time as these grow and approach adulthood.

4.2 PIT Tag Tracking

Emigration estimates based on PIT tag data were considerably lower than those based on acoustic tracking data. Since release, 65 PIT tags from BY2013 (1.3% of the group), 13 PIT tags from BY2014 (0.3% of the group), 20 PIT tags from BY2015 (0.4% of the group), 12 PIT tags from BY2016 (0.2% of the group), and one PIT tag from BY2017 (0.3% of the group) have been recaptured in the Rocky Reach, Rock Island (Chelan PUD indexing, unpublished data), Wanapum, or Priest Rapids (Grant County PUD indexing, unpublished data) reservoirs, or detected at the PIT detector in the Rocky Reach Bypass Surface Collector (RRJBS). Additionally, three PIT tags (all from BY2016) were detected in the Wells Dam Fish Ladders (pool 19) and are presumed to have emigrated. No fish from 2018 or any younger brood year have been detected yet at or downstream of Wells Dam. These low PIT tag-derived emigration

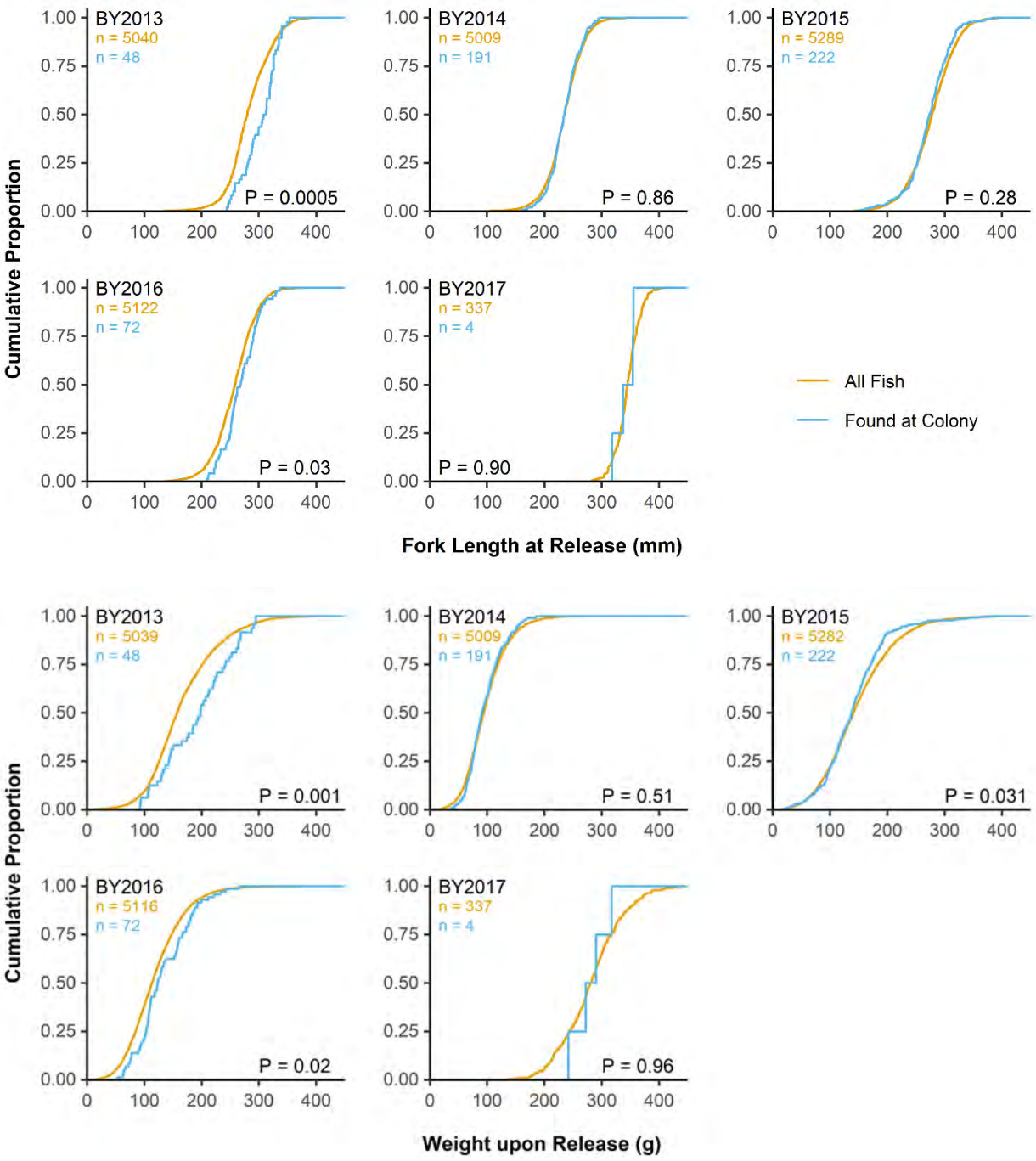

Figure 16. **Cumulative frequency plots of lengths (top) and weights (bottom) of hatchery-released White Sturgeon, showing the overall distributions at release (orange) and the distributions for PIT tags that were detected in the guano below a waterbird colony at the mouth of the Okanogan River (blue), by brood year. Samples sizes shown in the associated colors. *P*-values for Kolmogorov–Smirnov two-sample tests are shown in each panel.**

proportions are not surprising, given the difference in detection efficiency between acoustic and PIT tags. In addition, the Chelan PUD indexing surveys only operate for two months of the year, and the RRJBS only operates in the spring.

PIT tagged sturgeon have also been detected in tributaries. Specifically, one BY2013 fish was detected on a temporary PIT tag array managed by the Okanogan Basin Monitoring and Evaluation Program (OBMEP) Colville M&E staff in Foster Creek in mid-April 2014, about a week after release. Also, 155 BY2013 fish were detected in the lower Okanogan River at RM 12.5, as were 25 BY2014 fish, 11 BY2015 fish, 30 BY2016 fish, one BY2017 fish, five BY2019 fish, one BY2020 fish, and 2 BY2021 fish. Also detected in the lower Okanogan River were ten wild-origin sturgeon that were PIT tagged in the Wells Reservoir; and one that was originally tagged by Jerald in 2002 (which was later acoustic tagged by Douglas PUD in 2017). The Jerald fish was detected at the lower Okanogan PIT array in June 2014, May 2015, May 2016, June 2019, June 2020, and June 2023. The other ten wild-origin fish were detected between May and July of 2014 (n=1), 2015 (n=1), 2016 (n=1), 2017 (n=4), 2018 (n=1), 2019 (n=2), 2020 (n=2), 2021 (n=1), and 2022 (n=7), and included six individuals that were detected in multiple years. Six of the BY2013 fish were detected at the Zosel Dam array (all but one of which were previously detected at the lower river array). To date, two fish have been captured by Canadian fish managers in the Okanogan River Basin, suggesting that at a minimum the potential for fish to enter the Okanogan Basin in Canada exists. According to Canadian fish managers, neither of these fish had PIT tags, but photos of scute patterns suggest that these fish were BY2013 fish and sired from parents spawned at Marion Drain Fish Hatchery (lower Columbia River adults) and a result of the direct gamete program.

There are several known mortalities of PIT-tagged sturgeon. PIT tags from three BY2015 fish were detected at the waterbird colony in the Rock Island Dam forebay. Also, 538 PIT tags from Douglas PUD supplementation sturgeon (48 from BY2013, 191 from BY2014, 222 from BY2015, 72 from BY2016, 4 from BY2017, and one from BY2019) were detected during 16 surveys of the guano underneath the Great Blue Heron and Double-crested Cormorant colony in the Okanogan River (Figure 16). None of these fish had ever been detected in any of the indexing surveys. The size distributions of the fish consumed by the birds were, for some brood years, significantly different from that of the total cohort (i.e., non-random selection, Kolmogorov–Smirnov two-sample tests results shown in Figure 16). Also in the guano were PIT tags from Chelan PUD (n=15) and Grant PUD (n=1) supplementation fish.

4.3 Index Monitoring

Since 2015, juvenile and adult indexing crews have handled 2,003 individual PIT-tagged sturgeon (excluding fish whose tag was mis-recorded) in 4,691 capture events. Individual fish have been handled between one (932 fish, or 46.5% of the individuals handled) and 16 times (2 fish, Figure 17). The setlines sometimes capture acoustic-tagged sturgeon (which were detected because they also bear a PIT tag). Since 2015, 48 of the 178 acoustic-tagged fish have been captured in setlines, for a total of 161 capture events, with capture frequencies ranging from zero (67% of acoustic-tagged fish) to 14 times per fish (Figure 18).

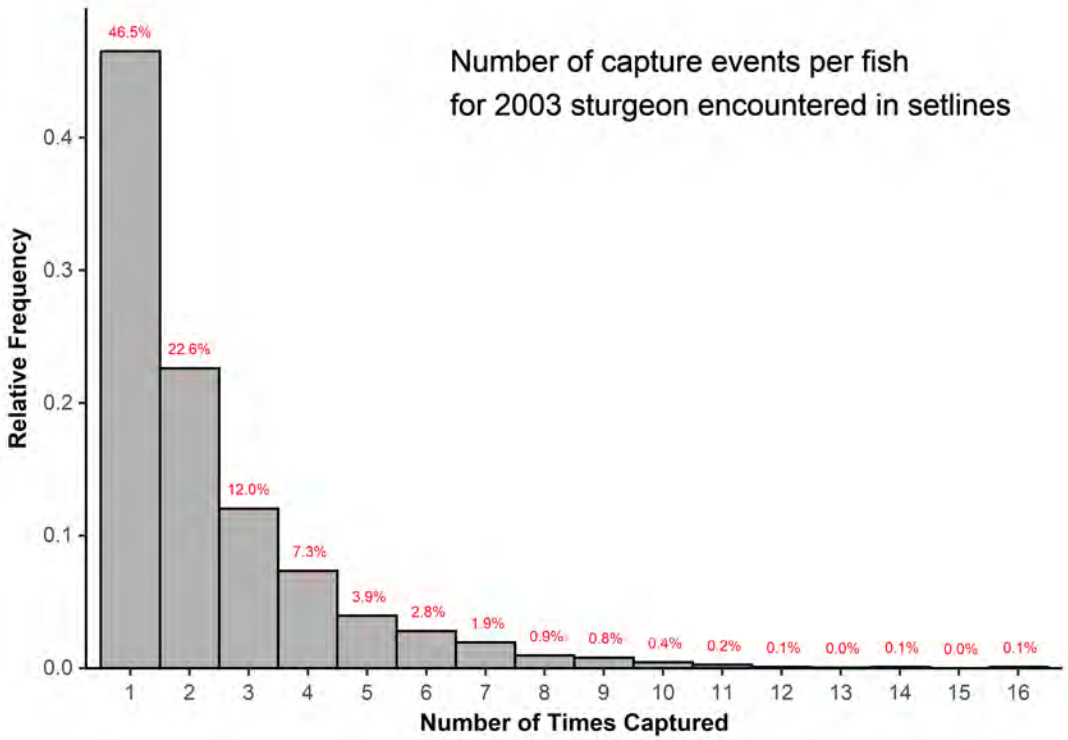

Figure 17. Relative frequency of the number of times that each individual sturgeon has been captured in juvenile or adult setlining gear since 2015.

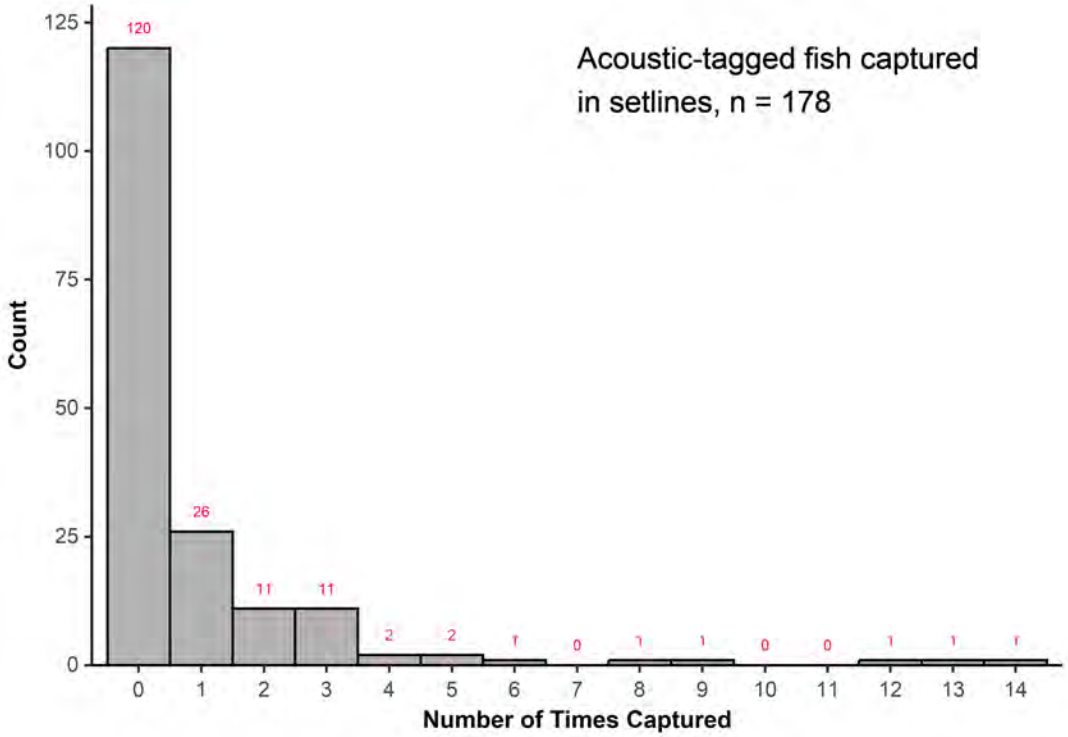

Figure 18. Frequency distribution of the number of times that each individual acoustic-tagged sturgeon (n=168) has been captured in juvenile or adult setlining gear since 2015.

4.3.1 Captures

In 2022, there were 427 White Sturgeon capture events during indexing surveys within the Wells Project area. Of these, 163 captures were made using 150 juvenile indexing setlines (1.087 fish/line) and 264 captures were made using 150 adult indexing setlines (1.760 fish/line). These capture events involved 400 unique individuals (Table 8), including 379 hatchery fish released by Douglas PUD (168 released in 2014, 46 released in 2015, 35 released in 2016, 50 released in 2017, six released in 2018, 13 released in 2019, 43 released in 2020, 15 released in 2021, and 3 released in 2022). Also included among the tally of unique fish, were seven fish of wild origin (four recaps and three new encounters with fork lenghts of 130cm, 146cm, and 243cm), and 11 hatchery fish recaptured after having been tagged *in situ* during previous years' sampling. There were no capture events in 2022 of hatchery origin whose tags had been lost or were not functioning properly. Comparisons of the catch numbers to the previous year's juvenile and adult indexing years are in Tables 9 and 10, respectively.

The average size of captured sturgeon varied among hook sizes and gauges (FL: $F_{5,4003} = 249.3$, $P < 0.0001$; Weight: $F_{5,3928} = 141.5$, $P < 0.0001$; Figure 19). The 2/0 hooks caught significantly smaller fish than any of the other hooks. And both the 2/0 and 4/0 hooks; i.e., those deployed as part of the juvenile indexing gear, caught significantly smaller sturgeon than any of the adult-sized hooks. There were some statistically significant differences among the adult-sized hook sizes (Figure 19), but the differences were not as marked, especially when considering the weight of the captured fish. Similar patterns held when

Table 8. Number of unique individuals caught during 2022 indexing, by gear type. Shaded rows indicate years where >5000 fish were released into the Project whereas yellow cells indicate years when fewer (99-570) larger fish were released.

Tagging Location / Time (n)	Juvenile Gear	Adult Gear	Both	Proportion of number released in brood year
Chelan County PUD	0	0	0	
DPUD Hatchery 2014 (n=5,044)	37	132	168	3.3%
DPUD Hatchery 2015 (n=5,009)	13	34	46	0.9%
DPUD Hatchery 2016 (n=5,289)	9	26	35	0.7%
DPUD Hatchery 2017 (n=5,131)	24	28	50	1.0%
DPUD Hatchery 2018 (n=337)	4	2	6	1.8%
DPUD Hatchery 2019 (n=99)	11	3	13	13.1%
DPUD Hatchery 2020 (n=570)	34	10	43	7.5%
DPUD Hatchery 2021 (n=338)	9	7	15	4.4%
DPUD Hatchery 2022 (n=332)	3	0	3	0.9%
Wild (recap)	0	4	4	
Wild (new PIT tag applied)	1	2	3	
Tag Loss (new PIT tag applied)	0	0	0	
Recaptures of *in situ* tags ‡	4	7	11	
Other recaptures *	3	0	3	
TOTAL	**152**	**255**	**400**	

‡ Recaptures of fish with PIT tags applied *in situ* during previous juvenile or adult setlining sessions.
* fish with incorrectly recorded PIT tag data.

Table 9. Number of unique individuals caught on juvenile indexing gear, by year. The vertical dashed lines denote years in which no juvenile indexing occurred.

	Juvenile Indexing Session					
Tagging Location / Time (n)	**2015**	**2016**	**2017**	**2019**	**2021**	**2022**
Chelan County PUD	1	2	2	3	0	0
DPUD Hatchery 2014	317	470	357	357	90	37
DPUD Hatchery 2015	43	57	61	120	40	13
DPUD Hatchery 2016	n/a	3	28	71	27	9
DPUD Hatchery 2017	n/a	n/a	5	44	48	24
DPUD Hatchery 2018	n/a	n/a	n/a	4	8	4
DPUD Hatchery 2019	n/a	n/a	n/a	3	13	11
DPUD Hatchery 2020	n/a	n/a	n/a	n/a	34	34
DPUD Hatchery 2021	n/a	n/a	n/a	n/a	4	9
DPUD Hatchery 2022	n/a	n/a	n/a	n/a	4	3
Wild (recap)	n/a	1	8	3	2	0
Wild (new PIT tag applied)	7	10	5	2	0	1
Tag Loss (new PIT tag applied)	11	8	14	10	4	0
Recaptures of *in situ* tags ‡	0	10	8	12	1	4
Other recaptures *	3	6	3	2	1	3
TOTAL	**382**	**567**	**491**	**631**	**272**	**152**

‡ Recaptures of fish with PIT tags applied *in situ* during previous juvenile or adult setlining sessions.
* fish with incorrectly recorded PIT tag data.

Table 10. Number of unique individuals caught on adult indexing gear, by year. The vertical dashed lines denote years in which no adult indexing occurred.

	Adult Indexing Sessions						
Tagging Location / Time	**2016**	**2017-1**	**2017-2 †**	**2018**	**2019**	**2021**	**2022**
Chelan County PUD	0	0	1	2	1	1	0
DPUD Hatchery 2014	62	86	131	221	179	209	132
DPUD Hatchery 2015	0	4	20	29	37	42	34
DPUD Hatchery 2016	0	0	2	8	15	33	26
DPUD Hatchery 2017	n/a	0	0	2	6	38	28
DPUD Hatchery 2018	n/a	n/a	n/a	0	0	8	2
DPUD Hatchery 2019	n/a	n/a	n/a	n/a	0	6	3
DPUD Hatchery 2020	n/a	n/a	n/a	n/a	n/a	13	10
DPUD Hatchery 2021	n/a	n/a	n/a	n/a	n/a	0	7
DPUD Hatchery 2022	n/a	n/a	n/a	n/a	n/a	0	0
Wild (recap)	2	3	8	8	3	6	4
Wild (new PIT tag applied)	14	4	6	3	3	2	2
Tag Loss (new PIT tag applied)	6	1	5	9	3	5	0
Recaptures of *in situ* tags ‡	1	2	10	5	7	8	7
Other recaptures *	0	0	0	1	1	2	0
TOTAL	**85**	**100**	**183**	**288**	**255**	**373**	**255**

‡ Recaptures of fish with PIT tags applied *in situ* during previous juvenile or adult setlining sessions.
* Fish with incorrectly recorded PIT tag data.
† includes 5 setlines (Oct 15-19) deployed with the goal of acoustic-tagging larger-sized sturgeon.

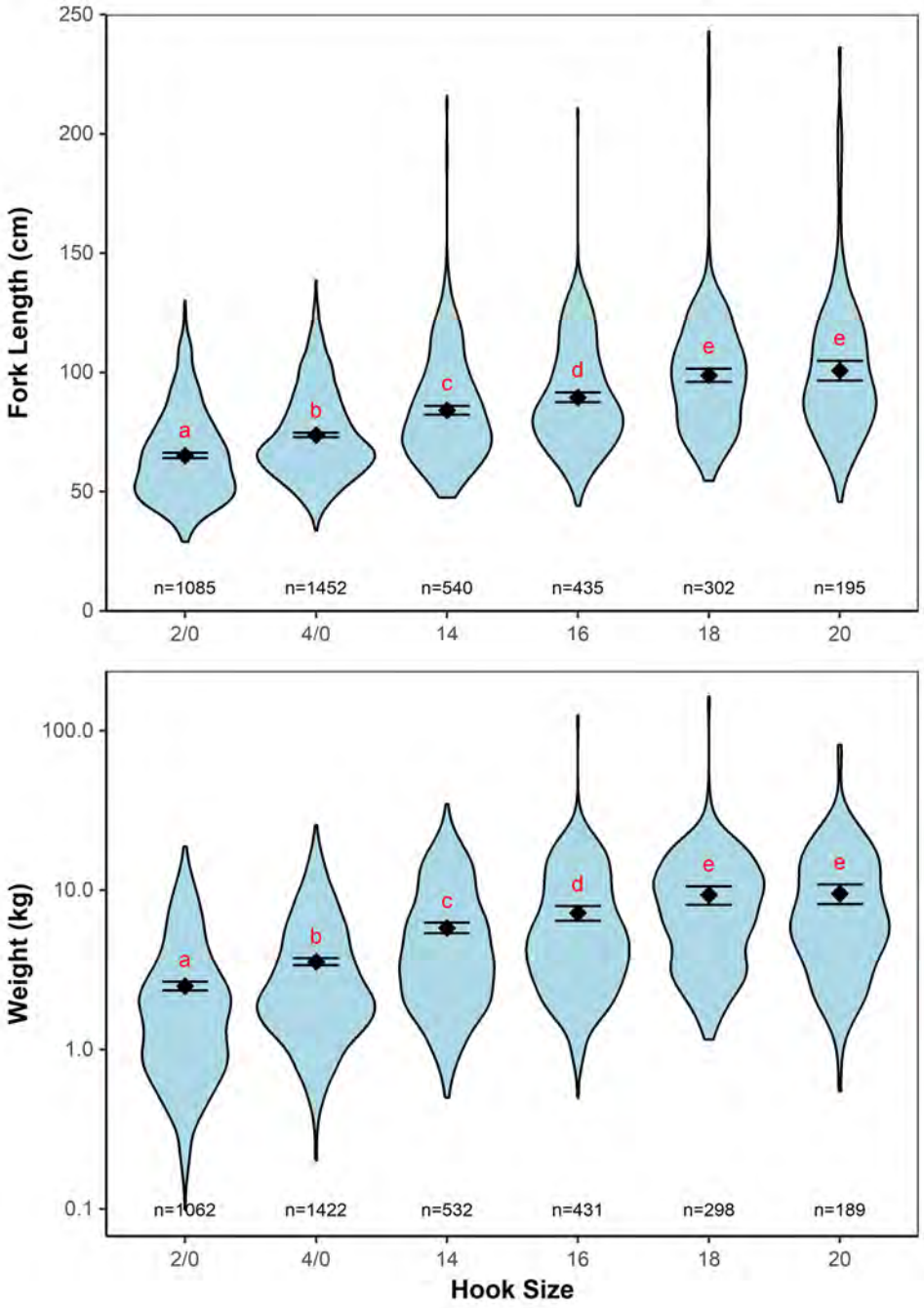

Figure 19. **Mean and distribution of fork length and weight of captured sturgeon by hook size. Note log Y-axis scale on bottom panel. Sample sizes are shown along the horizontal axis of each panel. Means (diamond) are shown with 95% confidence bounds at α = 0.05, along with letters (in red) that correspond to the results of Tukey HSD tests (within a panel, means that share a letter are not significantly different). Blue blobs show the distribution of observed values (wider blobs occur where there were more observations).**

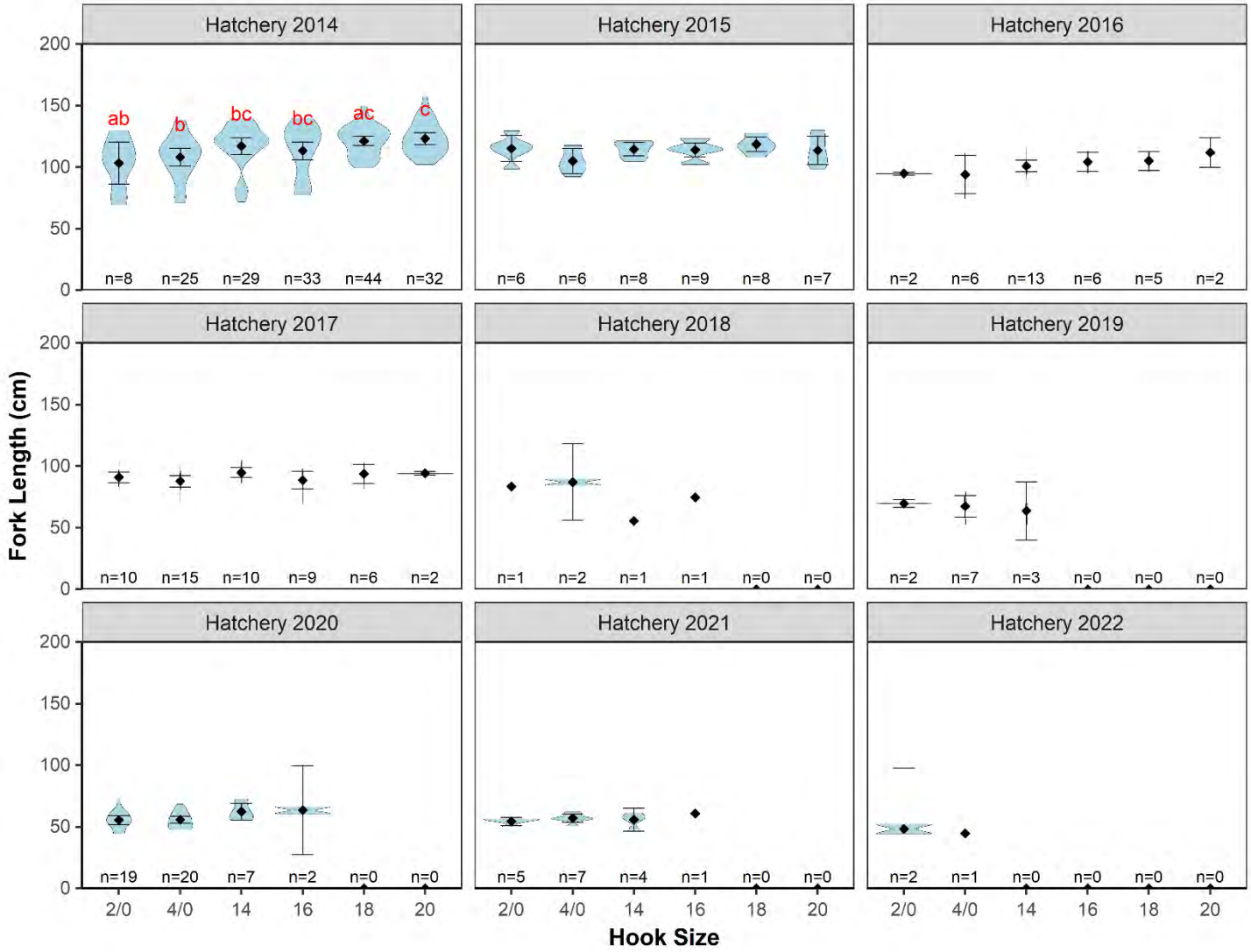

Figure 20. **Means and distributions of fork length of sturgeon captured in 2022 by hook size and release cohort. Sample sizes are shown along the horizontal axis of each panel. Means (diamond) are shown with 95% confidence bounds at α = 0.05, along with letters (in red) that correspond to the results of Tukey HSD tests (within a panel, where differences were found). Blue blobs show the distributions of observed values (wider blobs occur where there were more observations).**

analysis was restricted to the 2022 indexing data and run separately for each release cohort (Figure 20), though statistical significance was found only for cohorts with larger sample size.

Recapture rates for the BY2013 fish (released from the hatchery in 2014) have been notably higher than those of the other brood years, even when size-at-recruitment into the juvenile sampling gear has been taken into account. For example, we expected the vulnerability of the BY2015 fish in 2017 (when they were about 2.25 years old) to be similar to that of the BY2014 fish in 2016, or that of the BY2013 fish in 2015 (all 2.25 years old at the time of capture). By plotting the CPUE (fish caught per setline) vs. age at recapture (Figure 21), we show that there has been a disproportionately high recapture rate of the BY2013 fish. That said, the BY2013 recapture rate in 2021 and 2022 (arrows in Figure 21) are more in line with that which is expected for other brood years.

Recapture probabilities varied by fish size. For every brood year, individuals that were heavier at the time of release were more likely to be recaptured at least once in indexing surveys, as compared to smaller-sized individuals (Figure 22), an effect that was statistically significant for the 2013-2016 brood years (χ^2 = 198.5, 21.0, 8.7, and 19.1, respectively). Similar results were found when analysis focused on fish seen after at least one or two years at large.

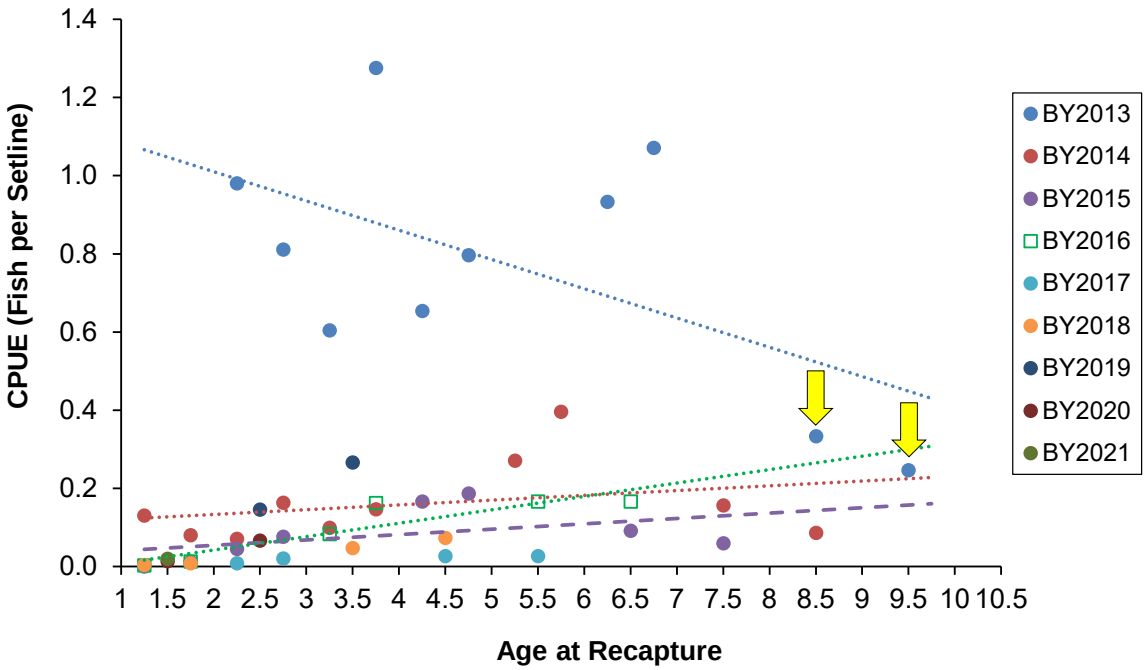

Figure 21. **Catch per unit effort (CPUE, fish per setline) of White Sturgeon of various ages in juvenile indexing setline gear. Each brood year is shown with a maximum of ten dots (one for each of ten juvenile indexing surveys – two per year over four years, plus 2021 and 2022). Age at recapture is based on approximate survey timing (e.g., the Summer 2015 survey would have sampled 2.25 year-old BY2013, and 1.25 year-old BY2014 fish, etc.). The yellow arrows draw attention to the BY2013 CPUE in 2021 and 2022.**

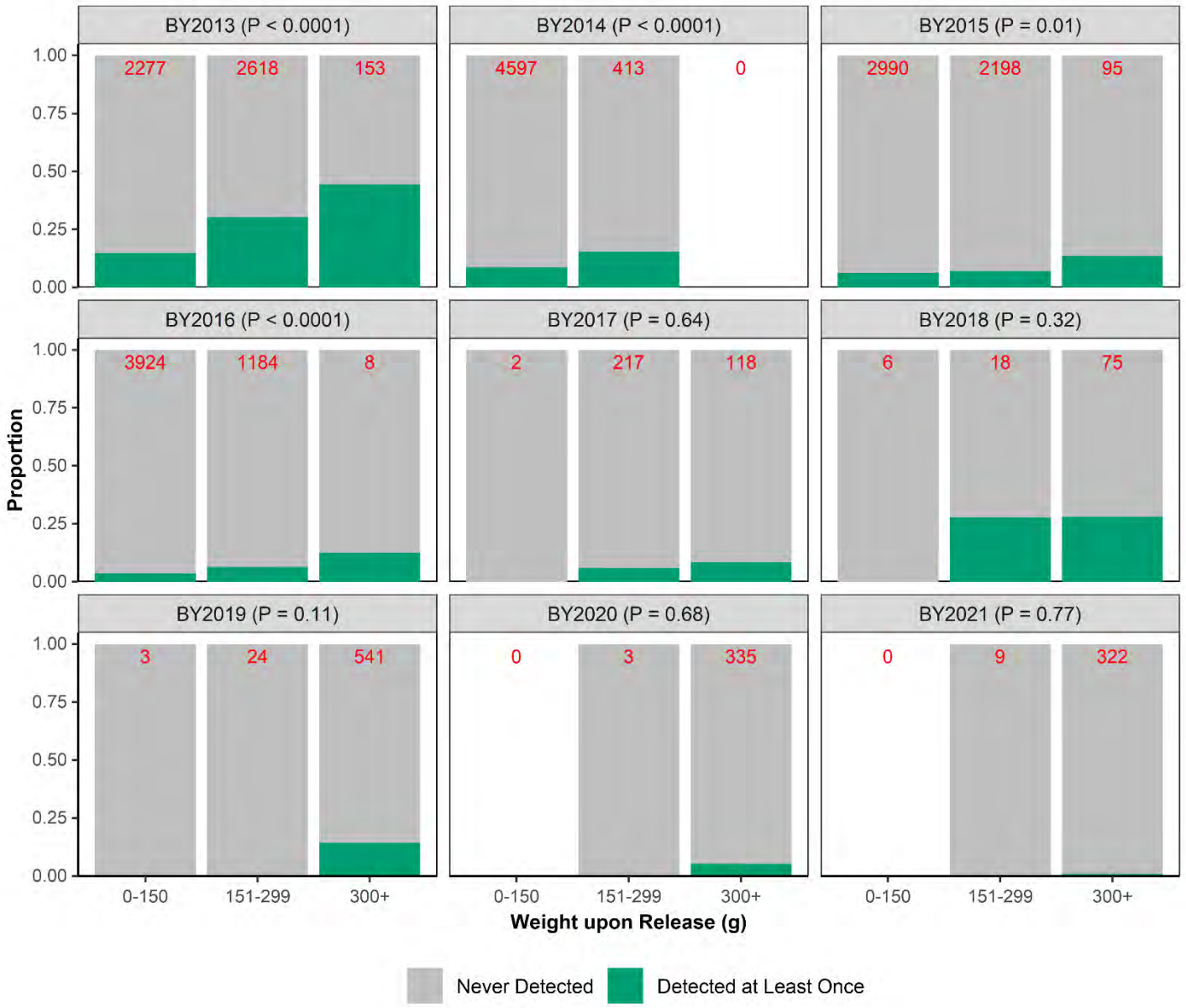

Figure 22. Proportions of hatchery-released White Sturgeon that were recaptured at least once during indexing surveys, by weight category (g at release) and brood year. *P*-values for Chi square tests shown in panel titles. Samples sizes shown in red.

Table 11. Numbers of White Sturgeon examined, lost tags (i.e., scute-marked individuals that did not have a functioning PIT tag), and tag-loss rates by session and overall.

Sampling Session	Fish Examined	Tags Lost	Tag Loss Rate
Juvenile Sampling Gear			
Summer 2015	239	8	3.35%
Fall 2015	195	3	1.54%
Summer 2016	238	4	1.68%
Fall 2016	475	4	0.84%
Summer 2017	269	6	2.23%
Fall 2017	334	8	2.40%
Summer 2019	367	1	0.27%
Fall 2019	467	9	1.93%
Juvenile 2021	298	4	1.34%
Juvenile 2022	162	0	0.00%
Adult Sampling Gear			
Adult 2016	72	6	8.33%
Adult 2017 - 1	98	1	1.02%
Adult 2017 - 2 †	179	4	2.23%
Adult 2018	315	9	2.86%
Adult 2019	263	3	1.14%
Adult 2021	405	4	0.99%
Adult 2022	262	0	0.00%
TOTAL	**4,638**	**74**	**1.60%**

† includes 5 setlines (Oct 15-19) deployed with the goal of acoustic-tagging larger-sized sturgeon.

4.3.2 Tag Loss

During juvenile indexing, 3,044 scute-marked fish were examined for PIT tags, and 47 were observed to have a lost or non-functional tag. During adult indexing 1,594 scute-marked fish were examined, 27 of which with lost or non-functional tags. The overall tag loss rate was 1.60% (Table 11). To date, no tag loss has been observed for wild-origin fish.

4.3.3 Survival Estimation

4.3.3.1 Hatchery Fish

Sample sizes were adequate for survival estimation for the BY2013 though BY2019 cohorts (Table 12). Too few BY2020 fish were captured in more than one year for robust modelling. Too few survey years have occurred to estimate results for BY2021 (Table 12).

Several inter-survey periods provided data for survival estimation (Figure 6). But since two surveys are required after any period of interest, survival could not be estimated after 2021 (it will be possible to estimate survival from 2022 once surveys in 2023 are completed).

Table 12. **Numbers of individual White Sturgeon recaptured, by the number of indexing year in which it was caught, and by brood year. The minimum threshold for model fitting requires at least some fish to be captured in two or more sessions (threshold shown in yellow).**

# of Sessions in which an Individual was Recaptured	Brood Year								
	BY2013	BY2014	BY2015	BY2016	BY2017	BY2018	BY2019	BY2020	BY2021
7	1	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a
6	22	0	0	n/a	n/a	n/a	n/a	n/a	n/a
5	31	8	1	0	n/a	n/a	n/a	n/a	n/a
4	111	14	4	0	0	n/a	n/a	n/a	n/a
3	202	29	11	8	1	0	n/a	n/a	n/a
2	314	63	35	26	3	7	11	1	n/a
1	479	158	82	113	15	19	65	17	3
Total Recaptured	1,160	272	133	147	19	26	76	18	3
Never Recaptured	3,884	4,737	5,156	4,984	318	73	494	320	329

CJS modeling for hatchery fish from brood years 2013 to 2016 resulted in a single model form receiving all the support (the model form that allowed both survival and detection probability to vary over time). This was also the top supported model for the 2018 brood year. For brood years 2017 and 2019, the top model was that which had a single average survival parameter, but which allowed detection probability to vary over time.

All estimated survival rates were scaled either to an annual or monthly time step. For the cohorts released more than one year before the next survey (i.e., for the BY2013 and BY2019 groups), an annual time step was used (Table 13). Thus, the annual survival from release to the first survey in 2015, 30.8%, should be applied over a 1.08 year period to calculate total survivorship during that 13-month period (i.e., $30.8\%^{1.08}$). Subsequent survival periods were 12 or 24 months long (there were no surveys in 2020). Despite differing 'survival durations', the survival rates for the BY2013 fish have been outputted on an annual time step, which allows for easy comparison over time. Specifically, the annual survival rate for BY2013 was 30.8% over the first 13 months after release, which was considerably lower than the annual rate in the next year (95.5% from 2015 to 2016), or in the third year 89.0% from 2016 to 2017).

Survival for the remaining cohorts could not be reliably estimated on an annual timestep, so monthly timesteps were used instead. This is likely a result of the short (1 month) period between release (June) and the start of indexing (July) each year, coupled with possibly low post-release survival rates for these groups. For example, *monthly* survival for the one-month period after release was as low as 20.5% (BY2014); which when expanded to an annual rate ($20.5\%^{12}$) is essentially zero, and causes the annual-step fitting routine to fail (the model cannot resolve a solution if survival rate is zero or 100, and in this case, an initial survival of 0% does not mesh with the subsequent detections of fish). Despite using the monthly time step, the initial post-release survival could not be reliably estimated for the BY 2015 and 2016 fish).

The survival models described above do not explicitly allow for emigration or tag loss. Emigration was estimated using acoustic telemetry data at 11.1% (see Section 4.1.1.1). Tag loss was estimated at 1.60% (see Section 4.3.2). We accounted for tag loss and emigration by 'reducing' the total number of fish being modeled. 'True' survival rate (S) differences were captured in the initial post-release value, and were generally 2 to 4 points higher than apparent rates (Table 14). The large decrease from apparent to true survival for BY2019 does not make sense, and should serve as a red flag for the reliability of the model results for this cohort.

4.3.3.2 Wild Fish

For wild fish, modeling was conducted on an annual time step, and multiple models received support. Both of the top models included a survival term that did not vary over time. Model averaging did not produce realistic estimates (models with negative betas were eliminated by the program during averaging), and the top model (that which included a single average survival parameter, but which allowed detection probability to vary over time) was used (Table 15). To date, no wild-origin fish have been known to emigrate, and no tag loss has been detected. As such, true survival and apparent survival rates did not differ from each other.

Table 13. Estimates of apparent survival and detection probability (and standard errors, SE, and the following page) derived from CJS models, by brood year (BY) and parental origin (WL = wild larvae, DG = direct gamete). Apparent survival was estimated when emigration and tag loss data were ignored. "FAIL' noted were values failed to converge. Rls = release.

	BY2013								
	All	**WL**	**DG**	**BY2014**	**BY2015**	**BY2016**	**BY2017**	**BY2018**	**BY2019**
Appar. Survival	*Annual*	*Annual*	*Annual*	*Monthly*	*Monthly*	*Monthly*	*Monthly*	*Monthly*	*Annual*
Rls to 2015	30.8%	36.6%	26.5%	20.5%	-	-	-	-	-
Rls to 2016	-	-	-	-	FAIL	-	-	-	-
Rls to 2017	-	-	-	-	-	FAIL	-	-	-
Rls to 2018	-	-	-	-	-	-	92.7%	-	-
Rls to 2019	-	-	-	-	-	-	-	42.6%	-
Rls to 2021	-	-	-	-	-	-	-	-	91.2%
2015 to 2016	95.5%	95.9%	94.9%	91.1%	-	-	-	-	-
2016 to 2017	89.0%	93.8%	84.2%	98.5%	76.0%	-	-	-	-
2017 to 2018	86.8%	83.5%	90.4%	99.7%	98.7%	78.1%	-	-	-
2018 to 2019	93.8%	92.1%	FAIL	99.4%	FAIL	FAIL	92.7%	-	-
2019 to 2021	92.4%	91.4%	93.4%	99.5%	FAIL	99.3%	92.7%	FAIL	-
Detection Probability									
2015	22.5%	23.7%	21.3%	4.2%	-	-	-	-	-
2016	38.1%	36.9%	39.4%	16.9%	FAIL	-	-	-	-
2017	40.3%	35.0%	46.4%	27.0%	14.9%	FAIL	-	-	-
2018	21.3%	21.3%	21.2%	10.7%	4.8%	0.8%	FAIL	-	-
2019	47.6%	52.5%	41.5%	54.6%	44.9%	18.2%	3.2%	7.1%	-
2021	34.5%	40.4%	27.8%	34.8%	33.5%	38.0%	67.5%	40.3%	25.6%

Table continues on next page

Table 13 continued.

	BY2013								
	All	**WL**	**DG**	**BY2014**	**BY2015**	**BY2016**	**BY2017**	**BY2018**	**BY2019**
SE of Appar. Survival									
Rls to 2015	1.0%	1.6%	1.3%	5.6%	-	-	-	-	-
Rls to 2016	-	-	-	-	0.0%	-	-	-	-
Rls to 2017	-	-	-	-	-	0.0%	-	-	-
Rls to 2018	-	-	-	-	-	-	0.8%	-	-
Rls to 2019	-	-	-	-	-	-	-	11.4%	-
Rls to 2021	-	-	-	-	-	-	-		1.6%
2015 to 2016	3.4%	4.6%	5.1%	2.2%	-	-			
2016 to 2017	3.3%	5.0%	4.3%	0.9%	1.0%	-	-	-	-
2017 to 2018	4.6%	6.1%	7.1%	1.1%	1.3%	1.0%	-	-	-
2018 to 2019	5.7%	6.9%	9.7%	1.1%	0.0%	0.0%	0.8%	-	-
2019 to 2021	4.8%	5.7%	8.4%	0.8%	0.0%	0.9%	0.8%	0.0%	-
SE of Detection Probability									
2015	1.3%	1.8%	1.8%	1.3%	-	-	-	-	-
2016	1.6%	2.2%	2.3%	2.5%	0.0%	-	-	-	-
2017	1.8%	2.4%	2.7%	3.2%	3.2%	0.0%	-	-	-
2018	1.6%	2.1%	2.3%	2.3%	1.7%	0.5%	0.0%	-	-
2019	2.5%	3.4%	3.7%	4.8%	5.2%	3.5%	1.6%	4.3%	-
2021	3.7%	5.2%	8.4%	7.0%	4.5%	6.9%	18.8%	12.3%	6.7%

Table 14. Estimates of true survival (and standard errors, SE) derived from CJS models, by brood year (BY) and parental origin (WL = wild larvae, DG = direct gamete). True Survival rates were generated after accounting for 11.1% emigration and 1.60% tag-loss, both counted in the first period after release.

Brood Year / Origin	Survival Period	Step	Apparent Survival	True Survival	SE of True Survival
BY2013 All	Rls to 2015	Annual	30.8%	33.8%	1.1%
BY2013 WL	Rls to 2015	Annual	36.6%	39.9%	1.7%
BY2013 DG	Rls to 2015	Annual	26.5%	29.2%	1.4%
BY2014	Rls to 2015	Monthly	20.5%	23.3%	6.3%
BY2015	Rls to 2016	Monthly	FAIL	FAIL	
BY2016	Rls to 2017	Monthly	FAIL	FAIL	
BY2017	Rls to 2018	Monthly	92.7%	92.7%	0.6%
BY2018	Rls to 2019	Monthly	42.6%	46.9%	12.4%
BY2019	Rls to 2021	Annual	91.2%	36.7%	7.9%

Table 15. Estimates of survival (apparent and true are equivalent) and detection probability (and standard errors, SE) derived from CJS models for wild (natural origin) sturgeon.

	Estimate	SE
Annual Survival	*Annual*	
per year	82.8%	8.0%
Detection Probability		
2016	30.5%	18.1%
2017	57.1%	12.3%
2018	20.3%	7.6%
2019	19.1%	8.4%
2021	31.7%	15.4%

4.3.4 Abundance Estimation

The model-averaged abundance estimates are presented in Table 16. Detailed modeling outputs are presented in Appendix E. The 'capture-probability' varying model (M_b) had the greatest weight and support for BY2013, BY2015, and BY2017. The time-varying model (M_t) had the greatest weight and support only for the 'other' cohort which included wild fish, re-tagged hatchery fish with lost tags, and immigrants from Rocky Reach Reservoir. The non-varying model (M_0) was the top model for BY2014, BY2016, BY2018, and BY2019 (Appendix E). The abundance estimates suggested that 32% of the fish in the reservoir were from BY2013, 34% from BY2014, and 17% from BY2016. The overall reservoir

Table 16. Estimates of Wells Reservoir sturgeon abundance in 2022, by cohort. Estimates exclude fish released in 2021 and 2022.

Release Year	BY	Number Stocked	Average Size at Release (g)	2022 Abundance†				Percent of 2022 Population†	Apparent Survival Since Release
				Estimate	SE	LCL	UCL		
2014	**2013**	5,044	166.5	651	673	199	7,588	32%	12.9%
2015	**2014**	5,009	97.6	691	796	104	7,282	34%	13.8%
2016	**2015**	5,289	147	65	36	38	346	3%	1.2%
2017	**2016**	5,131	118.4	355	193	138	1,103	17%	6.9%
2018	**2017**	337	281	12	21	6	5,041	1%	3.6%
2019	**2018**	99	364.7	57	59	16	620	3%	57.9%
2020	**2019**	570	495.7	143	93	59	660	7%	25.2%
2021	**2020**	338	916.7	na†					
2022	**2021**	332	488.1	na†					
Other *		-	-	81	58	30	415	4%	
TOTAL		**22,149**		**2,056**		**591**	**23,054**		

* includes wild fish, re-tagged hatchery fish with lost tags, and immigrants from Rocky Reach Reservoir

† 2022 abundance estimate excludes the fish released in 2021 and 2022 due to sample size limitations for model fitting.

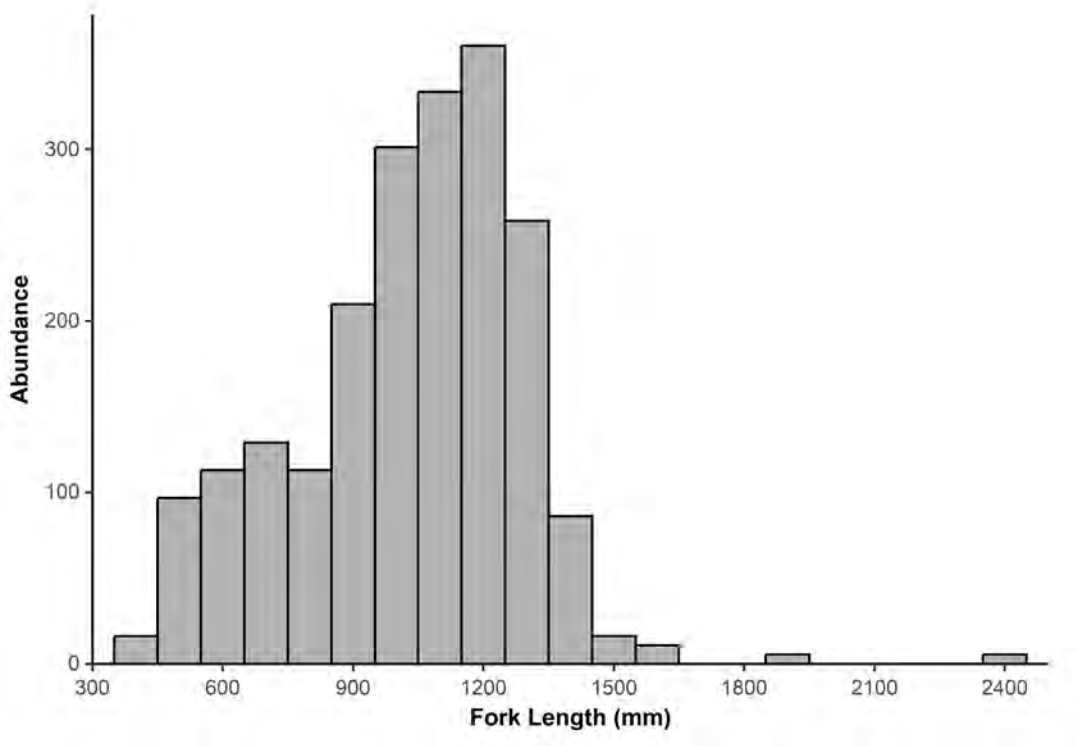

Figure 23. Length frequency distribution of individual White Sturgeon caught during the 2022 indexing survey, with y-axis scaled to sum to the estimated overall abundance of White Sturgeon in the Reservoir. The distribution and the overall abundance were both calculated exclusive of the fish released in 2021 and 2022.

abundance in 2021 (excluding fish released in 2021 and 2022) was estimated to be 2,056 sturgeon, but the 95% confidence limits were wide, suggesting the overall abundance could be as low as 591 or as high as 23,054. Confidence bounds were tighter for the 2021 assessment (i.e., from 1,466 to 5,426 fish; see Robichaud and Gingerich 2022) when sample sizes (numbers of setlines run) were about twice as great as in 2022. Increased sample size, recapture probability, or overall sturgeon abundance would be required to tighten the confidence bounds around the abundance estimate.

The assumed size distribution of the Wells Reservoir sturgeon is shown in Figure 23.

4.3.5 Distribution among Zones

For the surveys with samples distributed over the six sampling zones, there were clear differences in the catch rates among zones and sampling sessions (Table 17). A two-way GLM[8] showed a significant interaction between 'sampling zone' and 'sampling session', indicating that the among-zone distribution pattern varied significantly over time (Dev = 249.7; df = 44, F = 2.1, $P < 0.0001$). Within most sessions, differences in CPUE among-zones were highly significant (Table 17). Likely due to the considerable variability within the data, *post hoc* tests revealed only a few statistically significant pairwise differences (Figure 24). Generally, catch rates in the Lower Reservoir and Chief Joseph Tailrace were lower than in the more central parts of the Reservoir, regardless of session.

Table 17. Mean CPUE (number of fish per setline) values from indexing, by 'juvenile' sampling zone and session/gear type. Also, statistical results for among-zone comparisons.

Sampling Session	Lower Reservoir	Bathtub	Erlandsen	Upper Reservoir	Chief Joseph Tailrace	Dev	F†	*P*
Summer 2015	0.19	0.66	2.28	2.20	0.00	225.8	11.0	< 0.0001
Fall 2015	0.33	0.72	1.54	0.95	0.13	71.6	5.0	0.0008
Summer 2016	0.13	1.14	1.06	0.57	0.00	128.1	12.7	< 0.0001
Fall 2016	0.23	0.96	2.58	1.87	0.15	242.6	16.9	< 0.0001
Summer 2017	0.04	1.26	1.20	1.21	0.05	153.9	14.1	< 0.0001
Fall 2017	0.06	1.96	1.40	1.44	0.06	185.8	15.5	< 0.0001
Summer 2019	0.00	2.47	2.38	0.88	0.17	194.3	16.2	< 0.0001
Fall 2019	0.37	2.93	2.51	2.35	0.08	203.1	22.9	< 0.0001
Juvenile 2021	0.40	1.35	1.26	0.94	0.15	58.1	7.1	< 0.0001
Adult 2021	0.30	1.36	2.00	1.36	0.07	124.3	14.6	< 0.0001
2021 Combined	0.35	1.35	1.63	1.15	0.11	173.6	20.4	< 0.0001
Juvenile 2022	0.33	1.18	1.11	1.64	0.25	26.3	3.2	0.014
Adult 2022	0.31	2.62	1.85	1.72	0.38	58.2	7.4	< 0.0001
2022 Combined	0.32	1.89	1.48	1.68	0.32	75.58	9.1	< 0.0001

† Numerator degrees of freedom (df) = 5 for Summer 2015, otherwise df = 4.

[8] Okanogan data excluded (zone only sampled in one session)

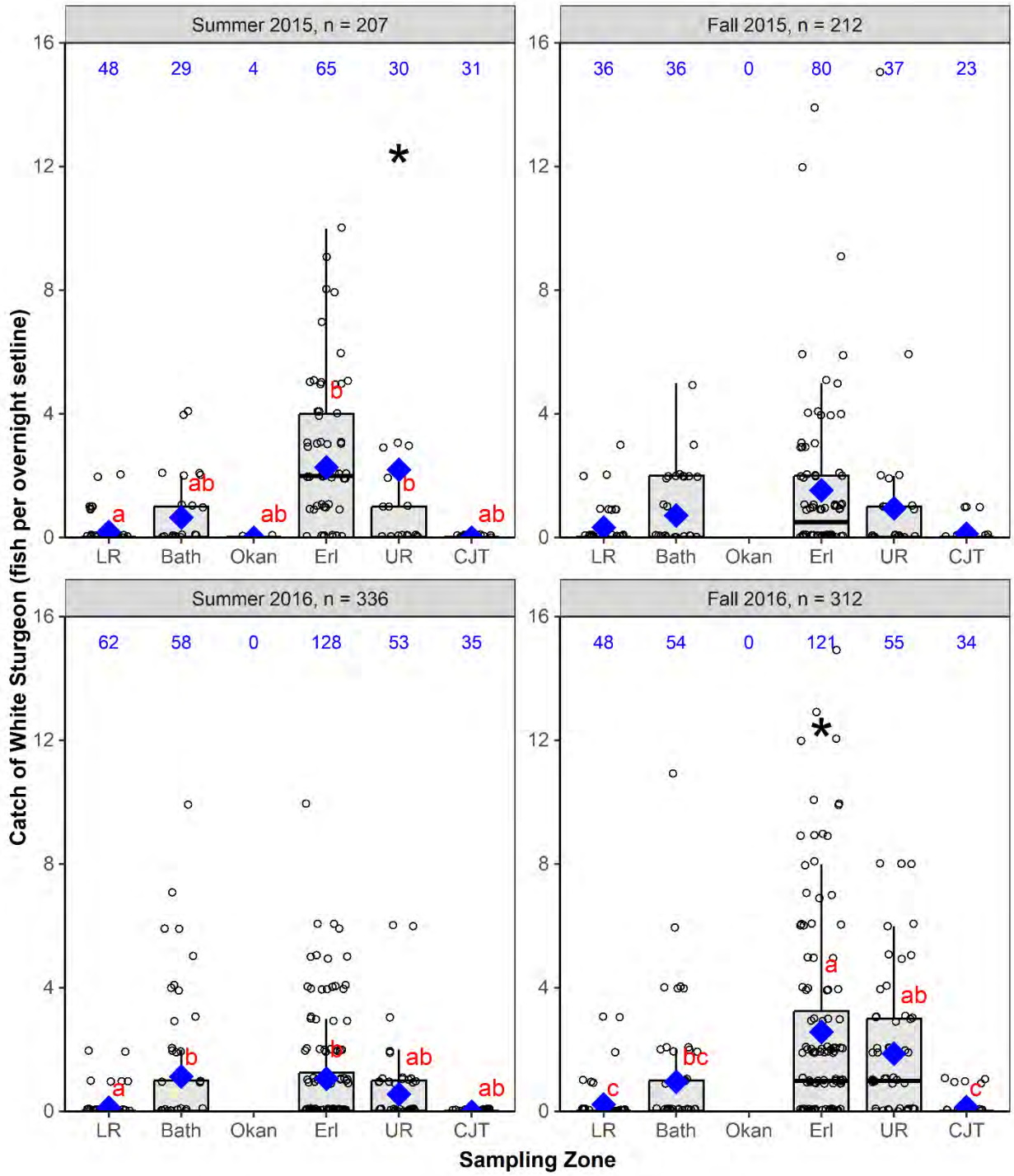

Figure 24. **Catch of White Sturgeon (fish per overnight setline) in indexing setlines deployed in six 'juvenile' sampling zones, by session/gear type. Black circles show the observed catch, jittered along the horizontal dimension (and very slightly in the vertical) to minimize the hiding of points underneath others. * Two large catches (22 and 28 fish) are left off the Summer 2015 plot for Upper Reservoir, as is one catch (18 fish) from the Fall 2016 plot for Erlandsen. Adult setlines pre 2021 are not included.**

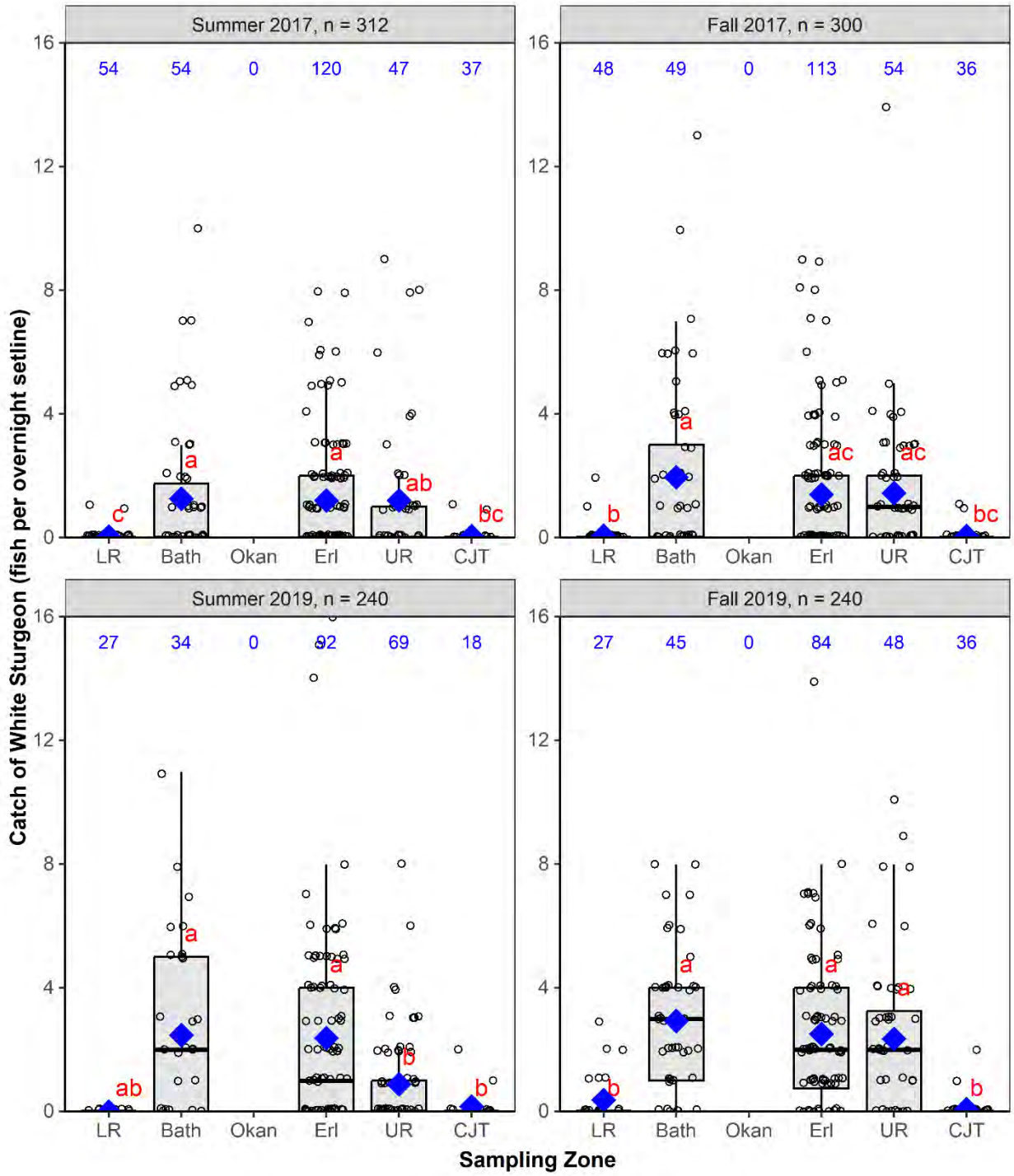

Figure 24 continued. Box plots extend from the 25th to 75th percentiles, and include a horizontal line at the median, and whiskers extend to 1.5 times the interquartile range. Mean values are indicated by blue diamonds. LR = Lower Reservoir, Bath = Bathtub, Okan = Okanogan, Erl = Erlandsen, UR = Upper Reservoir, CJT = Chief Joseph Tailrace.

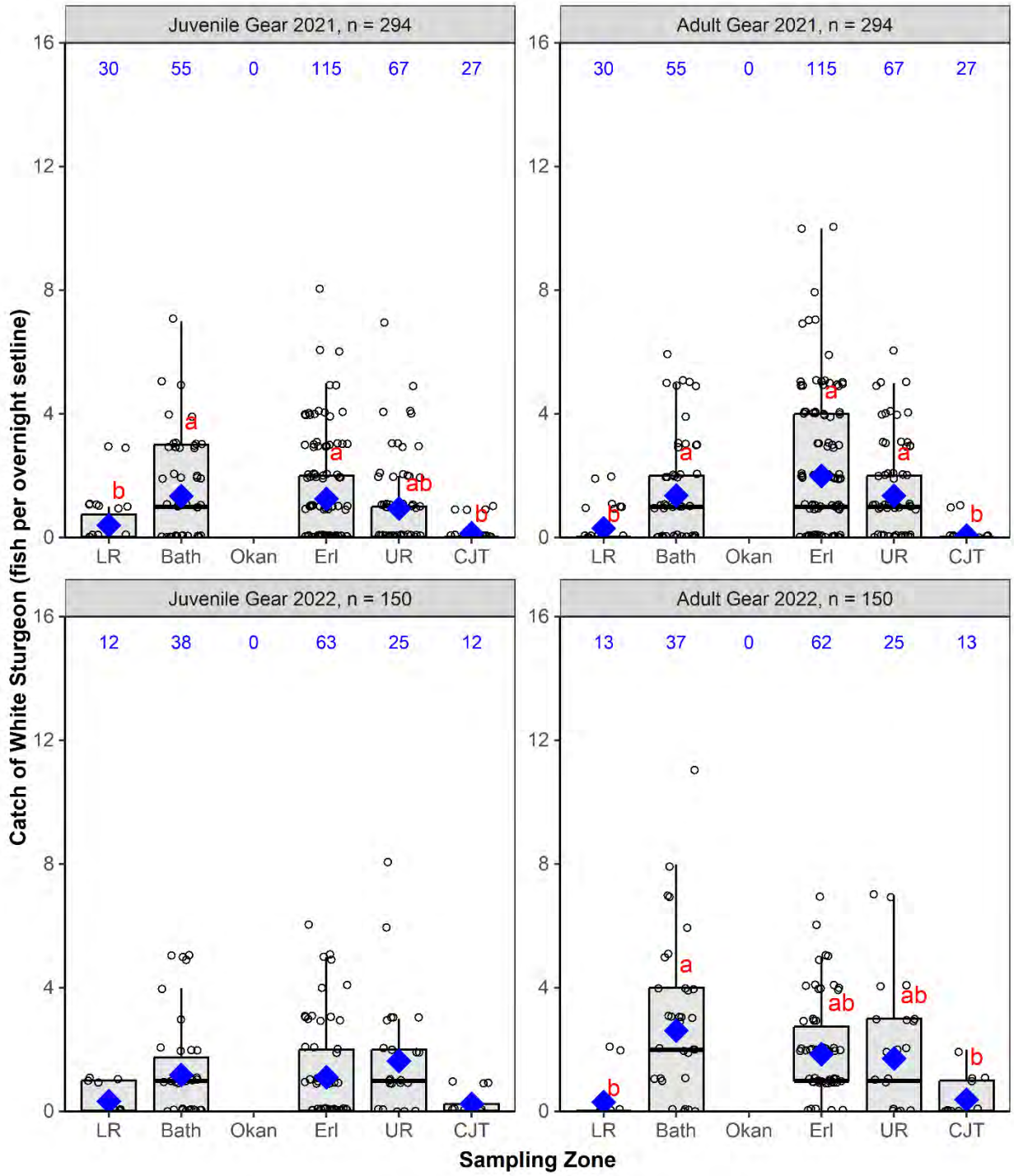

Figure 24 continued. Red letters indicate the statistical differences among sampling zones (zones that share a letter are not significantly different from each other). Samples sizes are in blue at top of each panel.

Seasonal and among-year changes in distribution were evident in the indexing data (Table 17, Figure 24). There were no seasonal effects on sturgeon distribution within 2015 (based on rank-order of CPUE values compared among sampling zones): in both 2015 sessions, CPUE was highest in Erlandsen, followed by the Upper Reservoir, and then the Bathtub. There appeared to be a downstream shift between years (Table 17, Figure 24): in Summer 2016, mean CPUE was highest in the Bathtub, followed by Erlandsen, and Upper Reservoir was third. The relative rank shifted back upstream in Fall 2016, resuming the same rank order as in 2015 (Erlandsen was highest, Upper Reservoir was second, and the Bathtub was third). In all four sessions in 2017 and 2019, CPUE was highest in the Bathtub (although among-zone differences were minimal in some sessions). In Summer and Fall of 2017 there was little difference in CPUE between the second and third place Erlandsen and Upper Reservoir zones. But in 2019, CPUE at Erlandsen was higher than in the Upper Reservoir in both sessions (compare to acoustic data, Figures 9 and 11, for which a lost receiver meant no detection data in Erlandsen, giving the false impression the fish were distributed in the Upper Reservoir during period of lost data). In 2021, CPUE of juvenile gear was highest in the Bathtub and then in Erlandson, whereas adult gear had highest CPUE at Erlandsen, followed by the Bathtub. For both gear types, the Upper Reservoir had third highest CPUE in 2021. In 2022, the highest CPUE for the juvenile gear was in the Upper Reservoir (1.64 fish per setline), followed by Bathtub (1.18) and Erlandson (1.11). By contrast, the adult gear had highest catch rates in the Bathtub (2.62 fish per setline), followed by Erlandson (1.85) and then the Upper Reservoir (1.72). In 2022, both gear type had lowest catch rates in the Lower Reservoir (0.31-0.33 fish per setline) and in the Chief Joseph Tailrace (0.25-0.38) zones.

4.3.6 Condition, Size and Growth

Length distributions upon release and at recapture are shown in Table 18 and Figures 25 through 28; weight distributions are in Table 18 and Figures 29-32; and those for relative weight are in Figure 33. Distributions showing growth, in terms of both length and weight, are shown in Table 18 and in Figures 34 and 35.

4.3.6.1 Hatchery fish

On average, fish were larger at release starting in 2020 than in years prior (Table 18). For fish released in 2021 and 2022 (BY 2020 and BY2021), growth in length within the first few months of release (average 33 and 42 mm for fish released in 2021 and 2022, respectively) was the lowest since the start of the study, as was the average weight change during this initial period (-40.1 to 18.2 g on average; Table 18). Only four fish released in 2021 and three fish released in 2022 were recaptured in 2022, so it is possible that sample size limitations are affecting the accuracy of these results. Since rates of length increase slow with size, it was somewhat expected that these fish released at larger bodied sizes fish would grow proportionally less than the smaller fish that were released in prior years, yet we cannot rule out environmental factors or density dependence as having an influence.

Table 18. Lengths (Panel A) and weights (Panel B) at release (mean, 95th percentiles shown), and mean growth over a variety of times at large (TAL), by brood year. Standard deviations and sample sizes are shown in panels C and D.

PANEL A: FORK LENGTHS

Fork Length (mm) at release				*Mean length increase (mm) by TAL*								
Brood Year	***2.5%***	***Median***	***97.5%***	***0.5 yr***	***1.5 yr***	***2.5 yr***	***3.5 yr***	***4.5 yr***	***5.5 yr***	***6.5 yr***	***7.5 yr***	***8.5 yr***
2013	228	280	343.6	-	193.1	342.1	454.0	508.2	627.3	-	763.0	871.2
2014	181	235	284	83.0	234.2	381.8	439.6	604.2	-	762.4	908.3	-
2015	207.3	278	338	129.3	187.8	296.9	440.6	-	617.3	733.7	-	-
2016	197	258	314	93.4	190.5	325.5	-	540.7	653.6	-	-	-
2017	310.8	345	378.2	-	172.8	-	395.9	394.5	-	-	-	-
2018	282.6	378	424.3	74.7	-	148.8	289.2	-	-	-	-	-
2019	356.4	411	451	-	81.1	153.0	-	-	-	-	-	-
2020	429.9	488	534.2	33.0	54.7	-	-	-	-	-	-	-
2021	369.0	409	444.5	42.0	-	-	-	-	-	-	-	-

	Percent length increase by TAL								
2013	-	66.9	118.4	158.4	173.6	215.6	-	261.0	301.3
2014	32.2	93.7	157.8	183.8	255.2	-	319.1	383.4	
2015	41.4	63.7	106.1	156.8	-	219.2	264.1	-	
2016	31.1	62.7	119.1	-	205.1	262.1	-	-	
2017	-	48.8	-	114.2	115.8	-	-	-	
2018	19.5	-	38.5	78.4	-	-	-	-	
2019	-	19.6	36.8	-	-	-	-	-	
2020	6.9	10.8	-	-	-	-	-	-	
2021	9.7	-	-	-	-	-	-	-	

Table 18 continued.

PANEL B: WEIGHTS

Weight (g) at release				*Mean change in weight (g) by TAL*								
Brood Year	***2.5%***	***Median***	***97.5%***	***0.5 yr***	***1.5 yr***	***2.5 yr***	***3.5 yr***	***4.5 yr***	***5.5 yr***	***6.5 yr***	***7.5 yr***	***8.5 yr***
2013	83.5	157.0	281.6	-	574.0	1,656.3	2,840.3	4,053.2	6,013.2	-	11,254	14,894
2014	45.7	93.8	164.1	100.2	605.4	1,505.9	2,316.1	4,412.3	-	9,313	13,159	-
2015	56.9	140.3	256.8	254.2	476.2	1,217.4	2,576.5	-	6,350.8	9,625	-	-
2016	49.8	113.2	205.4	156.7	514.8	1,274.0	-	4,227.2	6,417.6	-	-	-
2017	198.3	279.9	372.3	-	545.5	-	2,839.1	5,700.0	-	-	-	-
2018	122.7	382.0	551.3	44.5	-	739.6	1,798.3	-	-	-	-	-
2019	307.5	499.1	687.3	-	243.3	890.7	-	-	-	-	-	-
2020	603.4	917.1	1248.2	-40.1	162.3	-	-	-	-	-	-	-
2021	340.4	478.7	661.4	18.2	-	-	-	-	-	-	-	-

	Weight increase by TAL (by factor of)								
2013	-	3.4	9.8	17.2	23.4	35.2	-	65.4	91.8
2014	0.81	5.6	14.7	23.5	47.7	-	99.5	148.5	-
2015	0.95	2.9	9.6	19.1	-	45.9	70.5	-	-
2016	0.82	3.0	9.9	-	35.7	66.2	-	-	-
2017	-	1.8	-	10.3	19.1	-	-	-	-
2018	0.12	-	1.8	5.1	-	-	-	-	-
2019	-	0.5	1.8	-	-	-	-	-	-
2020	-0.03	0.1	-	-	-	-	-	-	-
2021	-0.01	-	-	-	-	-	-	-	-

Table 18 continued.

PANEL C: STANDARD DEVIATIONS

	Change in Length – Standard Deviations								
Brood Year	***0.5 yr***	***1.5 yr***	***2.5 yr***	***3.5 yr***	***4.5 yr***	***5.5 yr***	***6.5 yr***	***7.5 yr***	***8.5 yr***
2013		72.1	76.8	100.3	120.3	144.6		171.3	175.9
2014	30.7	63.2	78.9	110.7	113.4		125.8	149.7	
2015	33.6	50.3	67.1	83.9		107.8	101.8		
2016	44.0	58.7	66.9		74.4	77.8			
2017		15.3		67.1	158.6				
2018	35.2		69.7	86.3					
2019		37.3	73.5						
2020	23.3	29.4							
2021	8.7								

	Change in Weight – Standard Deviations								
Brood Year	***0.5 yr***	***1.5 yr***	***2.5 yr***	***3.5 yr***	***4.5 yr***	***5.5 yr***	***6.5 yr***	***7.5 yr***	***8.5 yr***
2013		338.3	643.9	1,291.7	1,952.0	2,846.9		5,264.9	6,617.0
2014	76.4	231.7	640.2	1,104.1	1,771.9		3,554.9	3,556.5	
2015	43.8	210.4	424.2	846.0		2,139.6	2,437.5		
2016	112.6	64.8	454.6		1,287.0	1,765.9			
2017		39.7		915.4	4,870.5				
2018	43.7		668.1	1,112.5					
2019		242.5	647.4						
2020	134.8	278.4							
2021	128.3								

Table 18 continued.

PANEL D: SAMPLE SIZES

Brood Year	Sample Size at Release	Length Data – Sample Size at Recapture								
		0.5 yr	*1.5 yr*	*2.5 yr*	*3.5 yr*	*4.5 yr*	*5.5 yr*	*6.5 yr*	*7.5 yr*	*8.5 yr*
2013	5,009		314	59	475	224	462		287	165
2014	4,985	43	57	75	28	138		78	46	
2015	5,286	3	29	8	75		56	35		
2016	5,119	5	2	48		84	50			
2017	337		4		14	6				
2018	99	3		17	13					
2019	568		44	43						
2020	338	4	15							
2021	332	3								

Brood Year	Sample Size at Release	Weight Data – Sample Size at Recapture								
		0.5 yr	*1.5 yr*	*2.5 yr*	*3.5 yr*	*4.5 yr*	*5.5 yr*	*6.5 yr*	*7.5 yr*	*85 yr*
2013	5,008		314	504	449	224	462		287	163
2014	4,985	43	53	71	28	138		78	45	
2015	5,279	3	28	8	74		56	34		
2016	5,113	5	2	47		83	49			
2017	337		4		14	6				
2018	99	3		17	13					
2019	568		44	38						
2020	338	4	14							
2021	332	3								

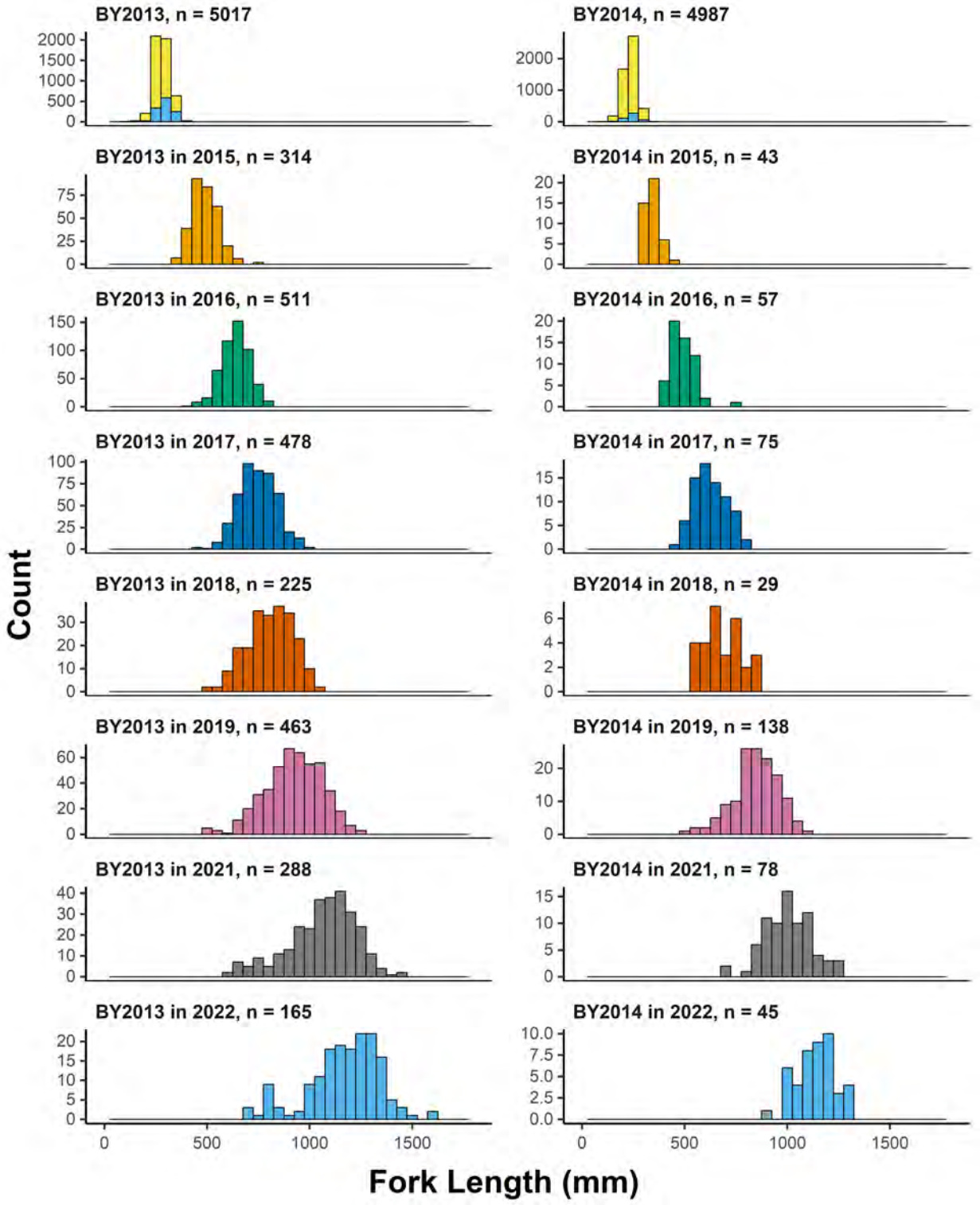

Figure 25. **Fork length frequency distributions for fish released in 2014 (BY2013, left panels) or 2015 (BY2014, right panels). Top row: fork lengths at release shown in blue (fish that were later recaptured) and yellow (all others). Second to eights rows: fork lengths upon recapture in 2015, 2016, 2017, 2018, 2019, 2021, and 2022, respectively. Note variable Y axis scales. Adult and juvenile setline data are included.**

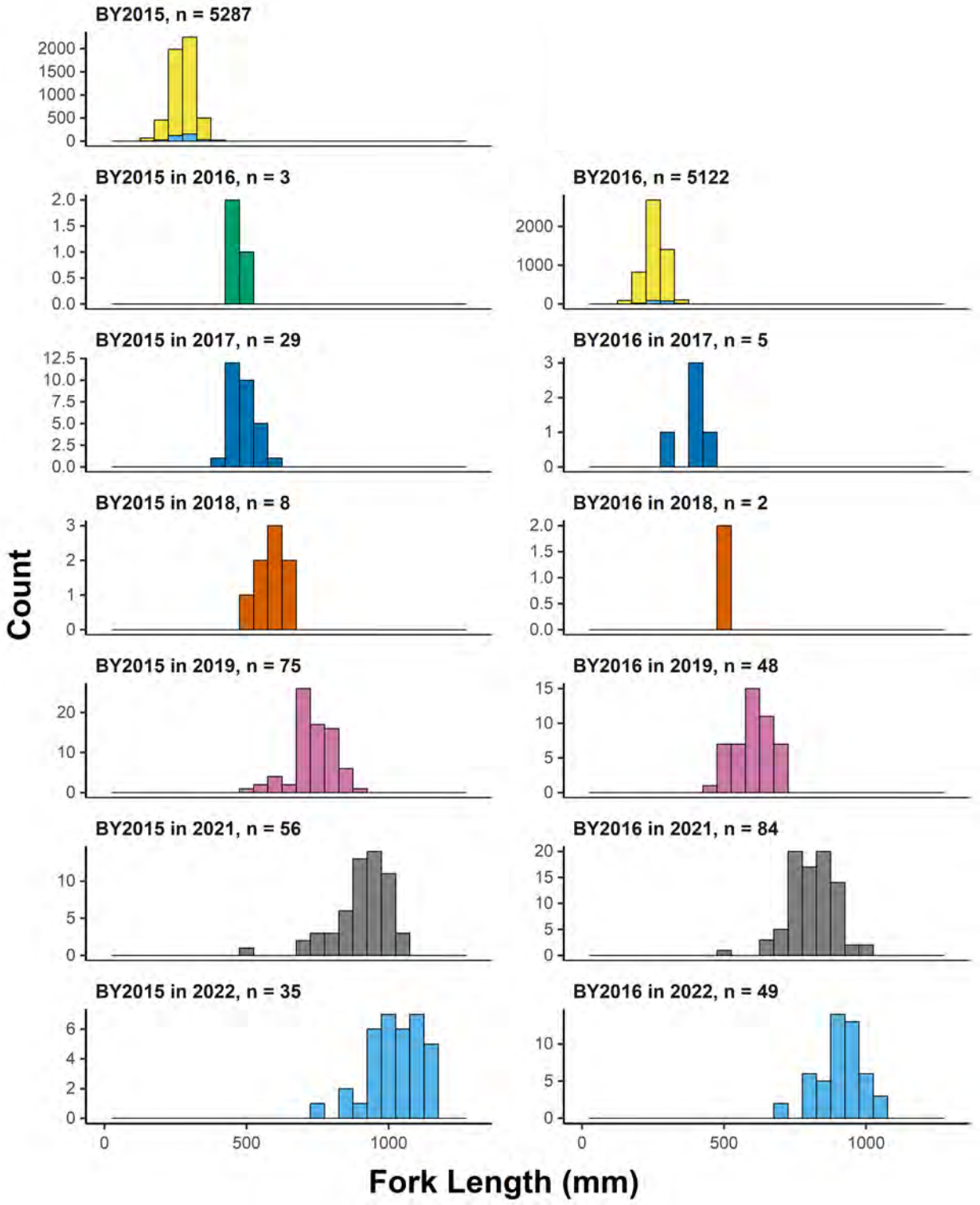

Figure 26. **Fork length frequency distributions for fish released in 2016 (BY2015, left panels) or 2017 (BY2016, right panels). Top row of each column: fork lengths at release shown in blue (fish that were later recaptured) and yellow (all others). Subsequent rows: fork lengths upon recapture. Note variable Y axis scales. Adult and juvenile setline data are included.**

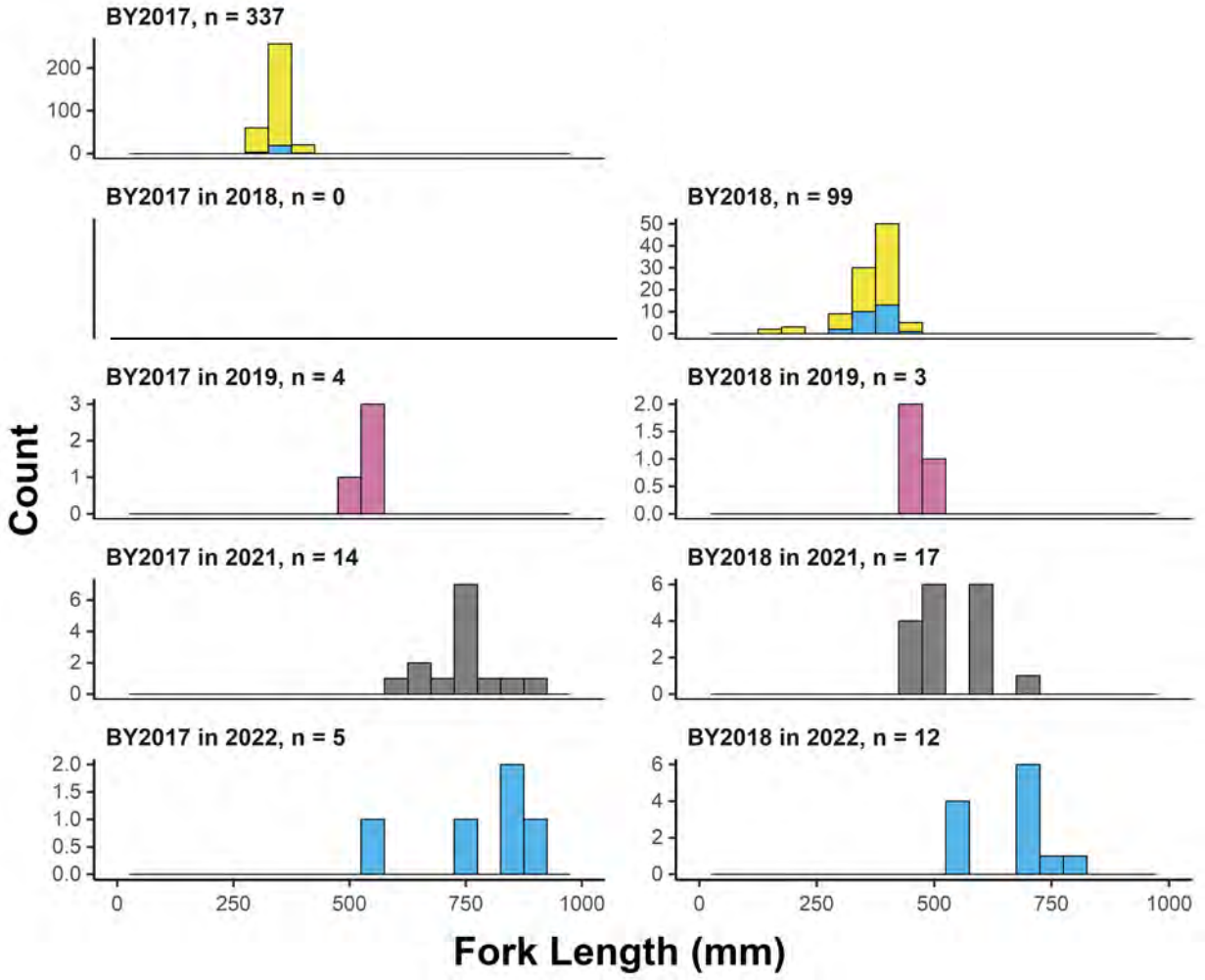

Figure 27. **Fork length frequency distributions for fish released in 2018 (BY2017, left panels) or 2019 (BY2018, right panels). Top row of each column: fork lengths at release shown in blue (fish that were later recaptured) and yellow (all others). Subsequent rows: fork lengths upon recapture. Note variable Y axis scales. Adult and juvenile setline data are included.**

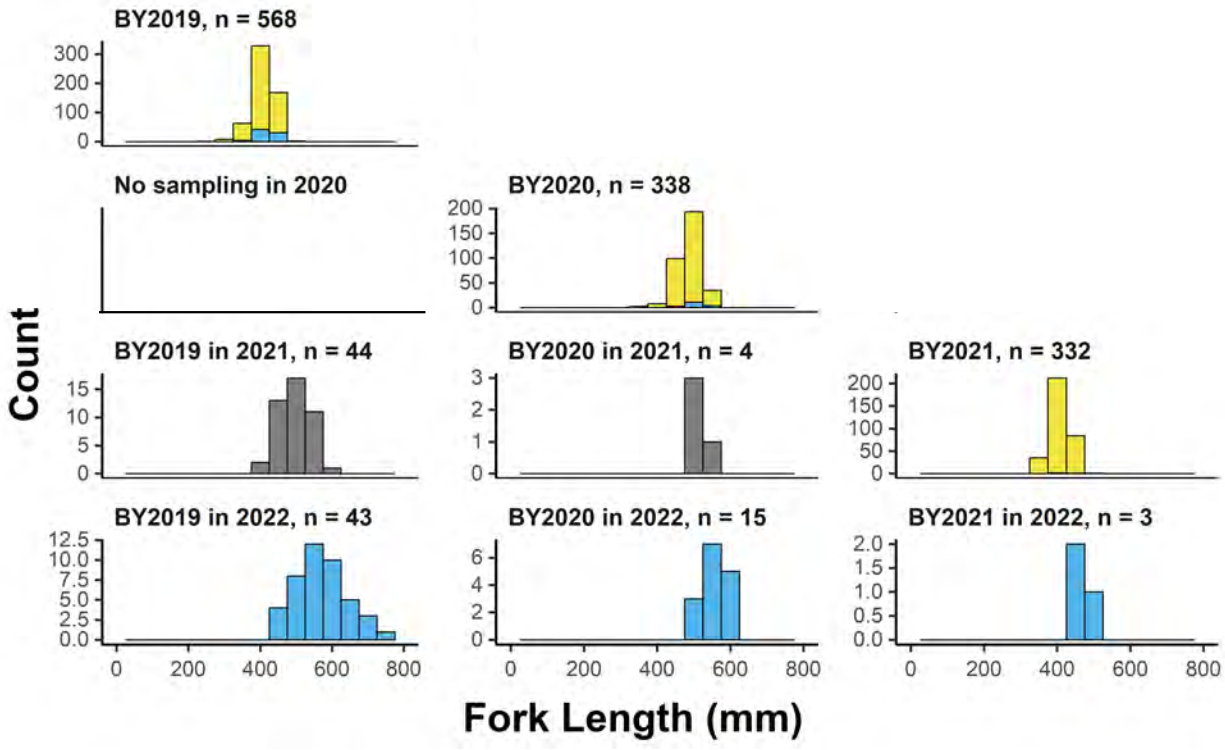

Figure 28. **Fork length frequency distributions for fish released in 2020 (BY2019, left panels), 2021 (BY2020, middle panels), or 2022 (BY2021, right panels). Top row of each column: fork lengths at release shown in blue (fish that were later recaptured) and yellow (all others). Subsequent rows: fork lengths upon recapture. Note variable Y axis scales. Adult and juvenile setline data are included.**

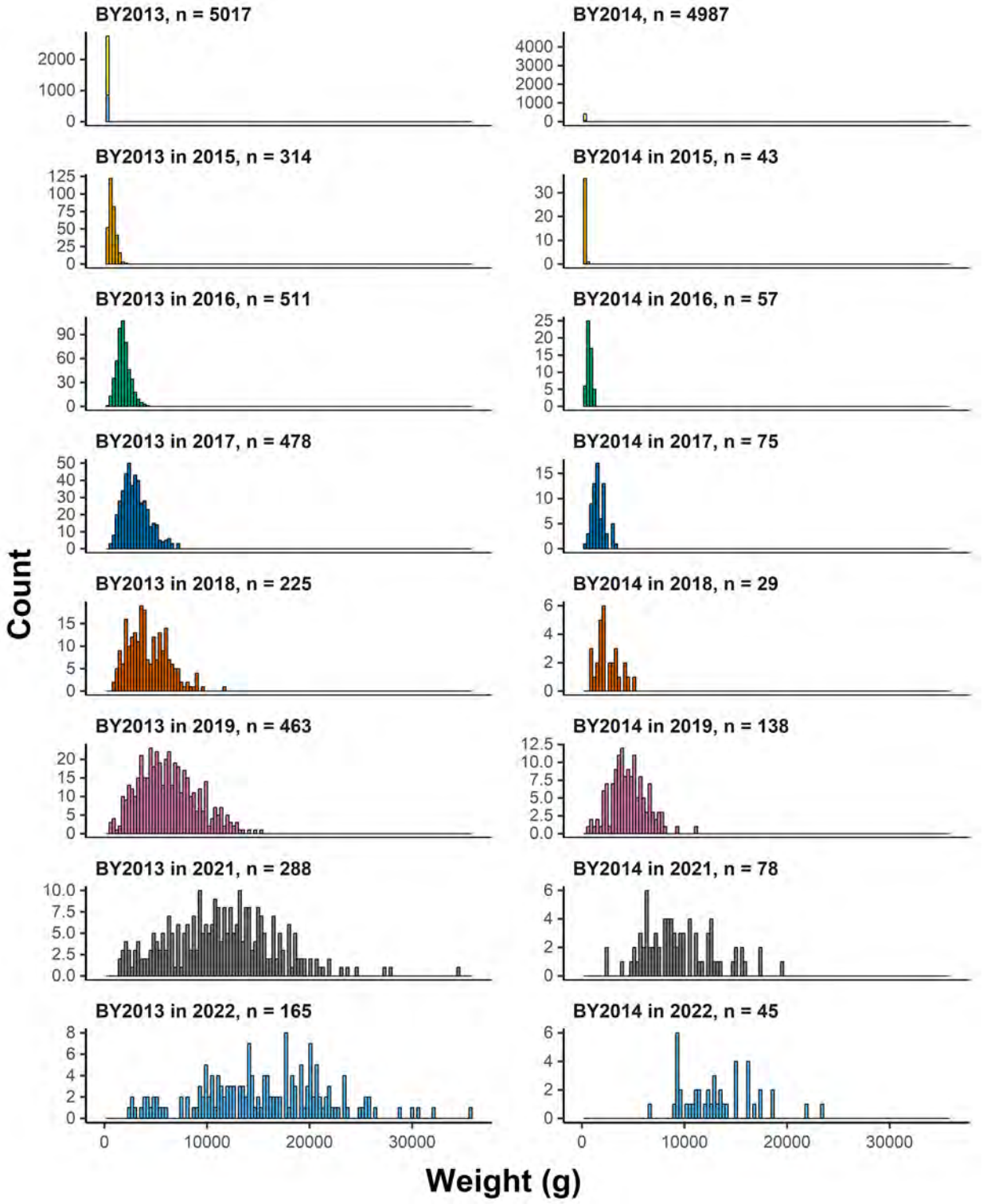

Figure 29. **Weight frequency distributions for fish released in 2014 (BY2013, left panels) or 2015 (BY2014, right panels). Top row: fork lengths at release shown in bllue (fish that were later recaptured) and yellow (all others). Second to seventh rows: fork lengths upon recapture in 2015, 2016, 2017, 2018, 2019, 2021, and 2022 respectively. Note variable Y axis scales. Adult and juvenile setline data are included.**

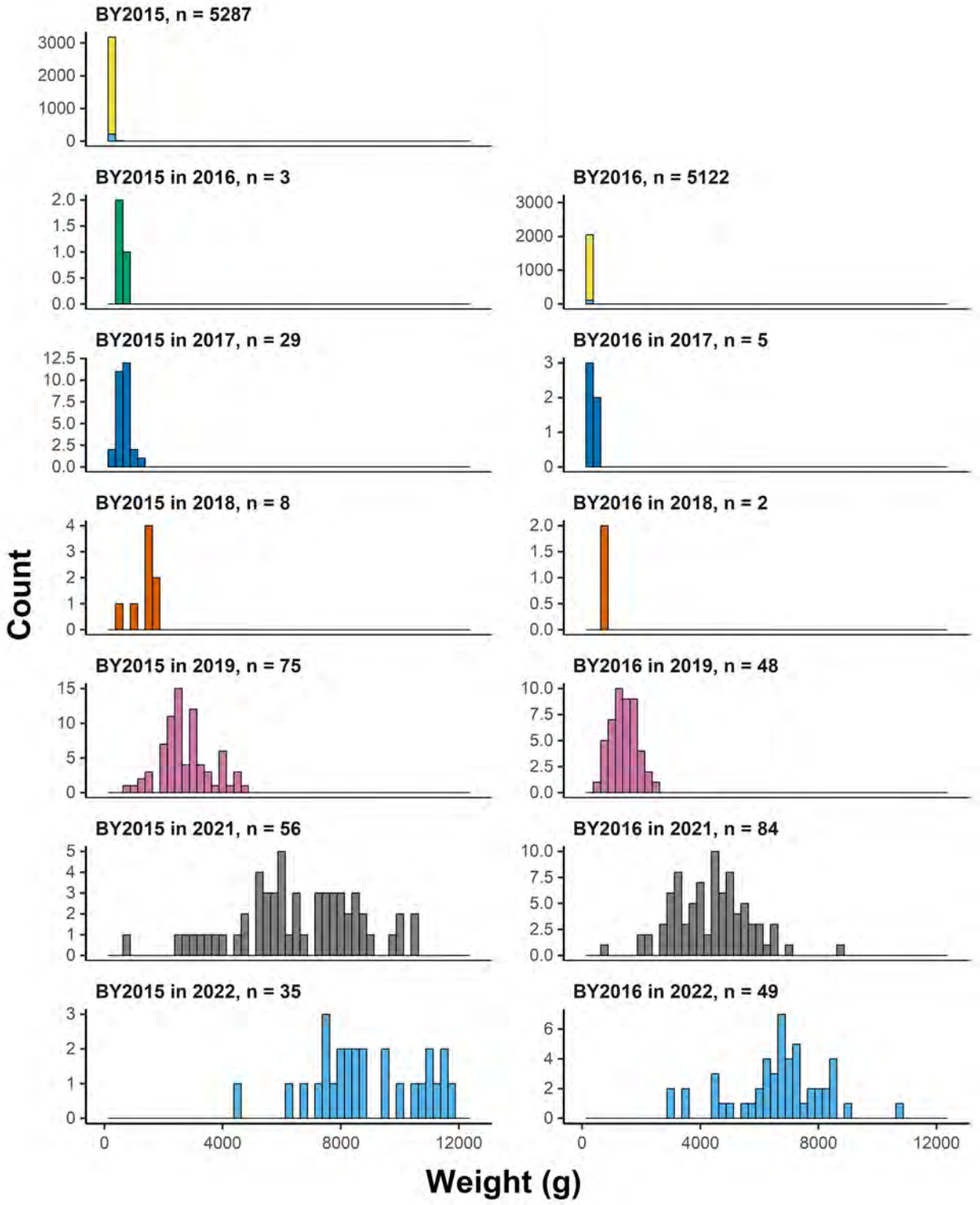

Figure 30. **Weight frequency distributions for fish released in 2016 (BY2015, left panels) or 2017 (BY2015, right panels). Top row of each column: fork lengths at release shown in blue (fish that were later recaptured) and yellow (all others). Subsequent rows: fork lengths upon recapture. Note variable Y axis scales. Adult and juvenile setline data are included.**

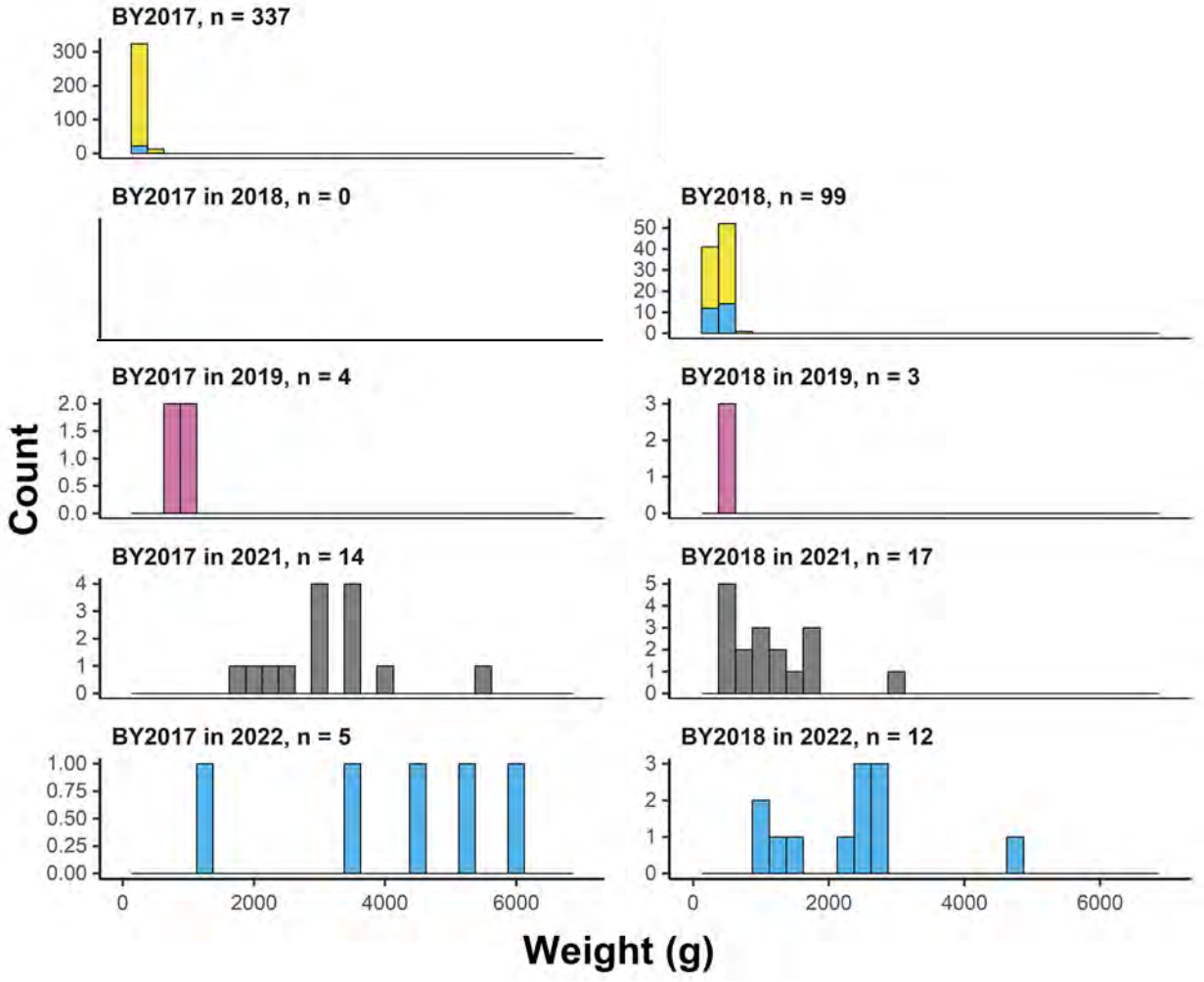

Figure 31. **Weight frequency distributions for fish released in 2018 (BY2017, left panels) or 2019 (BY2018, right panels). Top row of each column: fork lengths at release shown in blue (fish that were later recaptured) and yellow (all others). Subsequent rows: fork lengths upon recapture. Note variable Y axis scales. Adult and juvenile setline data are included.**

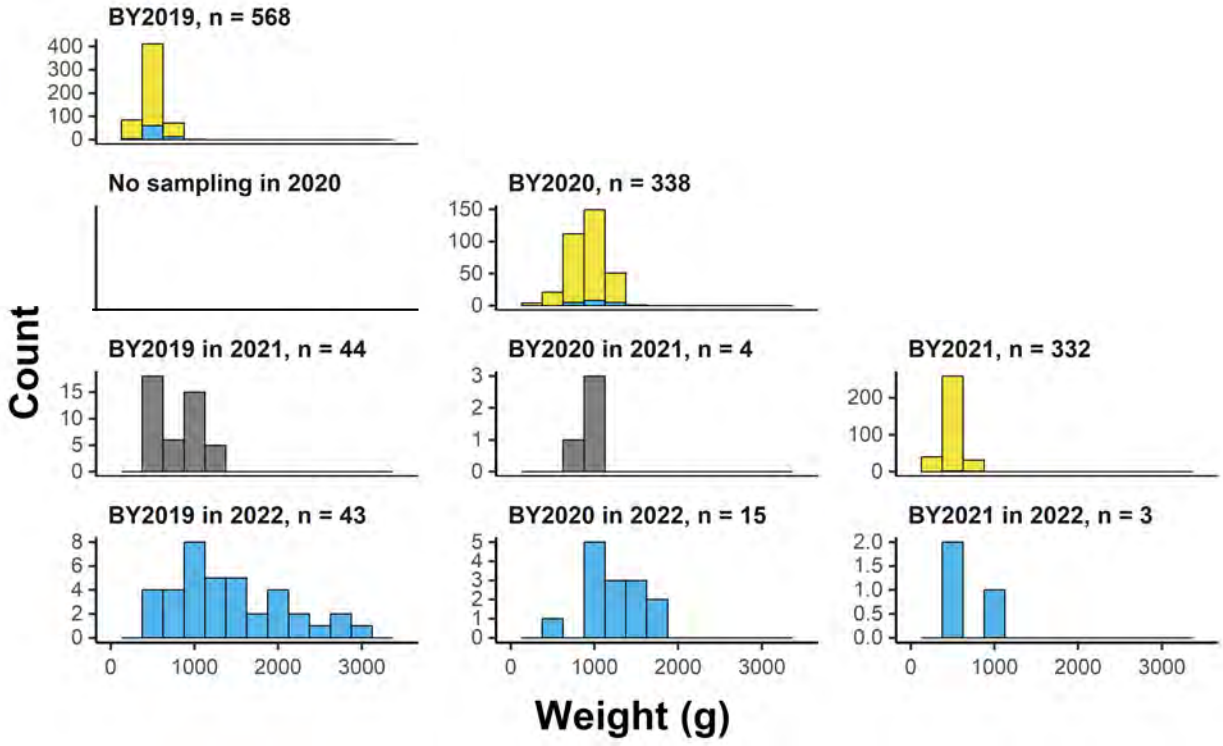

Figure 32. Weight frequency distributions for fish released in 2020 (BY2019, left panels), 2021 (BY2020, middle panels), or 2022 (BY2021, right panels). Top row of each column: fork lengths at release shown in blue (fish that were later recaptured) and yellow (all others). Subsequent rows: fork lengths upon recapture. Note variable Y axis scales. Adult and juvenile setline data are included.

At the time of release, the BY2019 to BY2021 fish had relative weight values averaging 1.10 , 1.16, and 1.09 (SEs = 0.10, 0.11, and 0.10, respectively; Figure 33), similar to other cohorts. The typical pattern, whereby average condition declines shortly after release, was also observed for the cohorts of larger-bodied fish. Cohorts for which we have multiple years of recapture data showed gradual condition recovery (Figure 33), either as a result of general health increases, or of attrition of the fish in worst condition.

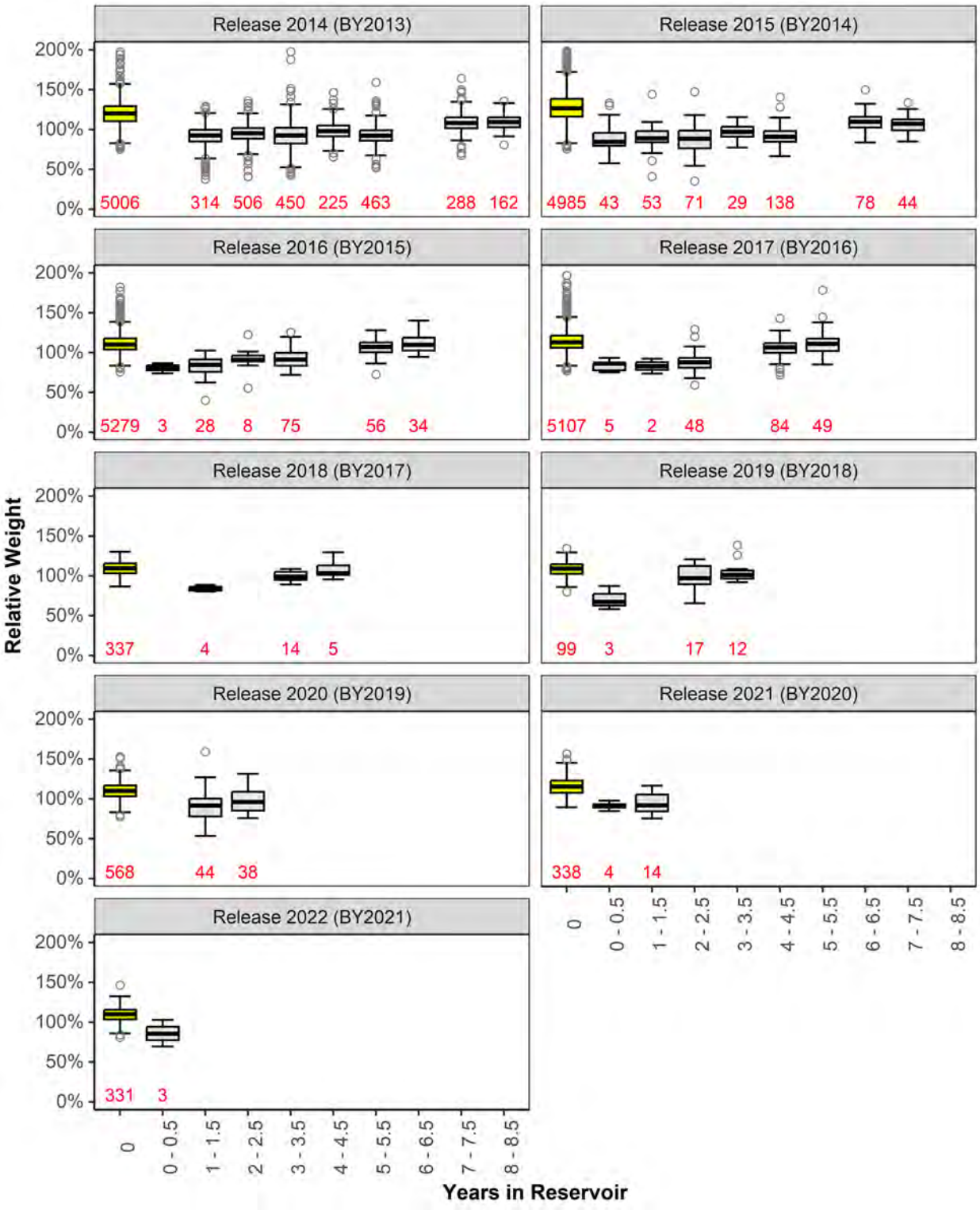

Figure 33. **Relative weight at tagging (yellow) and at recapture (grey), by brood year (BY). Fish caught in the same year as release were at large in the Reservoir for 0 to 0.5 years; those caught the year after release were at large for 1 -1.5 years, etc. Sample sizes shown in red. Juvenile and adult indexing data are both included.**

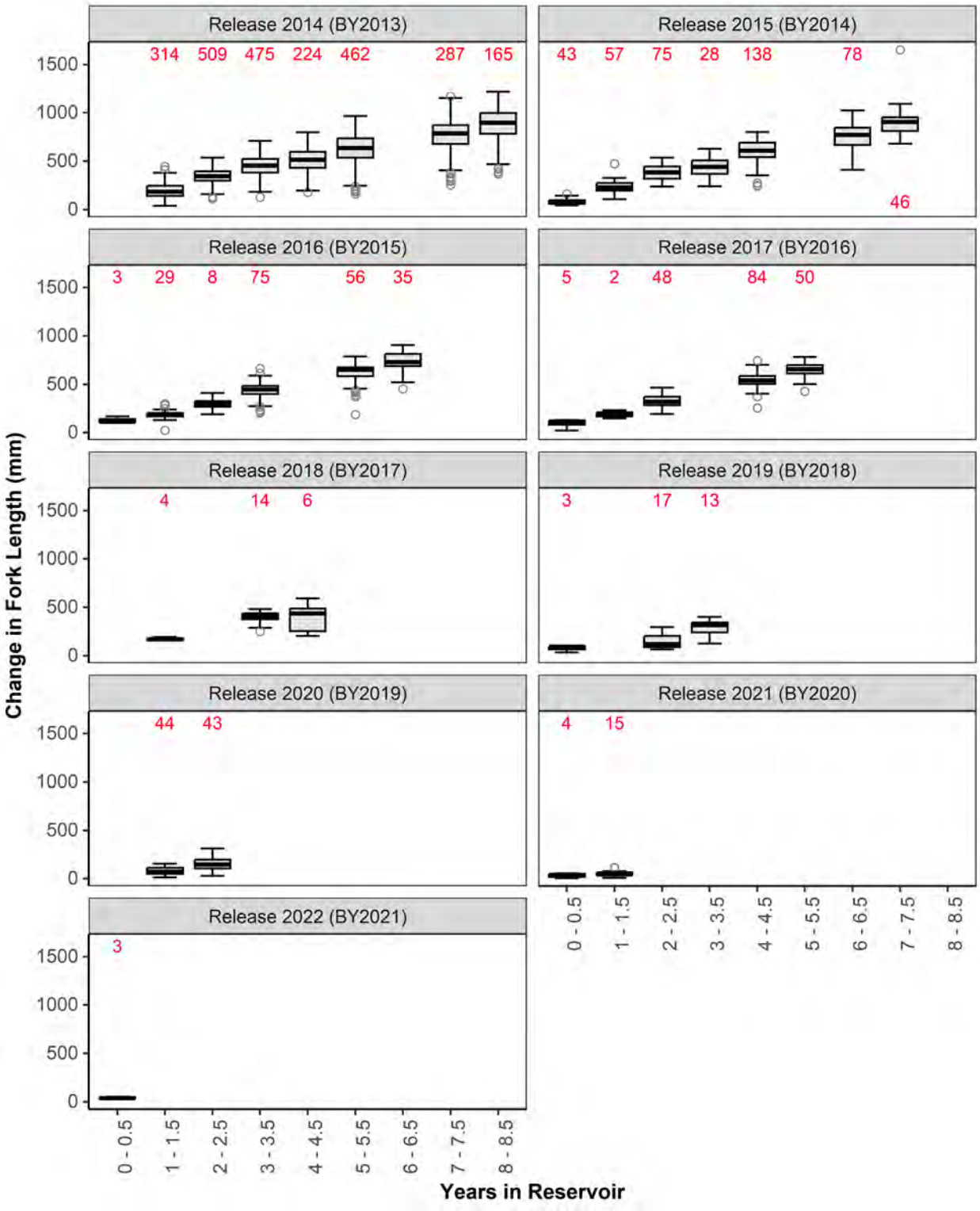

Figure 34. **Growth, expressed as changes in fork length, by brood year (BY). Fish caught in the same year as release were at large in the Reservoir for 0 to 0.5 years; those caught the year after release were at large for 1 to 1.5 years, etc. Sample sizes shown in red. Juvenile and adult indexing data are both included.**

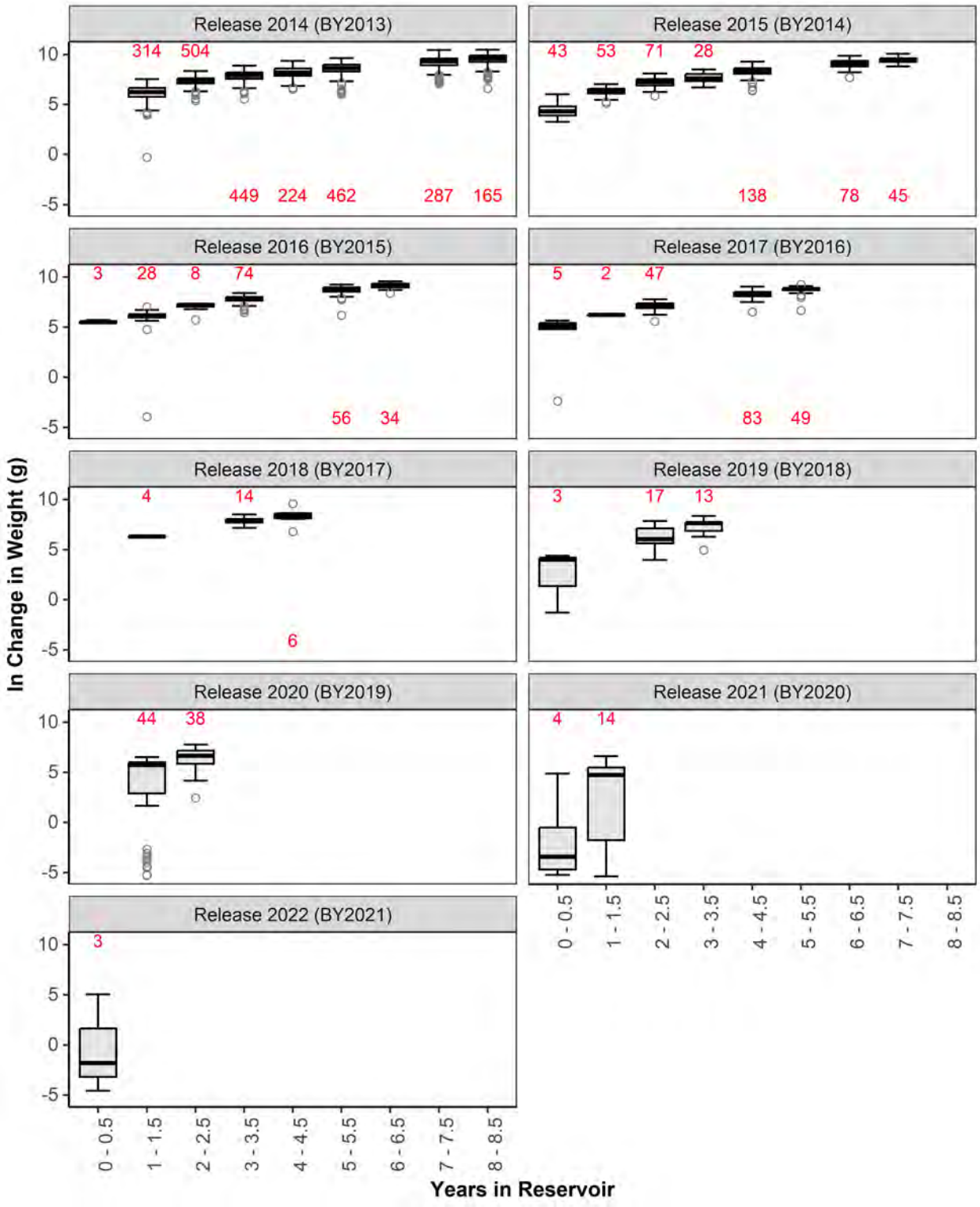

Figure 35. Growth, expressed as changes in weight, by brood year (BY). For readability, increases and decreases in weight are presented on a natural log scale as positive and negative ln values. Other details as in Figure 34.

4.3.6.2 Wild-origin Fish

In 2022, seven encounters were recorded with wild-origin fish, including three that were newly tagged (lengths were 130, and 146, and 243 cm), and four that were recapture events. Of these encounters, seven occurred on adult-sized indexing gear (lengths 121-243 cm), and one on juvenile-sized gear (130 cm on 4/0 hook).

Since 2015, there have been 111 encounters with 62 wild-origin fish during indexing, including 90 encounters where fish were both measured and weighed, 20 where fish were measured but not weighed, and one in which the fish was neither measured or weighed. Statistically, the weights of the wild-caught sturgeon fit tightly ($r^2 = 0.991$) to a third-power function of fork length (Figure 36; Weight(g) = -3.35 + 1.136×10^{-8} × Length(mm)^3; F = 3528.7, $P < 0.0001$), but the relationship appeared to be driven by the three largest fish, as there was more variation among residuals of fish <130 cm (see inset of Figure 36). Of the 62 wild origin fish, 34 had fork lengths < 100 cm when first encountered.

For wild origin fish that have been captured and measured multiple times since tagging began in 2015 (Figure 37, n=25), lengths increased at an average rate of 9.5 cm/year, though rates varied among individuals (Figure 38), and ranged from 1.2 to 20.3 cm/year. Individual growth rates in length were negatively correlated to size (r = -0.38, $P = 0.06$), indicating slower growth in length for fish that were tagged at a larger size, though the trend was not statistically significant.

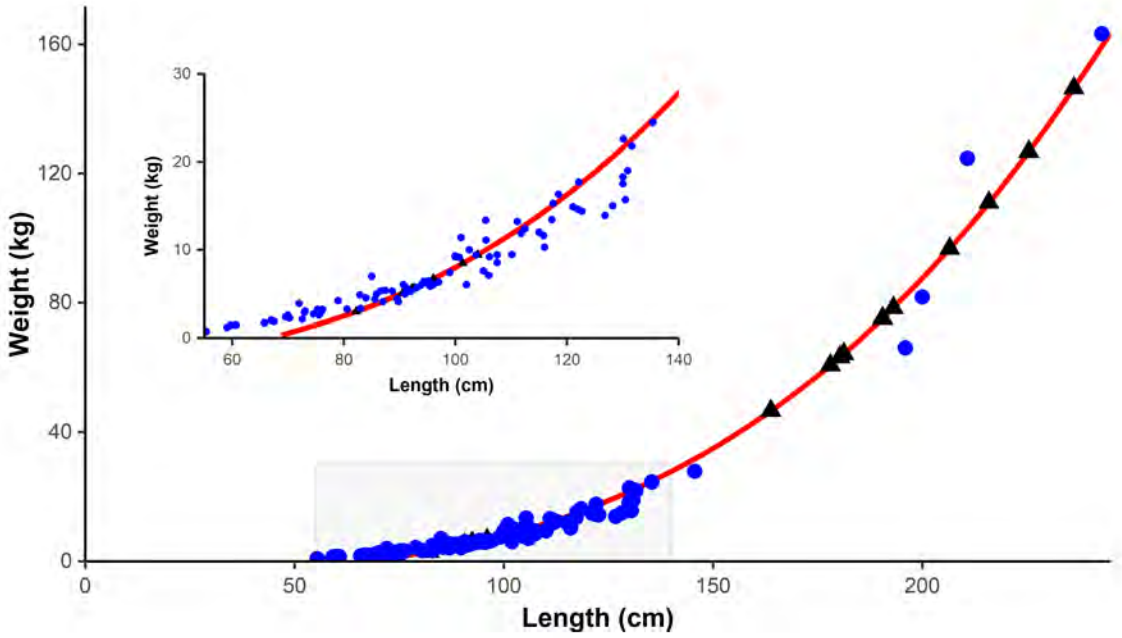

Figure 36. Lengths and weights of wild-origin sturgeon (62 unique individuals), captured in the Wells Reservoir from 2015-2022. The length-weight relationship (red line) is based on data from 90 sampling events (blue dots) where the wild-origin fish was both measured and weighed. For 20 sampling events, the wild-origin fish were not weighed (black triangles), hence are plotted with a Y position along the trend line. Area in grey box is shown in greater detail in the inset.

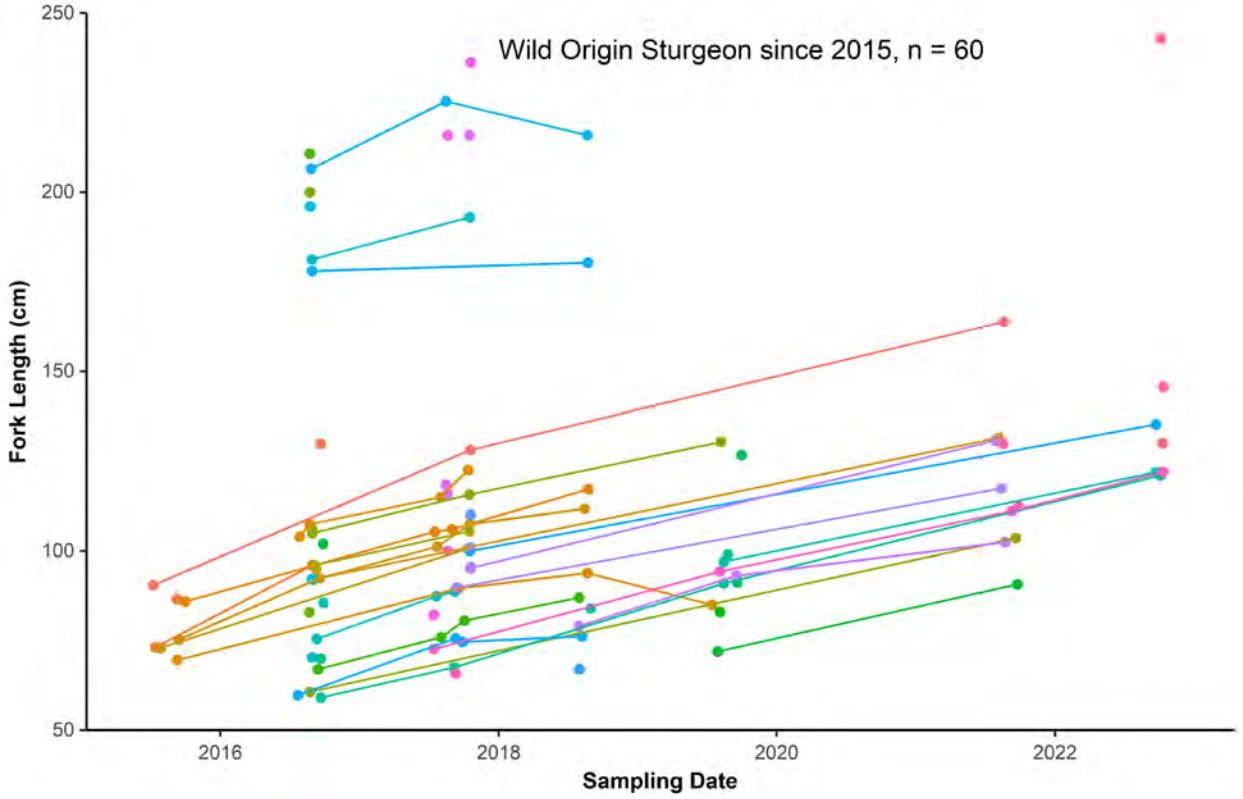

Figure 37. **Lengths of 60 individual wild-origin sturgeon that were tagged since 2015, plotted by capture date. Detections of 25 fish that were caught and measured multiple times are connected by lines. Dot colors correspond to individual fish.**

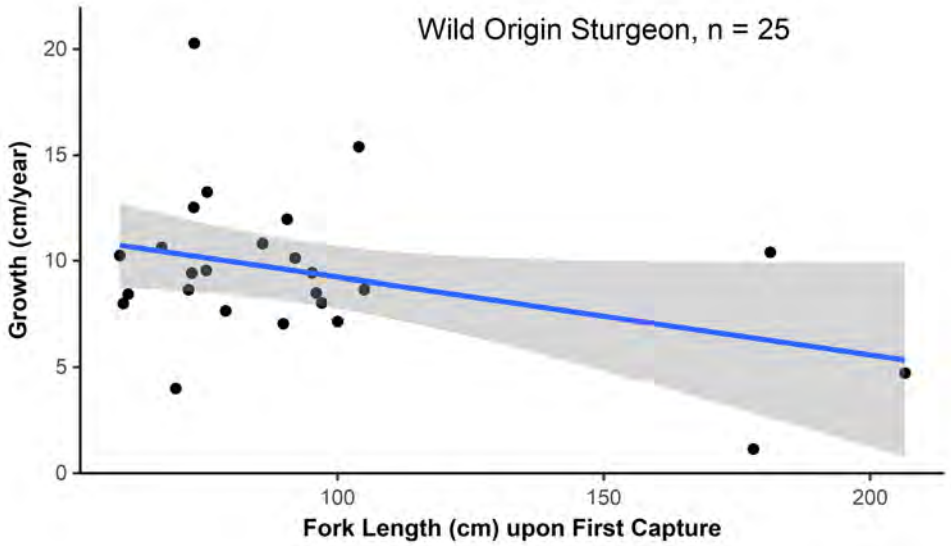

Figure 38. **Growth rates of wild-origin sturgeon that were caught and measured on at least two occasions since 2015 (n=25), as a function of size. Shaded area is the 95% confidence bounds of the linear regression line (blue).**

5 DISCUSSION

5.1 Sturgeon Movements

The distribution of wild-origin sturgeon in Wells Reservoir, as observed since 2015, was markedly different from that documented in 2002-2003. Specifically, Jerald (2007) fitted six large-sized sturgeon with radio tags and found them to congregate near the Okanogan River confluence, with none detected upstream of Park Island (RM 538) or downstream of Brewster (RM 530). While this distribution was corroborated by our summertime side-scan sonar work (Robichaud and Gingerich 2018), our acoustic-tracking network detected fish of wild origin throughout the Reservoir. Further, our acoustic telemetry data suggest that the Okanogan Confluence area was used relatively little and only in spring or early summer months (when Okanogan River temperatures were warmer than those in the Columbia River). Indeed, one of our adult acoustic-tagged fish (one that had been radio-tagged by Jerald in 2002) was detected in all zones, and it had PIT/acoustic detection sequences that suggested that it used the Okanogan River almost every year (2014, 2015, 2016, 2018, 2019, 2020, and 2022), but only in May and June (a second one of Jerald's Sturgeon was acoustic-tagged in 2018, and has not yet been detected in the Okanogan River). It is important to note that our study differs from Jerald's in several ways: we used acoustic tags and a wide distribution of autonomous receivers, thus allowing for relatively continuous detections even in deeper water; whereas Jerald's radio telemetry study required periodic manual tracking, and may have had detection efficiencies impacted by the depths in the lower reservoir. On the other hand, our results are similar to another acoustic telemetry study, where adult sturgeon in the Rocky Reach Reservoir were observed to move extensively over the year (Wright et al. 2015, Robichaud et al. 2021).

Based on research conducted elsewhere in the Columbia River (Haynes et al. 1978, Parsley et al. 1993, Parsley and Beckman 1994), one of the expected results from our tracking data was that adult fish would aggregate in the tailrace of Chief Joseph Dam during the spawning season. In the area of Waneta Dam, spawning typically coincides with the water temperature reaching or exceeding 14°C, which is typically in late June (Golder and Riverrun 2018); and in 2018 spawning occurred between June 13 and July 10. If such a temperature requirement holds, we can expect spawning in the Chief Joseph tailrace to occur around June 24 each year, the day on which average water temperatures reached and remained above 14°C over the last ten years (2012-2021). In 2018, 2019, 2020, 2021 and 2022, this temperature threshold was met on June 17, June 27, July 4, June 22, and July 5, respectively (U.S. Army Corps of Engineers data, summarized by Columbia Basin Research[9]). In 2018, at least one of the six acoustic-tagged fish was present at or upstream of the Chief Joseph Tailrace array from June 1 through mid-September, peaking between June 14 and August 19 when as many as five of the six acoustic-tagged adults were in the area (Robichaud and Gingerich 2019). In 2019, as many as seven of the eight acoustic-tagged adults were in the uppermost parts of the Reservoir between June 17 and Aug 14 (Robichaud and Gingerich. 2020). In 2020, as many as six of the eight tagged adults were present in these uppermost reaches on various days between late June and late August (Figure 13, top). In 2021, seven of eight study fish were in this uppermost area from July 9-21 (Figure 13, middle). In 2022, there was reduced use of this upstream area, relative to other years, with a maximum of three of seven wild adult study fish detected in the area at once

[9] http://www.cbr.washington.edu/dart

(June 30 to July 8; Figure 13, bottom). During this time, there were periods when tagged individuals would make forays upstream toward the Chief Joseph Dam (being detected by the Foster Creek Delta receiver), lasting from one to a few days (e.g., in 2022, on July 5, coincidentally the same day that water temperatures reached 14°C). Our side-scan sonar work (Robichaud and Gingerich 2018), which was conducted early in the summer of 2017 (June 21-29), corroborated the presence of large sturgeon in the Okanagan area, but did not find aggregations of large fish in the tailrace of Chief Joseph Dam. Perhaps if the timing of the sonar work were shifted later in the summer (July or August), it would have been possible to map the distribution of adult sturgeon in the tailrace.

Overwintering aggregations were observed by Jerald (2007) during his sole non-summertime survey (November 2003), located near the midpoint of the mainstem Columbia River across from the Okanogan River mouth. Our acoustic tracking data show most wild-origin adult sturgeon occupying a single area for much of the winter, spending their time in a relatively localized area from mid-November to mid-March. Investigations in the Rocky Reach Reservoir (Golder 2003a, Wright et al. 2015) found similar results, whereby adults aggregated in specific locations and showed reduced activity in the colder months. This appears to be a common pattern, having been documented for White Sturgeon in Priest Rapids, Wanapum, and McNary reservoirs (Haynes et al. 1978, Golder 2003b), in the upper Columbia and Fraser rivers (R. L. & L. 1994, Robichaud et al. 2017), as well as for other sturgeon species (e.g., Li et al. 2007). Overwintering habitat is thought to include deep water (Haynes et al. 1978, Parsley et al. 2008), and is likely sought out for bioenergetic purposes.

Since tracking began, there have been eight acoustic-tagged sturgeon that moved downstream past Wells Dam, and emigration from Wells Reservoir was estimated to have been 11.1%. On its face value, this proportion is higher (no statistical tests performed) than that estimated for the Rocky Reach Reservoir (9.5%; Robichaud et al. 2021). Also, timing of our emigration events from late spring through early fall (April to September) was more protracted than in the Rocky Reach Reservoir, where events occurred in March-May, and then September-December (Robichaud et al. 2021). Our observed emigration events include three that occurred within a few days of acoustic tagging and which may have been the result of handling stresses (without these possibly biased records, emigration from the Wells Reservoir would have been 8.2%). Robichaud et al. (2021) interpreted emigration events observed shortly after release as a natural event that might be expected to occur soon after a group of hatchery fish is released into a Reservoir. In the Wells Reservoir, two of the 'immediate' emigrants were released as part of a hatchery cohort, but the third was a BY2013 fish that was recaptured in 2015, and acoustic-tagged *in situ* (this fish emigrated 9 days after handling, or 531 days after release from the hatchery). We should also note that our emigration values may be underestimated as a result of the short tracking durations. Monitoring the longer-lasting tags has shown reduced levels of emigration over longer durations.

Besides moving downstream of Wells Reservoir, it was also possible for fish to move out of our core study area into the Methow or Okanogan rivers, and PIT tag detection equipment is deployed in both systems. To date, PIT tag scanners in the Okanogan River have detected 231 hatchery sturgeon (1% of the total number tagged). Some of these sturgeon were later detected back in the Wells Reservoir and cannot be considered to have emigrated. But since PIT tag detection rates are low (especially during high river flow periods in the spring when acoustic data suggest sturgeon are using the Okanogan River), the proportion of emigrants that returned is not known with certainty (nor is the proportion that left to begin with). In 2018, an acoustic receiver was deployed in the Okanogan River near the town of Malott, WA,

and both acoustic tagged sturgeon that were detected there are known to have later returned to the Columbia River. Detection sequences recorded by the acoustic receiver at the Okanogan River Mouth suggested that 13 wild-origin fish (including four adults) made movements into the Okanogan River during the months of April to July (April to June for adult fish). Some of these fish used the Okanogan River in multiple years. Some of Douglas PUD's hatchery-released fish have been detected at PIT array at Okanogan River Mile 12.5, at the Zosel Dam PIT array (n=6), or beyond (one fish was detected 5.6 km upstream of Osoyoos Lake on July 27, 2018). Further, a Canadian research team headed by the Okanogan Nation Alliance captured one of our BY2014 direct gamete fish in Lake Osoyoos (August 22, 2018; Tara White, Senior Fisheries Biologist, BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development, Thompson-Okanagan Region, pers. comm.). Temporary departures from the core area could bias our survival estimates (see Fujiwara and Caswell 2002) toward underestimation, but the magnitude of the bias is expected to be minor since the timing of emigrations (early spring in the Okanagan) is not expected to line up with the survey timing (July – Oct), and since duration of departures is not long relative to the length of the study program (Manly et al. 1999, Peñaloza et al. 2014). When more detection data are available (within both the Reservoir and the tributaries), it may be possible to estimate survival using multi-state models that take into account temporary periods of emigration (e.g., Schaub et al. 2004).

Emigration into the Okanogan River, or temporary use of this habitat, is an interesting observation since we are aware of few other cases in which sturgeon have been documented in Columbia River tributaries (see Chapman and Jones 2010 for sturgeon spawning in the Willamette River, OR; and Everett et al.

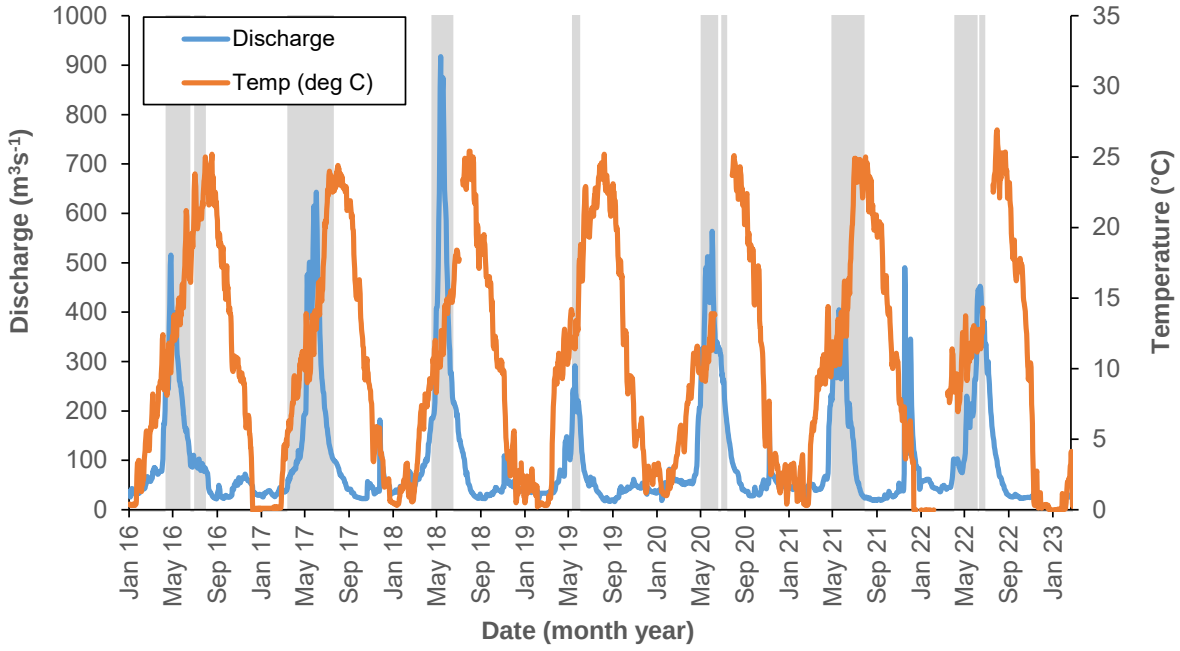

Figure 39. **Okanogan River discharge and temperature, measured at Malott, WA. Measurements averaged hourly (source: https://waterdata.usgs.gov/usa/nwis/uv?site_no=12447200). Gray shading indicates periods during which acoustic-tagged sturgeon were potentially present in the Okanogan River, based on detection patterns recorded at the tributary mouth.**

2004 for sturgeon spawning in the Salmon River, ID). Specific to the Wells Project, no sturgeon have been detected in the Methow River, suggesting that the Okanogan River may provide preferable habitat at certain times of the year. Based on detections made at the mouth of the Okanogan River, acoustic-tagged sturgeon were potentially up the tributary during periods of increasing temperature and elevated discharge (Figure 39). It is possible that sturgeon may be visiting the Okanogan River for foraging purposes. Large amounts of food, including detritus and juvenile salmonids, are flushed downstream each year during the high spring flows.

5.2 Index Monitoring

Vulnerability of sturgeon varied among gear types. Obviously, some degree of selectivity was expected. Robichaud and Gingerich (2018) demonstrated that within-cohorts, the average size and weight of sturgeon caught on adult gear was higher than on juvenile setlines. But the selectivity was subtle, with average sizes differing by a few cm between gears; and wild-origin sturgeon were caught on 'juvenile' gear (circle hooks size 2/0 or 4/0) as well as 'adult' setlines (circle hooks sized 14/0, 16/0, 18/0, or 20/0). As expected, 'adult'-sized individuals (> 150 cm) were only caught on 'adult' gear. By contrast, in the Rocky Reach Reservoir, adult gear (hooks sized 16/0 to 24/0) *only* caught adult-size fish (Wright et al. 2015), and juvenile gear has never caught a wild-origin fish (Robichaud et al. 2021). It is not clear why hatchery fish and smaller wild-origin fish are not captured on adult gear in the Rocky Reach Reservoir, especially since juveniles are caught on "adult gear" in the Upper Columbia (Howell and McLellan 2018) and in Wanapum and Priest Rapids reservoirs (Golder 2014).

Catch rates of the BY2013 fish were much higher than any subsequent release group, and until 2021, they were also higher than what would be expected given selectivity (Figure 21). Abundance models suggested that 32% of the sturgeon in the Reservoir were BY2013 fish. The elevated abundance and catch rates of the BY2013 cohort likely resulted from having survived better than other cohorts. Initial survival estimates were 30.8% (SE = 1.0%) *annually* for BY2013 fish during the 13-month period from release in 2014 to the indexing surveys in 2015. This equates to a much lower instantaneous mortality rate than for BY2014. BY2014 had survival estimates of 20.5% (SE = 5.6%) *monthly* for the one-month period from release to the summer 2015 indexing survey. The higher survival rate of the BY2013 cohort potentially continued beyond 2015: survival from 2015 to 2016 was estimated at 95.5% *annually* for BY2013 and 91.1% *monthly* for BY2014. Even lower survival rates were estimated for BY2016 and BY2017, but various survival parameters were unreliability estimated by the models, and catches of these cohorts may increase over time (due to gear selectivity), which could improve survival rate estimates for these fish in future years.

Post-release survival in other studies was considerably higher than that reported here. In the Upper Columbia River, the published survival rates, ranging from 27% to 29% (Golder Associates 2009), were later found to be underestimates. Recent data from the Upper Columbia White Sturgeon Recovery Initiative M&E Program have shown that after 16 years of stocking, the larger, older fish recruit to the sampling gear at higher rates. Specifically, annual survival estimates (i.e., survival adjusted to a 1-year period) were found to be heavily influenced by release weight: 47.6% at 100 g; 86.3% at 200 g; and 98.1% at 300 g (BC Hydro 2016) – all much higher rates than the original 27-29% assessments. It is possible that our survival estimates will also improve over time as more new recapture data are collected in the Wells Reservoir (each additional fish recaptured provides evidence for lower than previously-known detection probabilities in prior surveys, which, in turn, increases the survival retroactively).

Given the observations in other White Sturgeon supplementation programs, it is likely that the Wells Reservoir survival could be improved by releasing sturgeon of a larger size. For example, Justice et al. (2009) found evidence of size-dependent mortality for supplementation releases of juvenile sturgeon into the Kootenai River. Examination of their survival-at-length curves shows that fish the size of Douglas PUD's 2013-15 Brood Years would have had lower-than-average survival rates (as defined by their model). In the Upper Columbia White Sturgeon Recovery Initiative (BC Hydro 2016), the 20th, 50th, 75th, and 90th percentiles of all release weights (2002-2014) were 35, 55, 93, and 181 g, respectively, which corresponded to annual survival estimates of 23.8%, 29.3%, 44.4%, and 81.1%. For comparison, in this study, the BY2013 and BY2014 larval-origin fish were released at median sizes of 157 g and 93.8 g respectively, and which could explain why initial survival rates appear lower for BY2014 fish relative to BY2013. Douglas PUD increased the average size of the hatchery fish released starting in 2018, and the mean size was significantly higher starting in 2020, but the effect of that change is as of yet unknown (until further surveys can be conducted, and additional multi-year recaptures are recorded).

Size at release was explored as a potential factor influencing survival in Wells Reservoir. Within each cohort, the recaptured proportions were higher for fish that were heavier upon release, a pattern that also held when examining the proportions that were recaptured at least a year after release, or 2 or more years after release. Recapture proportions are not equivalent to survival rates due to selectivity effects, which could certainly have biased against the capture of smaller fish within the first few months after release. However, selectivity effects are expected to have abated for fish detected two or more years after release, and thus we believe that the observed recapture proportions speak, at least somewhat, to survival advantages for larger-bodied fish within cohorts. Moreover, the cohort-specific abundance estimates, when expressed as a proportion of the initial release group (Table 16), also support highest survival rates for the two largest-bodied release groups (i.e., BY2019 and BY2020). By contrast, BY2013 and BY2014 had markedly different initial survival rates, and markedly different average body sizes, potentially providing further anecdotal evidence for this theory, yet they have current abundances that are about equal. Moreover, the initial survival estimates for BY2017 (92.7% monthly equates to 40.2% annually) and BY2019 (91.2% monthly equates to 33.1% annually) were on par with the BY2013 rates (30.8% annually), whereas those for BY2014 and BY2018 were markedly lower, a pattern that was not related to average cohort body sizes.

If size at release is an important predictor of survival, it is not clear what environmental stressors could act so strongly on smaller-sized fish at release. Smaller fish are known to have lower survival rates (e.g., Justice et al. 2009, BC Hydro 2016), but the differences in initial survival that we are reporting between release years are marked (as were those reported by BC Hydro 2016), and not directly related to body size differences. Food availability and predation are two stressors that we have considered in hopes of explaining differences in survival rates. While relative weights seem to be depressed initially after one year in the Reservoir, they appear to rebound by year two at large (Figure 33), and age-specific percent weight gains are not showing a declining pattern over time (Table 18), at least for years where we have ample data (BY2013-2016). This is consistent with a no-food-limitation hypothesis, though a similar pattern could result from the gradual attrition of fish in poor condition. Predation may play a larger role in survival. As reported, many of our White Sturgeon PIT tags have been found beneath the cormorant rookery near the mouth of the Okanogan River (among-year variation in scanning effort, area measured, and scanning methods used confounds comparisons of tag recoveries by cohort). Nevertheless, we showed that cormorants were not explicitly targeting smaller fish (Figure 16), making it difficult to

conclude that avian predation is responsible for smaller fish having lower survival. Also, it is currently unknown whether releasing larger fish (started in 2018) will have reduced cormorant predation on our released sturgeon, and any future analyses will need to account for the change in release location (farther from the colony) in 2017.

Higher initial survival and/or current abundances of BY2013 relative to BY2014-BY2016 conspecifics could have been influenced by a founder effect advantage. Research suggests that at the time of release, very few natural origin fish were being produced in the Wells Reservoir, and production was irregular when occurring. Therefore, prior to supplementation, the availability of age-0 White Sturgeon in the Project area was likely quite small and patchily distributed among years. In this case, local predators may not have been targeting the White Sturgeon released in 2014, but may have since become more effective at preying on hatchery-released sturgeon. Also, prey available to the BY2014 releases, may have been consumed in a manner that reduced its availability to subsequent cohorts. These hypotheses might help explain perceived declines in short-term survival rates for BY2014-BY2016 hatchery-releases. By contrast, the short-term post-release survival rates for BY2017 and BY2019 were on par with BY2013 rates, much higher than for BY2014 and BY2018, and presumably predator-field and conspecific competition conditions would not have varied so widely among years in that pattern. Isolating the true cause or suite of causes that contribute to hatchery sturgeon survival in the Wells Project could prove to be difficult. Instead, future M&E is likely to focus more closely on accurately assessing survival, rather than the mechanisms that explain survival rates.

Survival of adult White Sturgeon is not widely reported in the literature. This is likely because studies either had unreliable model fits (due to small sample sizes, e.g., Wright et al. 2015), or because survival of adults is not considered problematic. In most published sturgeon survival studies, as would be expected for any species, the smallest fish have the highest mortality (e.g., Justice et al. 2009, BC Hydro 2016), survival for the oldest juvenile fish has been reported as 96.5-99.5% (BC Hydro 2016), and adult survival between Hugh L. Keenleyside Dam and the U.S.-Canada border has been estimated at 97% (Irvine et al. 2007). Similarly high annual survival rates (>85% for age 7+) were estimated as part of a population model for wild White Sturgeon in the Fraser River (Challenger et al. 2021). In the Wells Reservoir, the survival of wild-origin fish (some of which are adults) had relatively high point estimates, but the extremely wide confidence bounds mar the usefulness of the specific values. Nevertheless, our acoustic telemetry data for 18 wild-origin fish suggests only one possible mortality (movements of all these fish having been tracked continuously since they were tagged, but with one fish's track stopping in August 2021, suggesting ~94% survival. We have no contrary evidence to date that suggests survival of larger fish within the Wells Reservoir is not near 100% on an annual basis. For example, only three adult-sized mortalities have been reported within the Wells Project Area over the last ten years (Douglas PUD, unpublished data).

Growth of wild-origin fish in the Wells Reservoir varied widely among individuals. Fish grew between 1.2 and 20.3 cm/year (average rate of 9.5 cm/year), with the largest fish appearing to grow less in length than the smaller individuals. Jerald (2007) reported growth rates of 19 cm/year for a 65 cm fish (over 14 months) and of 7.4 cm/year for a 197 cm fish (over 5 years). In the Rocky Reach Reservoir, smaller White Sturgeon (74-89 cm when tagged) grew by an average of 8.7 cm/year (over 11-12 years), whereas one large (208.5 cm) fish grew by 2.5 cm/year (over 12 years; Wright et al. 2015). Growth rates for juvenile Fraser River sturgeon in the 60-99 cm size class were 2.9 -5.5 cm/year for fish, depending on the

year (Nelson et al. 2019). Due to limited sample sizes and large variability, it is not possible to make firm growth rate comparisons among locations.

Growth rates of hatchery-reared White Sturgeon were comparable among cohorts. The first cohort released, BY2013, showed average increases in length and weight after 1.5 years that were on par with those of the BY2015 and BY2016 (Table 18), whereas those of BY2014, a group of smaller-sized fish, grew more quickly, as expected, and the most recent brood years are growing more slowly. Regardless, there does not appear at this time to be any founder effects, saturation, or density dependent growth declines.

5.3 Determining Natural Reproduction Potential

Aging data from 2001-2002 (Jerald 2007) suggested strong year class recruitment between the years 1972 and 1978, and again between 1988 and 1996. The aging of wild-origin sturgeon caught in 2016[10] (Robichaud and Gingerich 2018) showed a preponderance of fish from the 2011 and 2012 year classes (although aging of older sturgeon is relatively imprecise, and there is uncertainty around this assessment), indicating either that there had been natural recruitment or immigration from upstream areas in those years. There is a general consensus that White Sturgeon recruitment corresponds with high flow (Hildebrand et al. 2016), yet in the Wells Reservoir large (>85th percentile) snowpack appears to coincide

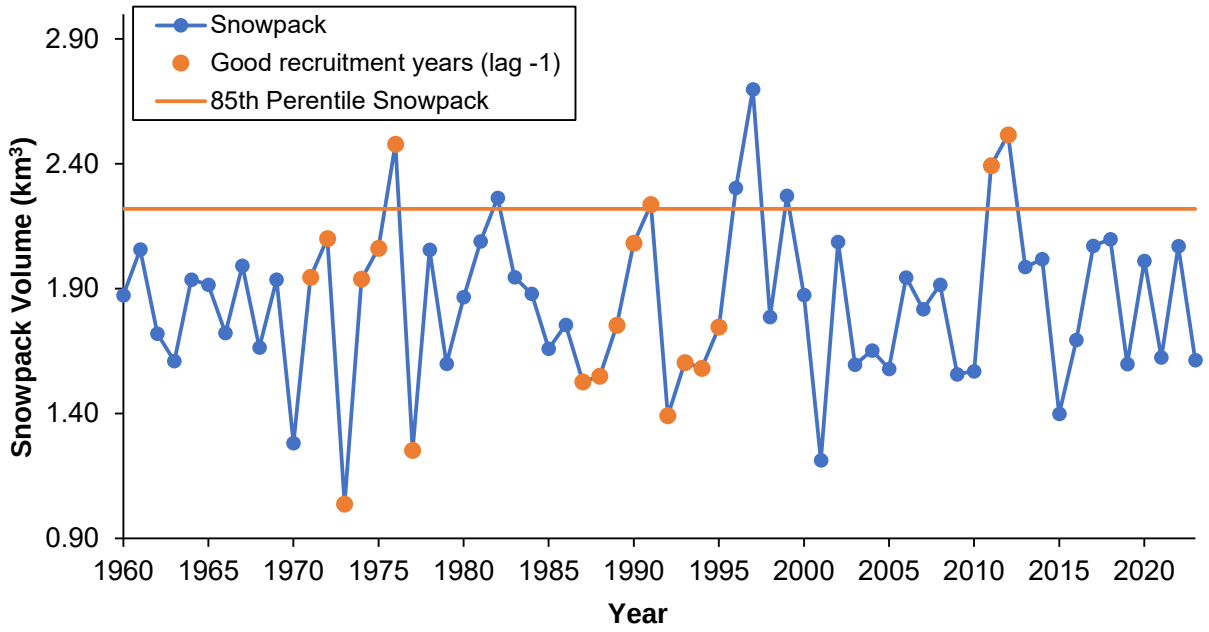

Figure 40. Grand Coulee Dam water supply (April to September snowpack) by year (source: https://www.nwrfc. noaa.gov/water_supply/ws_ranking.cgi?id=GCDW1). Orange dots are the snowpack in years prior to those with White Sturgeon recruitment in the Wells Reservoir. Horizontal line at the 85th percentile snowpack value (2.22 km^3 or 72,824 KAF).

[10] Ages of fish sampled in 2017 or 2018 have not yet been assessed.

with recruitment in only 4 of the 8 recent cases (Figure 40). While snowpack is a good indicator of discharge levels, there are several other factors that may come in to play (e.g., the timing of the runoff relative to temperatures reaching 14 °C), and only 4 of 18 recruitment years had high snow volumes (Figure 40).

To date, spawning has not been observed in the Wells Reservoir, but we do know from side-scan sonar and indexing captures that spawning-sized adults continue to exist. Our side-scan sonar work (Robichaud and Gingerich 2018) corroborated the presence of large sturgeon in the Okanagan area in the early summer, and this has been confirmed using acoustic tracking. The tracking also showed that the fish move to the Chief Joseph Tailrace from June through September. The movements of eight adult-sized wild-origin sturgeon that have been fitted with 10-year acoustic tags will continue to be tracked. Douglas PUD shall continue to work with the Aquatic SWG to implement Section 4.2.3 of the WSMP towards determining natural reproduction potential within the Wells Project.

6 SUMMARY

Douglas PUD has worked toward the goals of promoting White Sturgeon abundance in the Wells Reservoir to a level that can be supported by the available habitat and for the population to be characterized by a diverse age structure consisting of juveniles and adults from multiple cohorts. During 2014-2022, supplementation has increased White Sturgeon abundance in the Reservoir, and the effectiveness of the supplementation program has been evaluated. Adaptive strategies based on scientific evidence were used to manage the supplementation program. First, broodstock crosses were eliminated in favor of rearing the more genetically diverse wild-caught larvae. Second, it was decided to reduce the number (but increase the size) of the fish being released, starting in 2018. Work has been conducted to determine the potential for natural reproduction in the Wells Reservoir, including aging of wild-origin recaptures, side-scan sonar surveys (Robichaud and Gingerich 2018), adult indexing, acoustic tracking of adults, and development of age-structures abundance estimation models. Overall, the data collected from M&E activities conducted to date provide a strong foundation on which to base current and future management decisions and inform future studies of the natural reproduction potential of White Sturgeon in Wells Reservoir.

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which make indexing possible. Many Douglas PUD staff participated in various components of the program including but not limited to Jason Schilling, Barb Wolfe, Betsy Bamberger, and Andrew Gingerich. Staff from Wells and Methow Fish Hatcheries also provided support in the field. John Rohrback provided leadership in the field and lifted many sturgeon in the field and keyed in many data points that served as the resource for all the analysis contained herein. LGL and Blue Leaf Environmental administrative staff kept various technical, financial, and logistical aspects of the project running smoothly. Chelan and Grant PUD, Blue Leaf Environmental, Golder Associates, and members of the Upper Columbia White Sturgeon Recovery team have provided valuable regional coordination and data sharing. Private residents around the Wells Reservoir, including but not limited to Roger Erlandsen, are thanked for providing receiver mounting locations and access.

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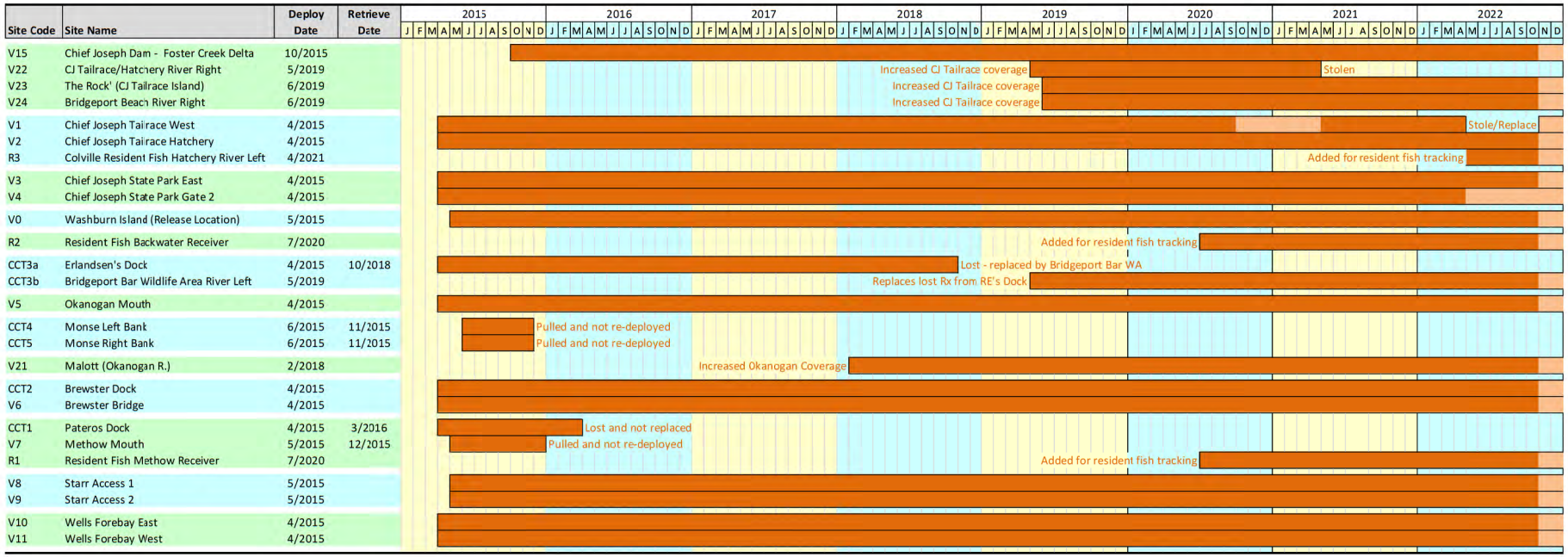
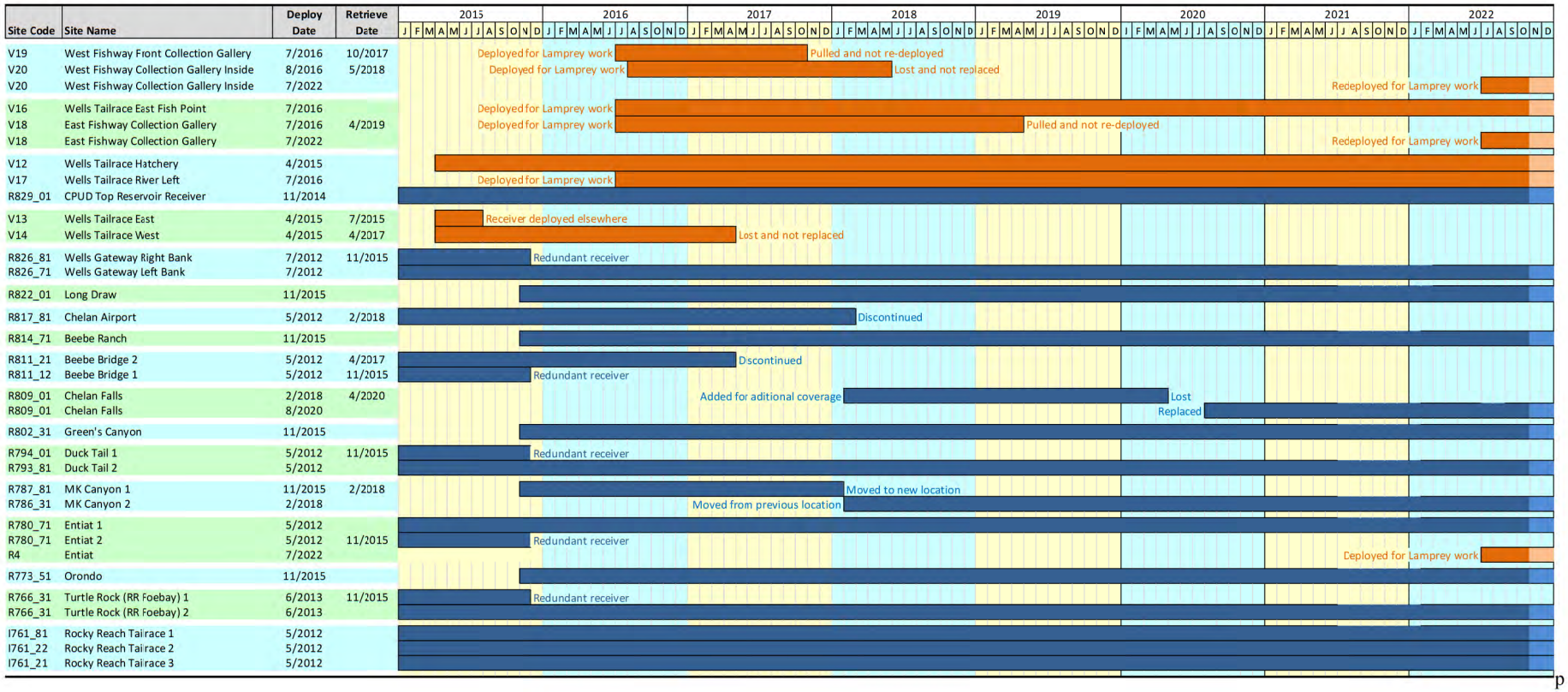
APPENDICES

Appendix A. Receiver deployments, starting upstream and moving down river. Blue and green row coloring is used to show where receivers were deployed in pairs/clusters. Douglas receiver deployment bars are orange, and Chelan deployments blue. Paler parts of deployment bars show months for which the receiver is deployed, but data are not included.

Wells Reservoir



Rocky Reach and Rock Island reservoirs



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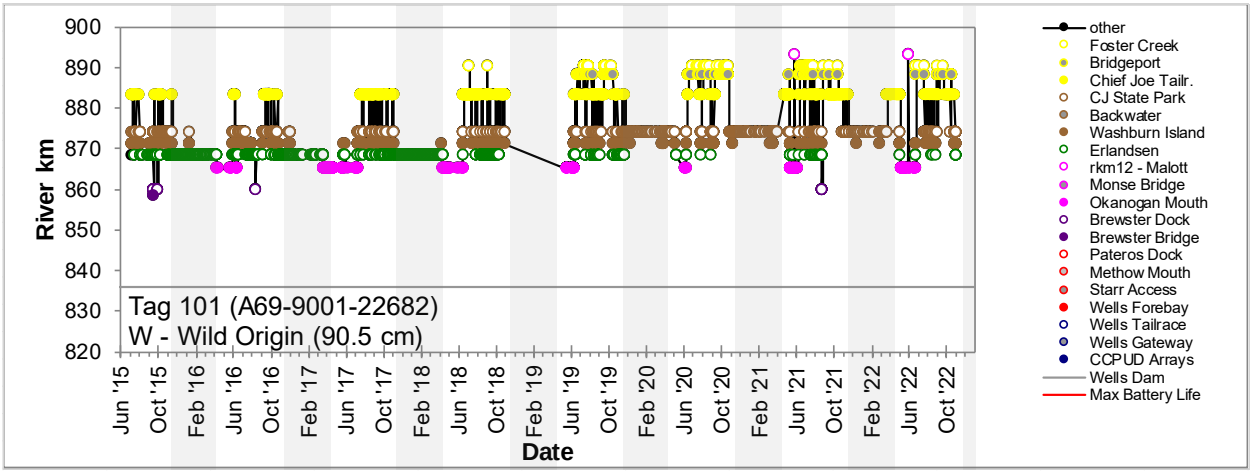
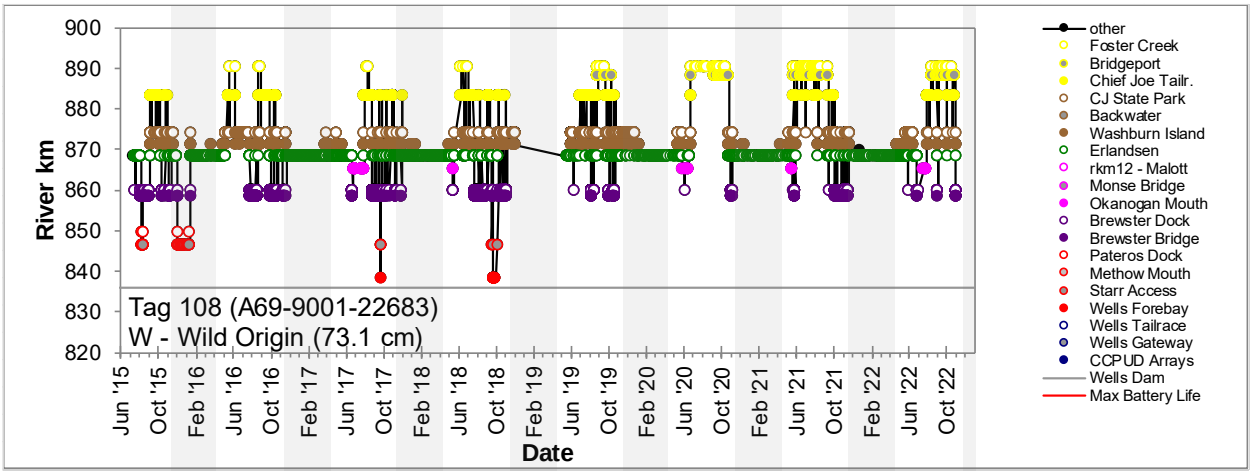
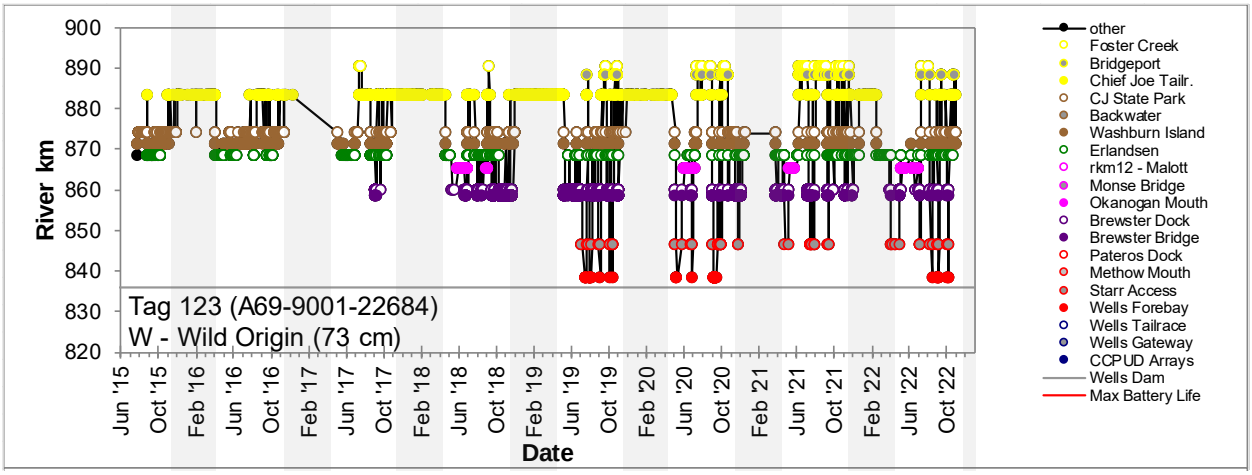
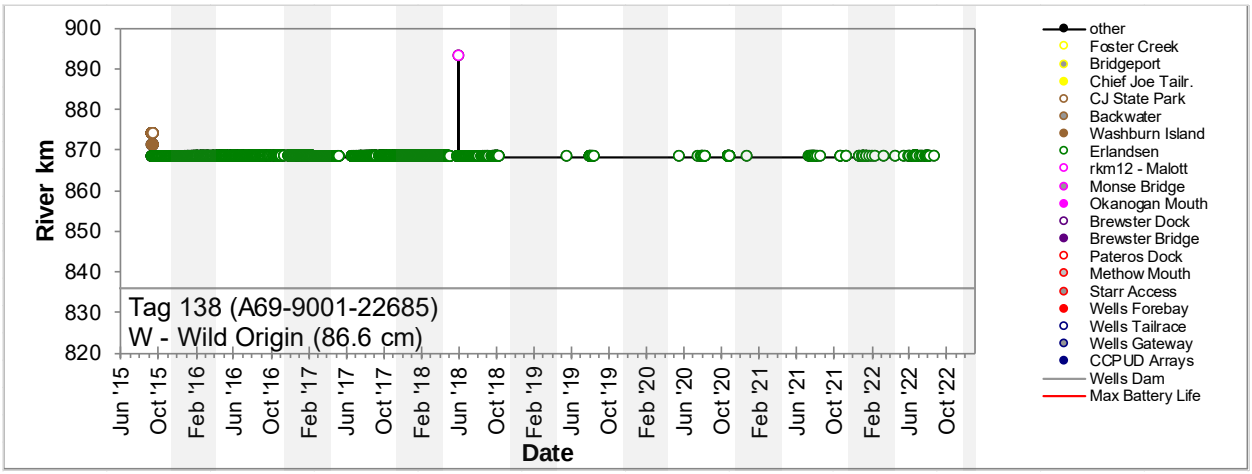
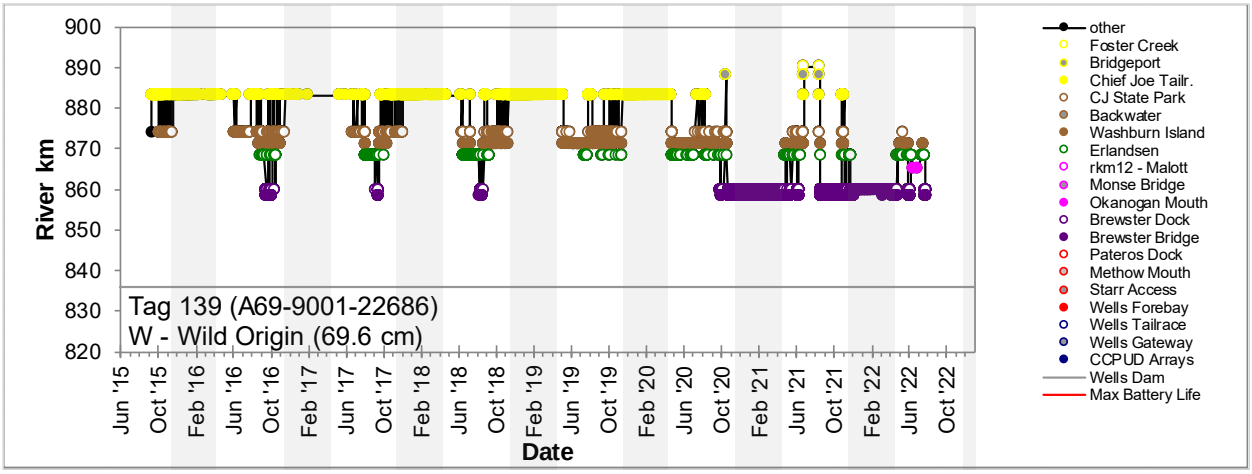
Appendix B. Detection history plots for smaller-sized wild-origin fish, tagged *in situ*.








River km
900
890
880
870
860
850
840
830
820
Tag 138 (A69-9001-22685)
W - Wild Origin (86.6 cm)
Jun '15
Oct '15
Feb '16
Jun '16
Oct '16
Feb '17
Jun '17
Oct '17
Feb '18
Jun '18
Oct '18
Feb '19
Jun '19
Oct '19
Feb '20
Jun '20
Oct '20
Feb '21
Jun '21
Oct '21
Feb '22
Jun '22
Oct '22
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
Tag 139 (A69-9001-22686)
W - Wild Origin (69.6 cm)
Jun '15
Oct '15
Feb '16
Jun '16
Oct '16
Feb '17
Jun '17
Oct '17
Feb '18
Jun '18
Oct '18
Feb '19
Jun '19
Oct '19
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Jun '21
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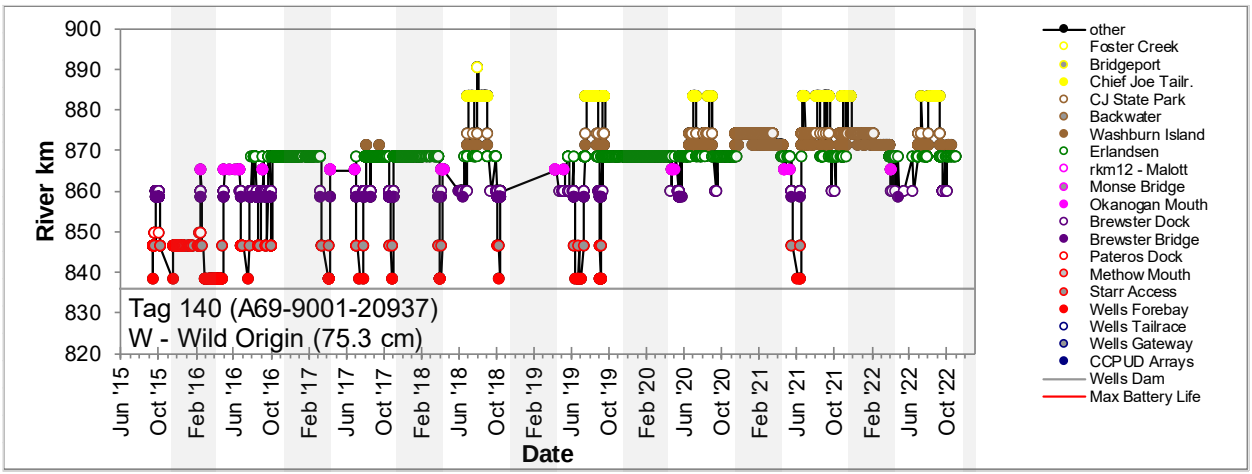
Feb '22
Jun '22
Oct '22
Date
other
Foster Creek
Bridgeport
Chief Joe Tailr.
CJ State Park
Backwater
Washburn Island
Erlandsen
rkm12 - Malott
Monse Bridge
Okanogan Mouth
Brewster Dock
Brewster Bridge
Pateros Dock
Methow Mouth
Starr Access
Wells Forebay
Wells Tailrace
Wells Gateway
CCPUD Arrays
Wells Dam
Max Battery Life


River km
900
890
880
870
860
850
840
830
820
Tag 140 (A69-9001-20937)
W - Wild Origin (75.3 cm)
Jun '15
Oct '15
Feb '16
Jun '16
Oct '16
Feb '17
Jun '17
Oct '17
Feb '18
Jun '18
Oct '18
Feb '19
Jun '19
Oct '19
Feb '20
Jun '20
Oct '20
Feb '21
Jun '21
Oct '21
Feb '22
Jun '22
Oct '22
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
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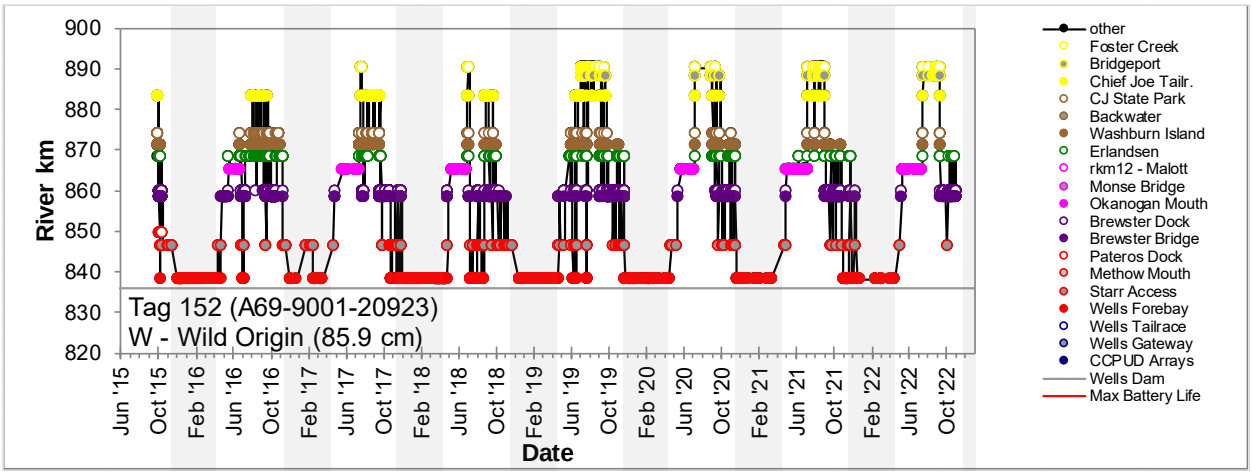
Methow Mouth
Starr Access
Wells Forebay
Wells Tailrace
Wells Gateway
CCPUD Arrays
Wells Dam
Max Battery Life


River km
900
890
880
870
860
850
840
830
820
Tag 152 (A69-9001-20923)
W - Wild Origin (85.9 cm)
Jun '15
Oct '15
Feb '16
Jun '16
Oct '16
Feb '17
Jun '17
Oct '17
Feb '18
Jun '18
Oct '18
Feb '19
Jun '19
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Jun '20
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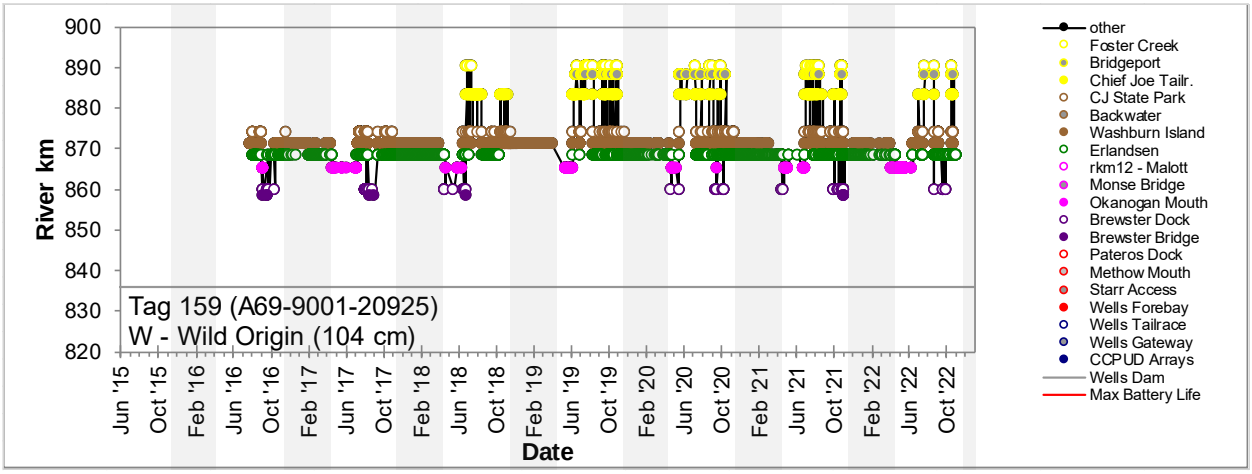
Feb '22
Jun '22
Oct '22
Date
other
Foster Creek
Bridgeport
Chief Joe Tailr.
CJ State Park
Backwater
Washburn Island
Erlandsen
rkm12 - Malott
Monse Bridge
Okanogan Mouth
Brewster Dock
Brewster Bridge
Pateros Dock
Methow Mouth
Starr Access
Wells Forebay
Wells Tailrace
Wells Gateway
CCPUD Arrays
Wells Dam
Max Battery Life


River km
900
890
880
870
860
850
840
830
820
Tag 159 (A69-9001-20925)
W - Wild Origin (104 cm)
Jun '15
Oct '15
Feb '16
Jun '16
Oct '16
Feb '17
Jun '17
Oct '17
Feb '18
Jun '18
Oct '18
Feb '19
Jun '19
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Jun '20
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Feb '21
Jun '21
Oct '21
Feb '22
Jun '22
Oct '22
Date
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Foster Creek
Bridgeport
Chief Joe Tailr.
CJ State Park
Backwater
Washburn Island
Erlandsen
rkm12 - Malott
Monse Bridge
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Brewster Dock
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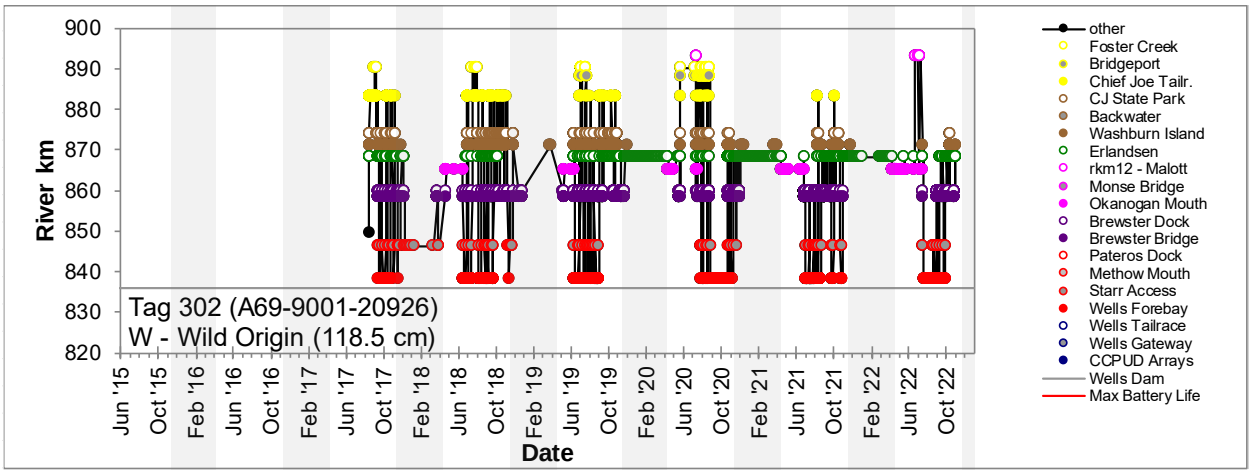
Methow Mouth
Starr Access
Wells Forebay
Wells Tailrace
Wells Gateway
CCPUD Arrays
Wells Dam
Max Battery Life


River km
900
890
880
870
860
850
840
830
820
Tag 302 (A69-9001-20926)
W - Wild Origin (118.5 cm)
Jun '15
Oct '15
Feb '16
Jun '16
Oct '16
Feb '17
Jun '17
Oct '17
Feb '18
Jun '18
Oct '18
Feb '19
Jun '19
Oct '19
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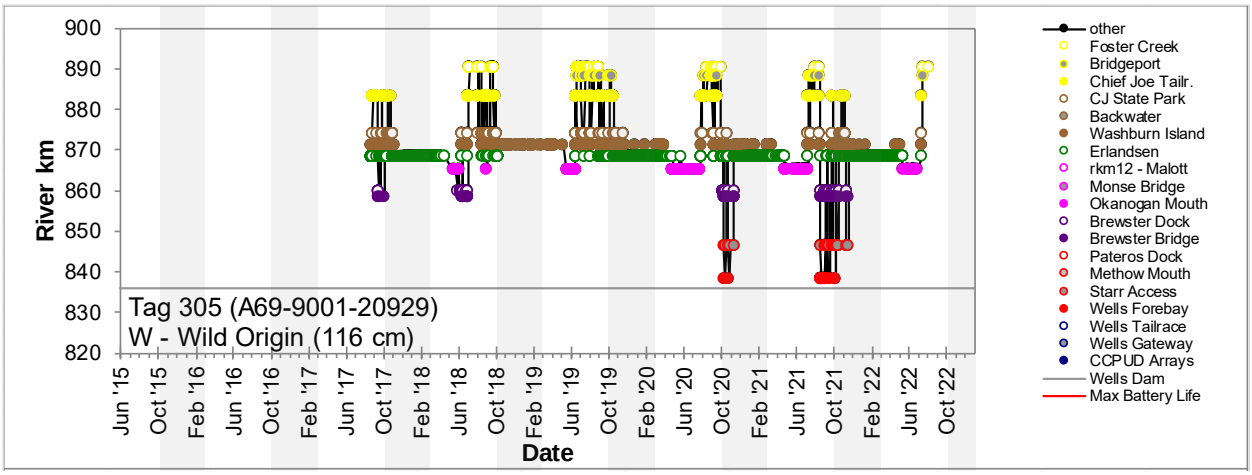
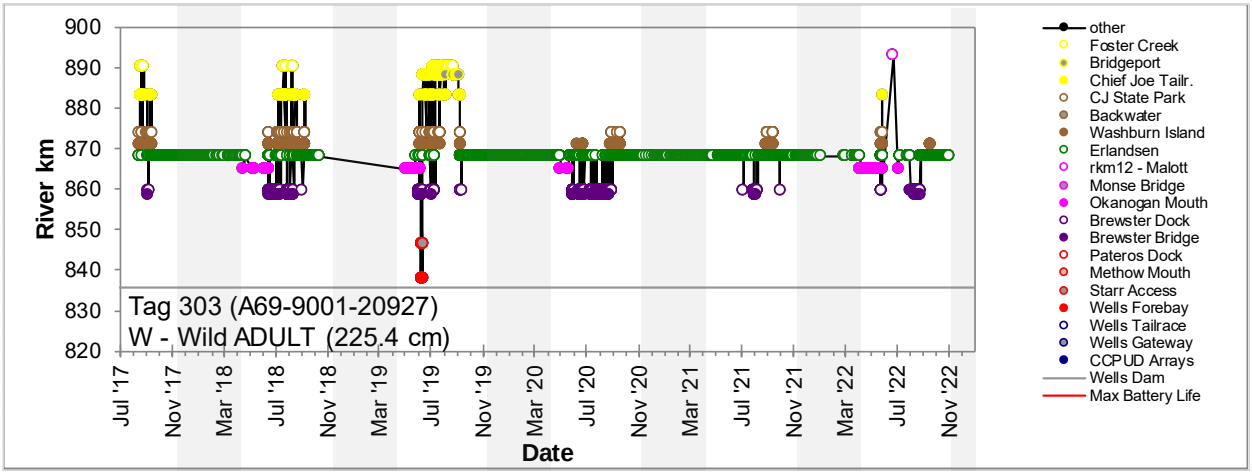
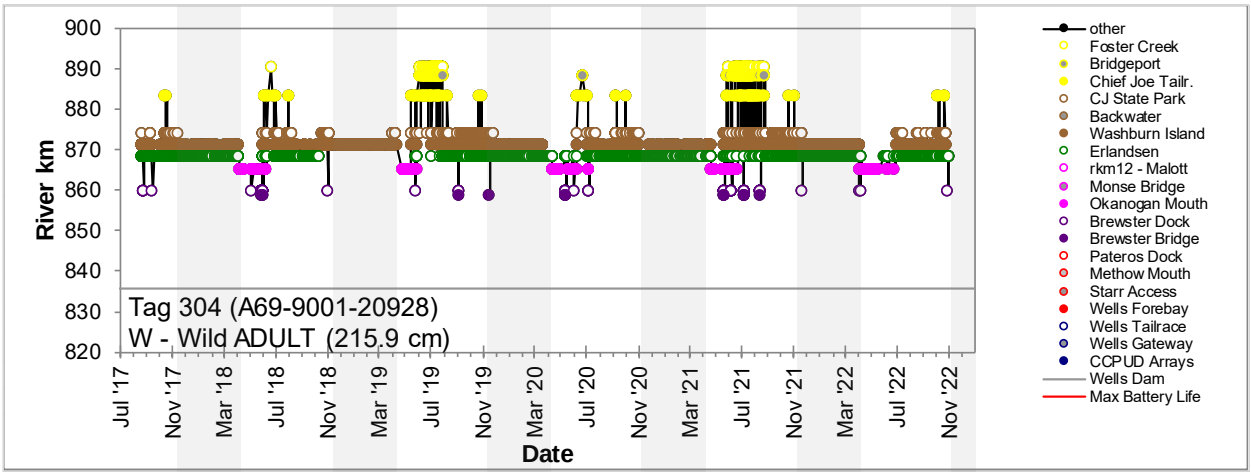
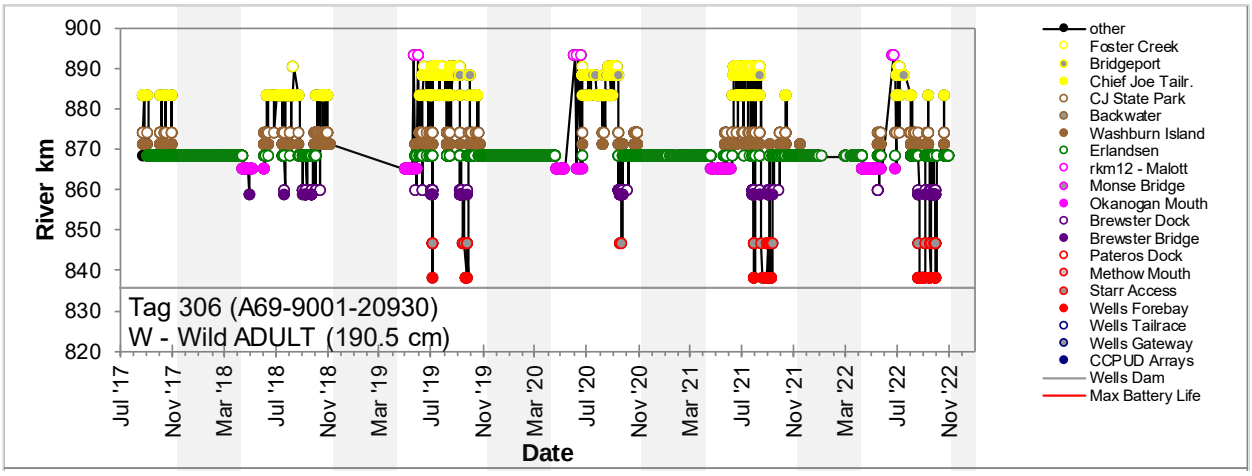
Feb '22
Jun '22
Oct '22
Date
other
Foster Creek
Bridgeport
Chief Joe Tailr.
CJ State Park
Backwater
Washburn Island
Erlandsen
rkm12 - Malott
Monse Bridge
Okanogan Mouth
Brewster Dock
Brewster Bridge
Pateros Dock
Methow Mouth
Starr Access
Wells Forebay
Wells Tailrace
Wells Gateway
CCPUD Arrays
Wells Dam
Max Battery Life

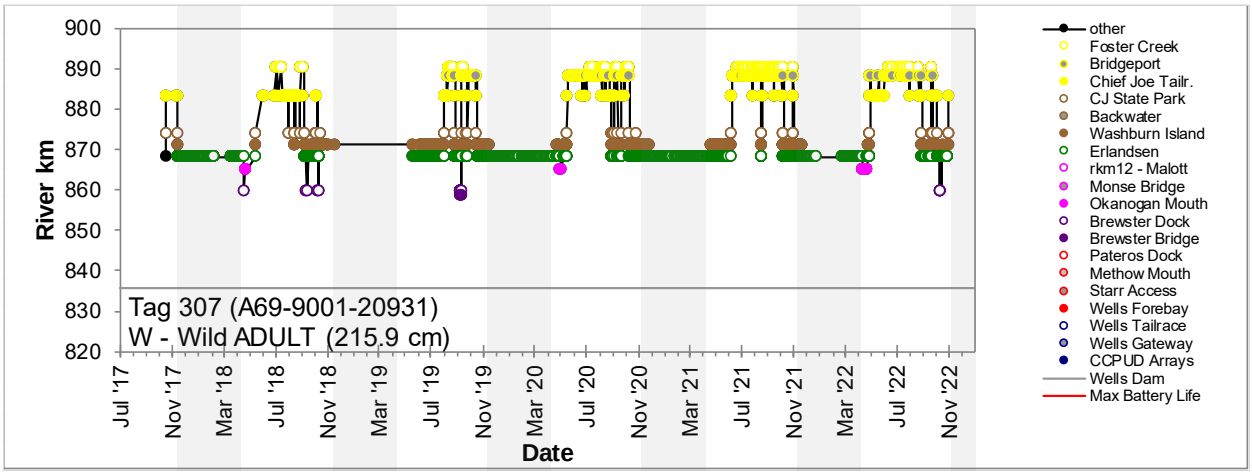

River km
900
890
880
870
860
850
840
830
820
Jun '15
Oct '15
Feb '16
Jun '16
Oct '16
Feb '17
Jun '17
Oct '17
Feb '18
Jun '18
Oct '18
Feb '19
Jun '19
Oct '19
Feb '20
Jun '20
Oct '20
Feb '21
Jun '21
Oct '21
Feb '22
Jun '22
Oct '22
Date
Tag 305 (A69-9001-20929)
W - Wild Origin (116 cm)
other
Foster Creek
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

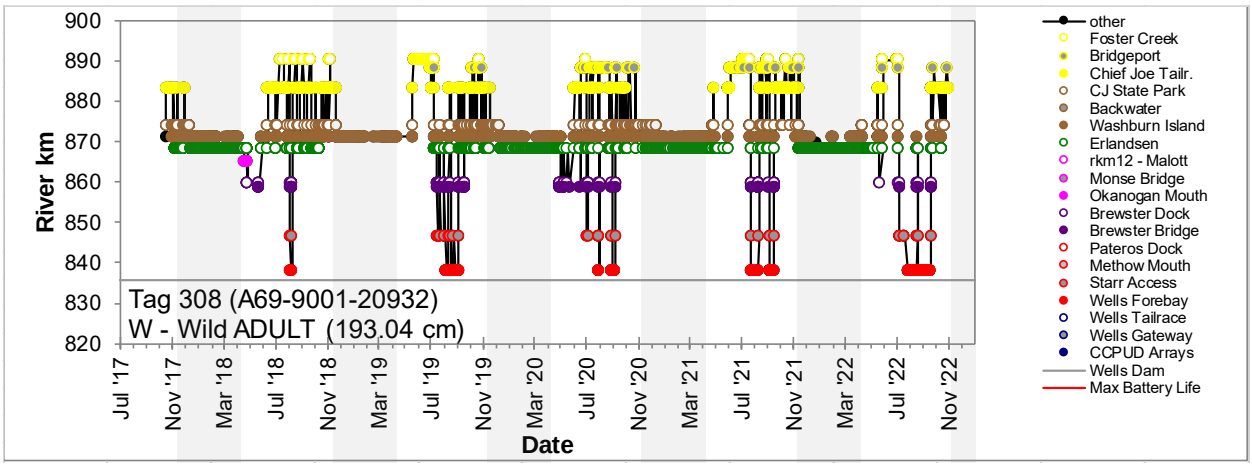
Appendix C. Detection history plots for adult wild-origin fish, tagged *in situ*.

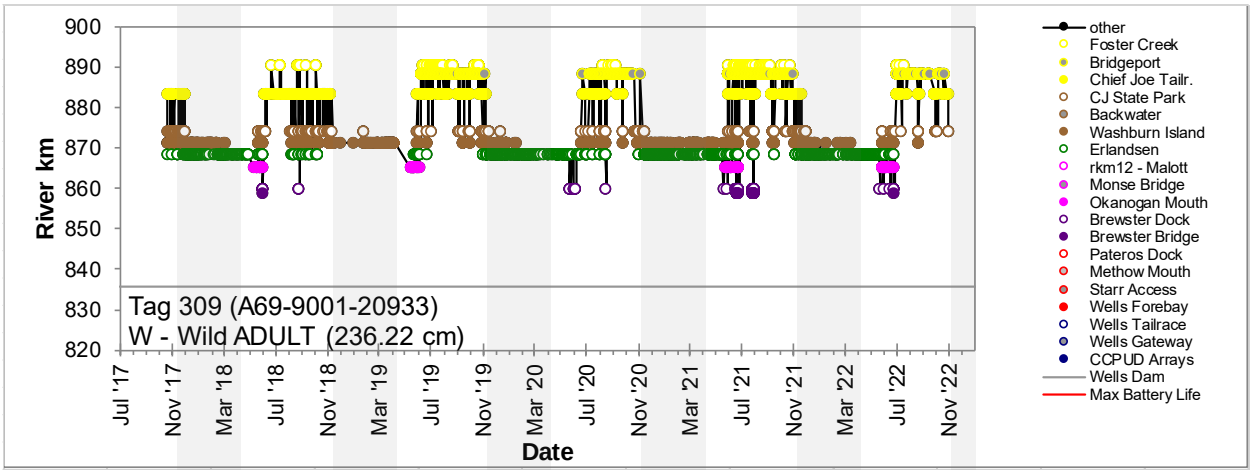







River km
900
890
880
870
860
850
840
830
820
Tag 307 (A69-9001-20931)
W - Wild ADULT (215.9 cm)
Jul '17
Nov '17
Mar '18
Jul '18
Nov '18
Mar '19
Jul '19
Nov '19
Mar '20
Jul '20
Nov '20
Mar '21
Jul '21
Nov '21
Mar '22
Jul '22
Nov '22
Date
other
Foster Creek
Bridgeport
Chief Joe Tailr.
CJ State Park
Backwater
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
Tag 308 (A69-9001-20932)
W - Wild ADULT (193.04 cm)
Jul '17
Nov '17
Mar '18
Jul '18
Nov '18
Mar '19
Jul '19
Nov '19
Mar '20
Jul '20
Nov '20
Mar '21
Jul '21
Nov '21
Mar '22
Jul '22
Nov '22
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
Tag 309 (A69-9001-20933)
W - Wild ADULT (236.22 cm)
Jul '17
Nov '17
Mar '18
Jul '18
Nov '18
Mar '19
Jul '19
Nov '19
Mar '20
Jul '20
Nov '20
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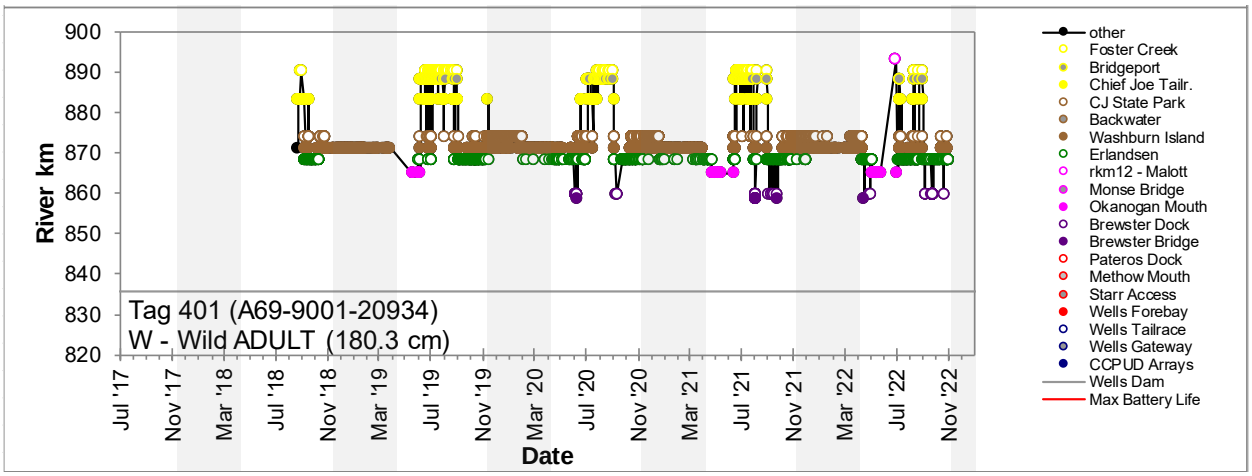
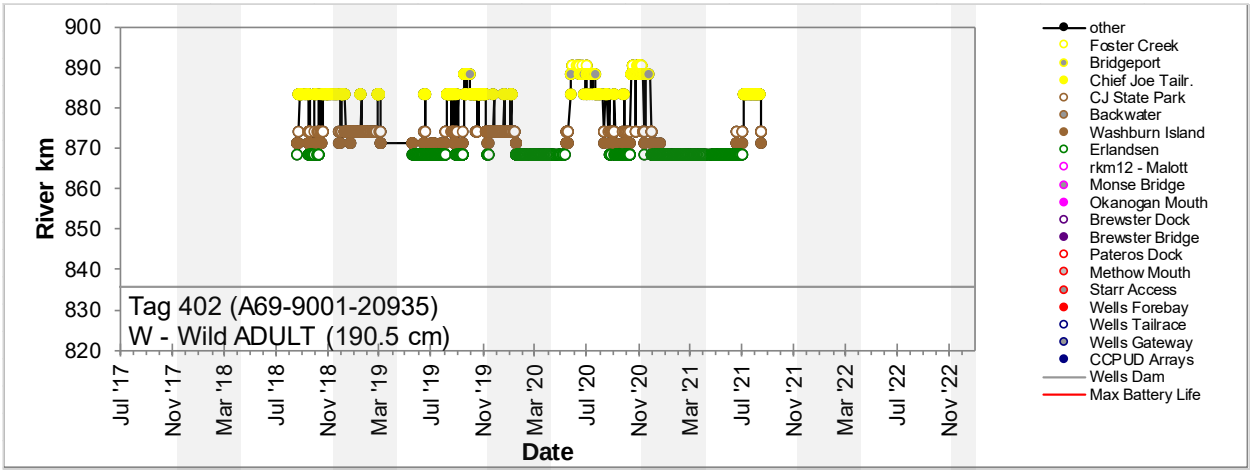
Mar '22
Jul '22
Nov '22
Date
other
Foster Creek
Bridgeport
Chief Joe Tailr.
CJ State Park
Backwater
Washburn Island
Erlandsen
rkm12 - Malott
Monse Bridge
Okanogan Mouth
Brewster Dock
Brewster Bridge
Pateros Dock
Methow Mouth
Starr Access
Wells Forebay
Wells Tailrace
Wells Gateway
CCPUD Arrays
Wells Dam
Max Battery Life


River km
900
890
880
870
860
850
840
830
820
Tag 401 (A69-9001-20934)
W - Wild ADULT (180.3 cm)
Jul '17
Nov '17
Mar '18
Jul '18
Nov '18
Mar '19
Jul '19
Nov '19
Mar '20
Jul '20
Nov '20
Mar '21
Jul '21
Nov '21
Mar '22
Jul '22
Nov '22
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
Tag 402 (A69-9001-20935)
W - Wild ADULT (190.5 cm)
Jul '17
Nov '17
Mar '18
Jul '18
Nov '18
Mar '19
Jul '19
Nov '19
Mar '20
Jul '20
Nov '20
Mar '21
Jul '21
Nov '21
Mar '22
Jul '22
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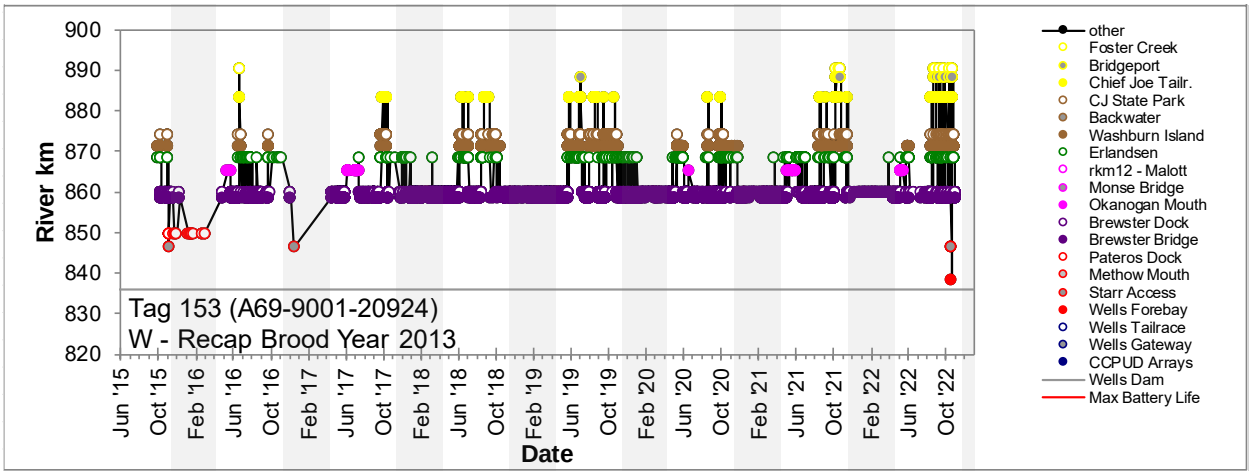
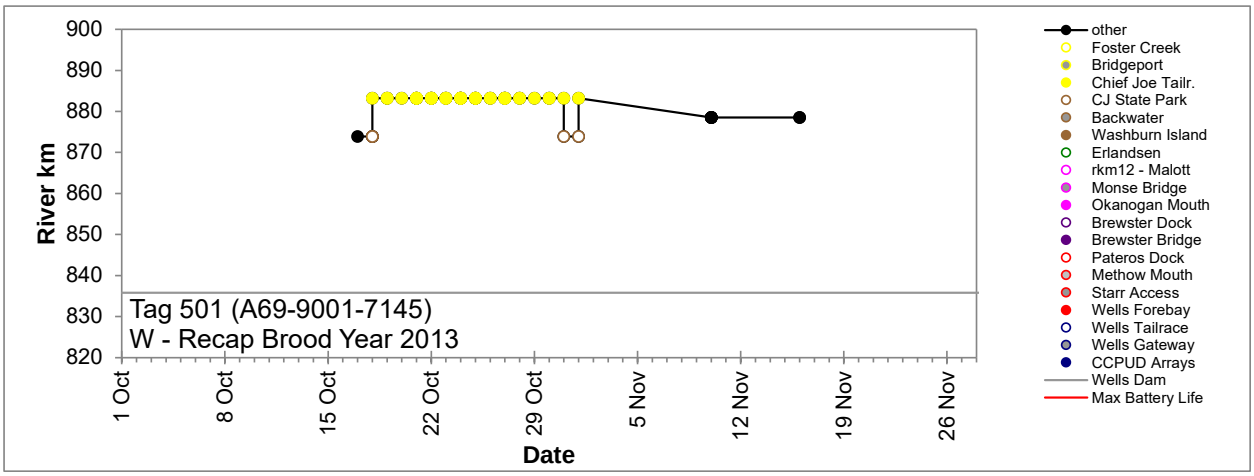
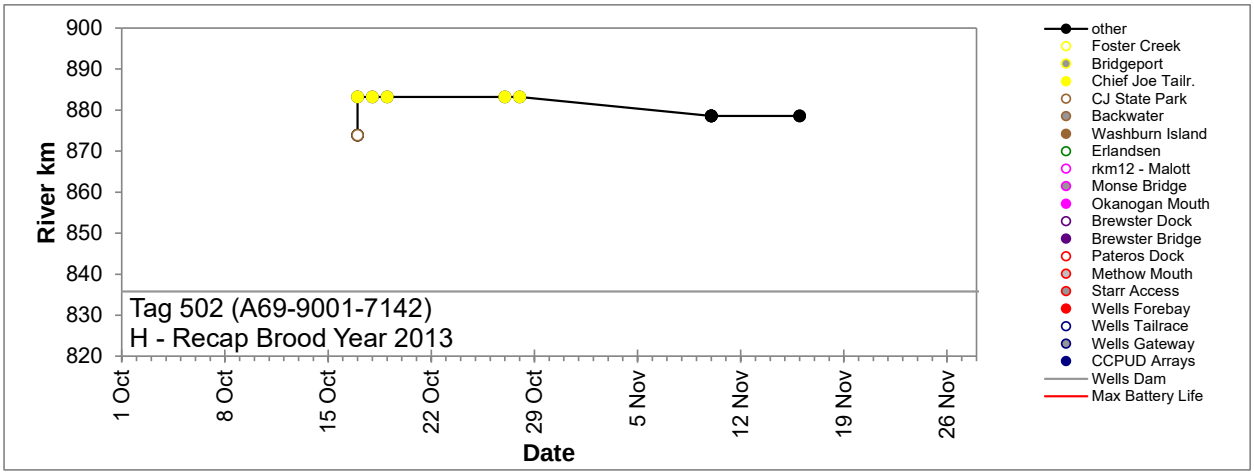
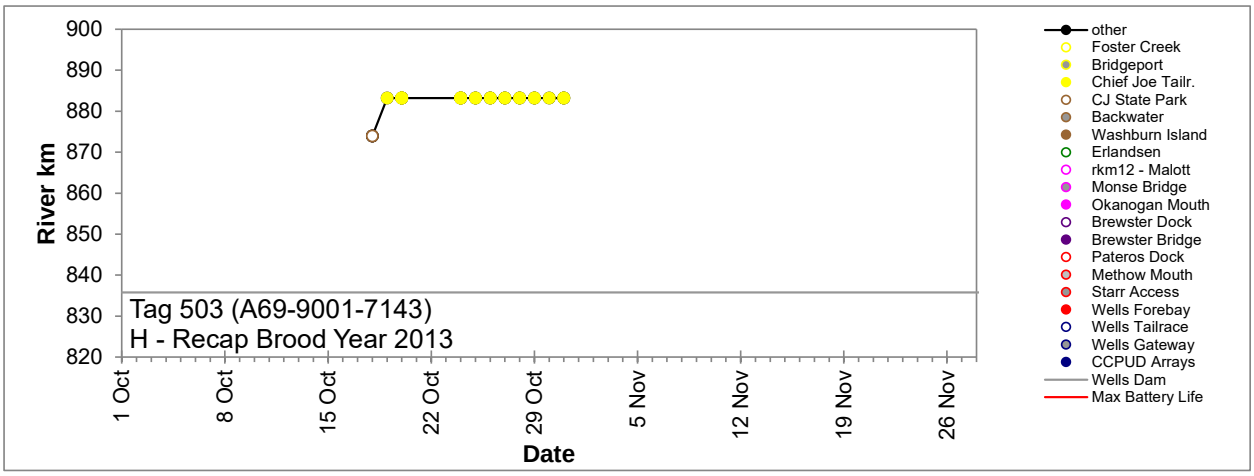
Date
other
Foster Creek
Bridgeport
Chief Joe Tailr.
CJ State Park
Backwater
Washburn Island
Erlandsen
rkm12 - Malott
Monse Bridge
Okanogan Mouth
Brewster Dock
Brewster Bridge
Pateros Dock
Methow Mouth
Starr Access
Wells Forebay
Wells Tailrace
Wells Gateway
CCPUD Arrays
Wells Dam
Max Battery Life

Appendix D. Detection history plots for hatchery-origin fish, tagged *in situ*.





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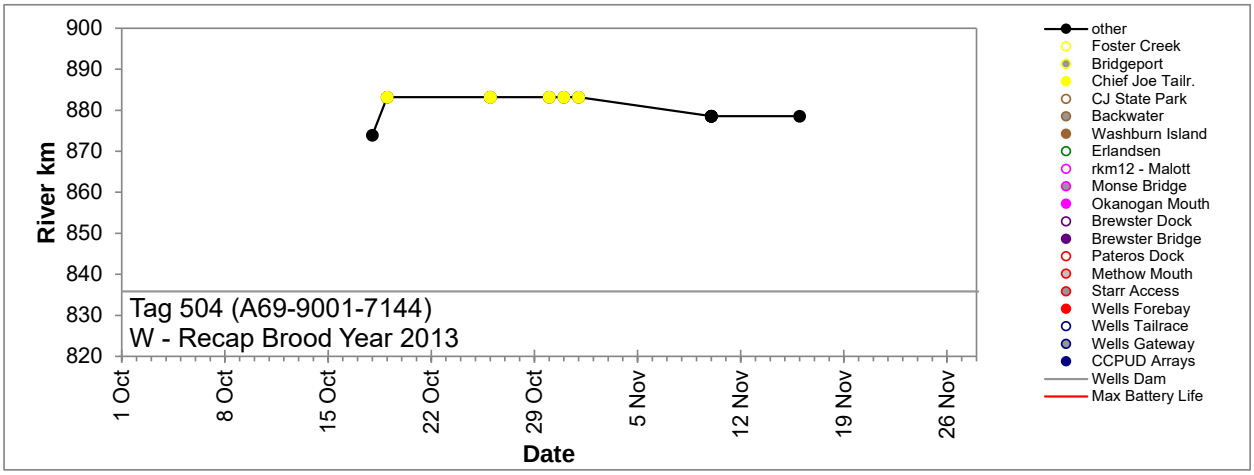
Chief Joe Tailr.
CJ State Park
Backwater
Washburn Island
Erlandsen
rkm12 - Malott
Monse Bridge
Okanogan Mouth
Brewster Dock
Brewster Bridge
Pateros Dock
Methow Mouth
Starr Access
Wells Forebay
Wells Tailrace
Wells Gateway
CCPUD Arrays
Wells Dam
Max Battery Life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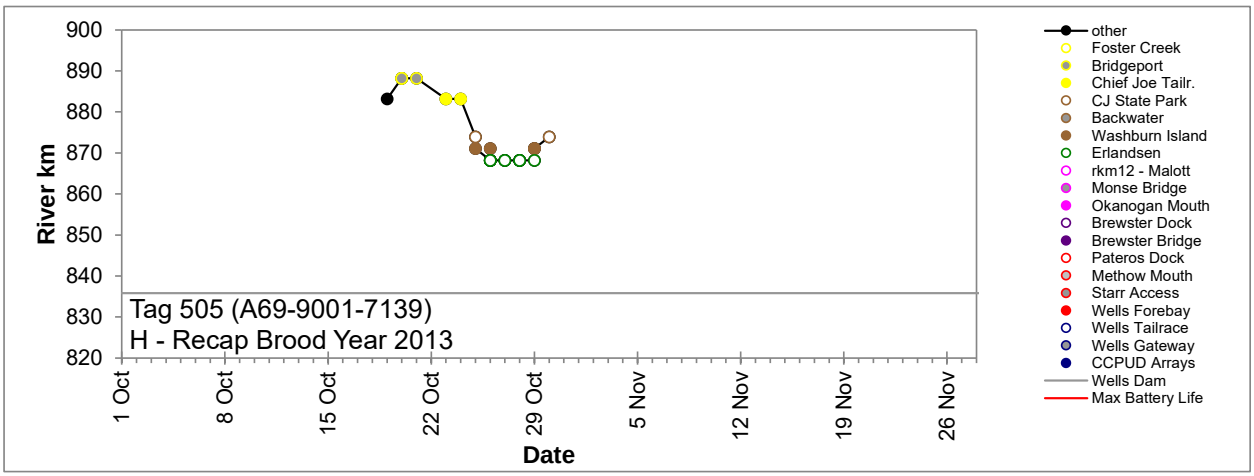
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Wells Dam
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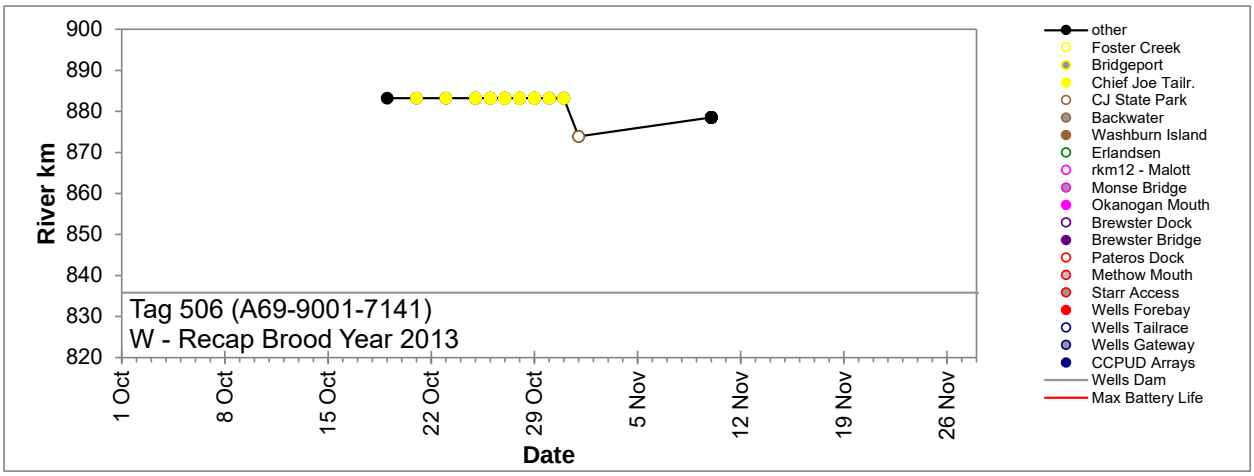
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Wells Gateway
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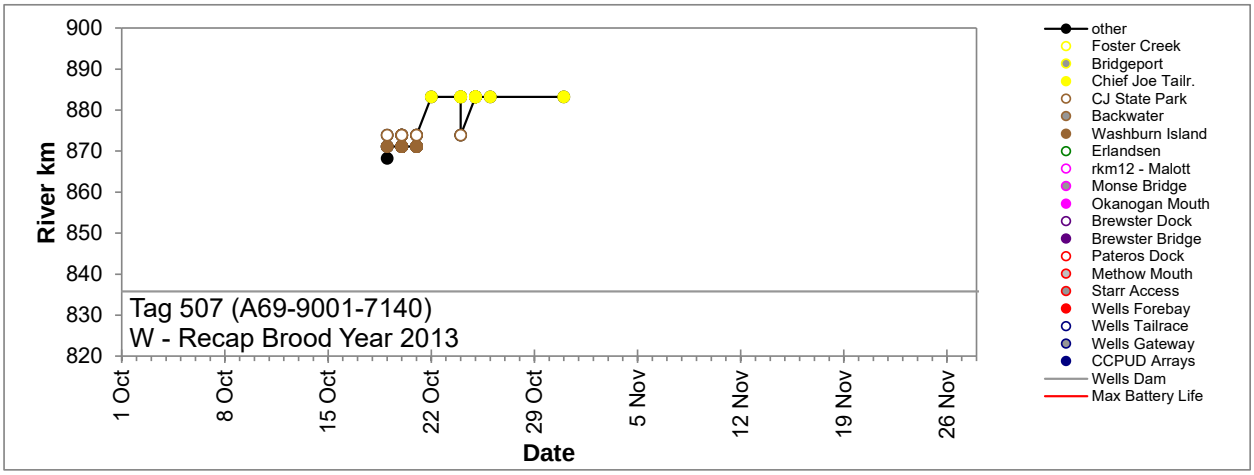
Wells Dam
Max Battery Life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CCPUD Arrays
Wells Dam
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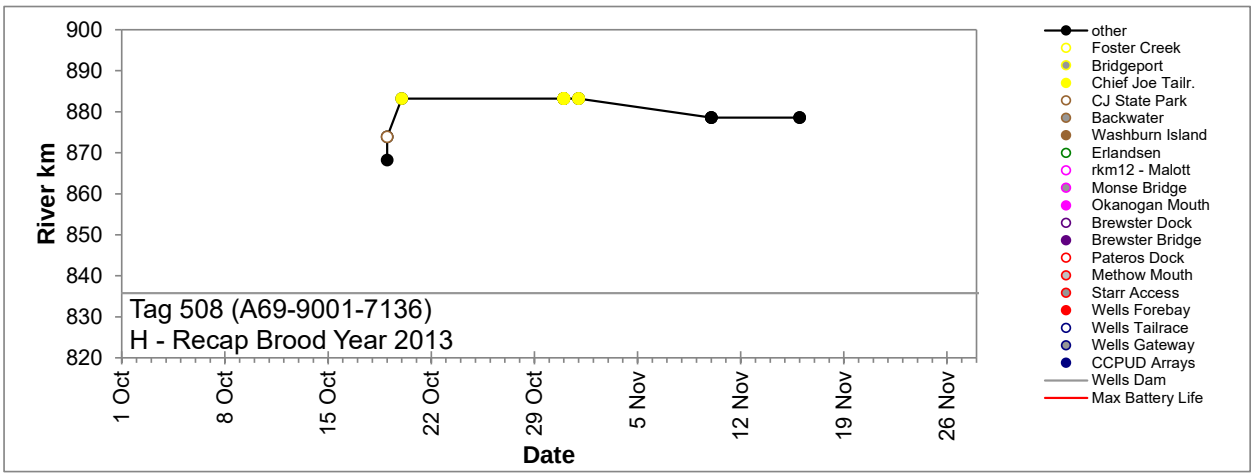
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CJ State Park
Backwater
Washburn Island
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Monse Bridge
Okanogan Mouth
Brewster Dock
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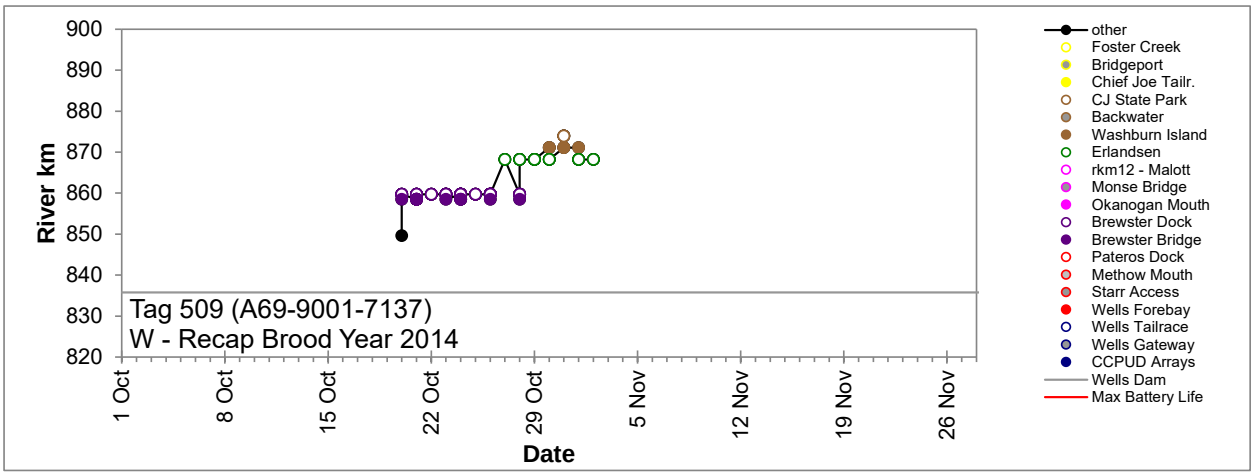
CCPUD Arrays
Wells Dam
Max Battery Life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Chief Joe Tailr.
CJ State Park
Backwater
Washburn Island
Erlandsen
rkm12 - Malott
Monse Bridge
Okanogan Mouth
Brewster Dock
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Starr Access
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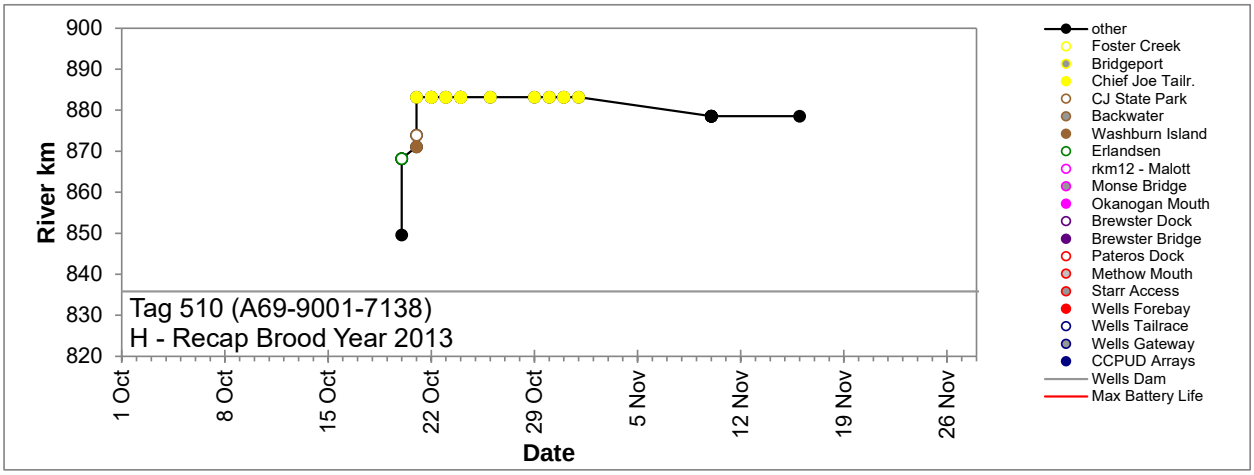
Wells Gateway
CCPUD Arrays
Wells Dam
Max Battery Life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CJ State Park
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Brewster Dock
Brewster Bridge
Pateros Dock
Methow Mouth
Starr Access
Wells Forebay
Wells Tailrace
Wells Gateway
CCPUD Arrays
Wells Dam
Max Battery Life

Appendix E. Abundance Model detailed outputs.

Release Year	Model	Numb. Param	AICc	ΔAICc	weight	Neg2LnL	2021 Population Abundance† Estimate	SE	LCL	UCL
2014	**M_b**	3	-777.09	0.00	0.75	-783.1	307	73	221	532
	M_t	6	-774.03	3.06	0.16	-786.1	1,679	608	875	3,397
	M_0	2	-772.77	4.31	0.09	-776.8	1,702	617	886	3,446
	Avg						**651**	**673**	**199**	**7,588**
2015	**M_0**	2	-97.13	0.00	0.64	-101.2	851	832	197	4,328
	M_b	3	-95.20	1.92	0.25	-101.3	211	399	57	2,549
	M_t	6	-93.59	3.53	0.11	-106.0	831	812	193	4,224
	Avg						**691**	**796**	**104**	**7,282**
2016	**M_b**	3	-61.66	0.00	1.00	10.9	851	832	197	4,328
	M_t	Failed					361,885	8,810,456	2,590	51,251,190
	M_0	Failed					1,566,214	0	1,566,214	1,566,214
	Avg						**65**	**36**	**38**	**346**
2017	**M_0**	2	-99.32	0.00	0.91	17.1	355	193	148	1,002
	M_t	6	-94.61	4.71	0.09	13.5	349	190	146	984
	M_b	Failed					41,971,604	119,625,297	2,276,665	773,785,361
	Avg						**355**	**193**	**138**	**1,103**
2018	**M_b**	3	16.54	0.00	1.00	6.8	12	21	6	144
	M_t	Failed					66,888	3,370,456	283	16,171,056
	M_0	Failed					339,650	0	339,650	339,650
	Avg						**12**	**21**	**6**	**5,041**

…continued overleaf

Release Year	Model	Numb. Param	AICc	ΔAICc	weight	Neg2LnL	2021 Population Abundance†			
							Estimate	SE	LCL	UCL
2019	M_0	2	13.67	0.00	0.71	9.5	69	63	22	346
	M_b	3	15.63	1.96	0.27	9.2	26	27	14	179
	M_t	6	20.10	6.43	0.03	6.7	66	60	22	329
	Avg						**57**	**59**	**16**	**620**
2020	M_0	2	-51.40	0.00	0.71	-55.5	146	52	84	305
	M_b	3	-49.34	2.05	0.26	-55.5	136	161	52	978
	M_t	6	-45.17	6.22	0.03	-57.6	145	51	83	302
	Avg						**143**	**93**	**59**	**660**
Other*	M_t	6	1.27	0.00	0.46	-11.6	88	55	37	297
	M_0	2	1.78	0.51	0.36	-2.3	96	61	39	326
	M_b	3	3.15	1.88	0.18	-3.1	35	19	23	128
	Avg						**81**	**58**	**30**	**415**

* includes wild fish, re-tagged hatchery fish with lost tags, and immigrants from Rocky Reach Reservoir

† 2021 abundance estimate excludes the fish released in 2020 and 2021.

Appendix K
Wells Reservoir, 2022 White Sturgeon Reproduction Assessment

WELLS RESERVOIR
2022 WHITE STURGEON REPRODUCTION ASSESSMENT

WELLS HYDROELECTRIC PROJECT

FERC NO. 2149

July, 2023

Draft Prepared by:
Public Utility District No. 1 of Douglas County
For the Aquatic Settlement Work Group

1.0 BACKGROUND

The White Sturgeon Management Plan (WSMP) includes objectives required by the Federal Energy Regulatory Commission (FERC) operating license for the Wells Hydroelectric Project's (Wells Project) that the Public Utility District No. 1 of Douglas County (Douglas PUD) is required to meet. The WSMP directs the implementation of Protection, Mitigation and Enhancement measures for potential Project impacts on White Sturgeon.

Objective 3 of the WSMP is to determine the potential for natural reproduction in the Wells Reservoir in order to appropriately inform the scope of future supplementation activities. Section 4.2.3 of the WSMP describes specific monitoring activities that may be carried out in support of Objective 3, which include tracking of tagged White Sturgeon adults and the utilization of egg mats to determine spawning locations and determine natural reproduction potential in the Wells Reservoir. Five surveys of natural reproduction 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.

Acoustic tagging of adult White Sturgeon began in 2017 (see Figure 1 for map of study area) and data from five years of acoustic tracking suggested that most adult fish occupy the lower (<15 river miles) and/or mouth of the Okanogan River in the spring and early summer (e.g. Figures 2a,2b & 3). Side-scan sonar work (Robichaud and Gingerich 2018), corroborated the presence of large sturgeon in the Okanagan area in the early summer (Figure 4). Early season Okanogan residency was followed by major use of the upstream-most zones, including areas near the Chief Joseph tailrace from June through mid-September.

White Sturgeon aging data from 2001-2002 (Jerald 2007) suggested strong year class recruitment between the years 1972 and 1978, and again between 1988 and 1996, but were complicated by the poor accuracy associated with aging large adult fish. The aging of wild-origin sturgeon caught in 2016 (Robichaud and Gingerich 2018) showed a preponderance of fish from the 2011 and 2012 year classes. There is a general consensus that White Sturgeon recruitment corresponds with high flow (Hildebrand et al. 2016), and in the Wells Reservoir large snowpack appears to be linked to recruitment (six of seven high snow volume years had good recruitment). Curiously, both in June of 2011 and July of 2012 average river discharge at Wells Dam was over 246 kcfs, which are considered to be flood flows at the Wells Project having the probability to last for seven or more days and occurring only once every ten years (7Q10). Two hundred and fifty thousand cubic feet per second (at The Dalles USGS gauging station) has been noted as an important factor in observed recruitment events in the lower Columbia River (Brad James, WDFW retired, *pers comm*). While snowpack is a good indicator of discharge levels, there are several other factors that may come in to play (e.g., the timing of the runoff relative to temperatures reaching 14°C) and as such the likelihood of spawning and recruitment occurring within the Wells Project area is poorly understood. Furthermore, the adult sturgeon population within the Wells Project is expected to be relatively small (Jerald 2007) complicating our expectation for juvenile output.

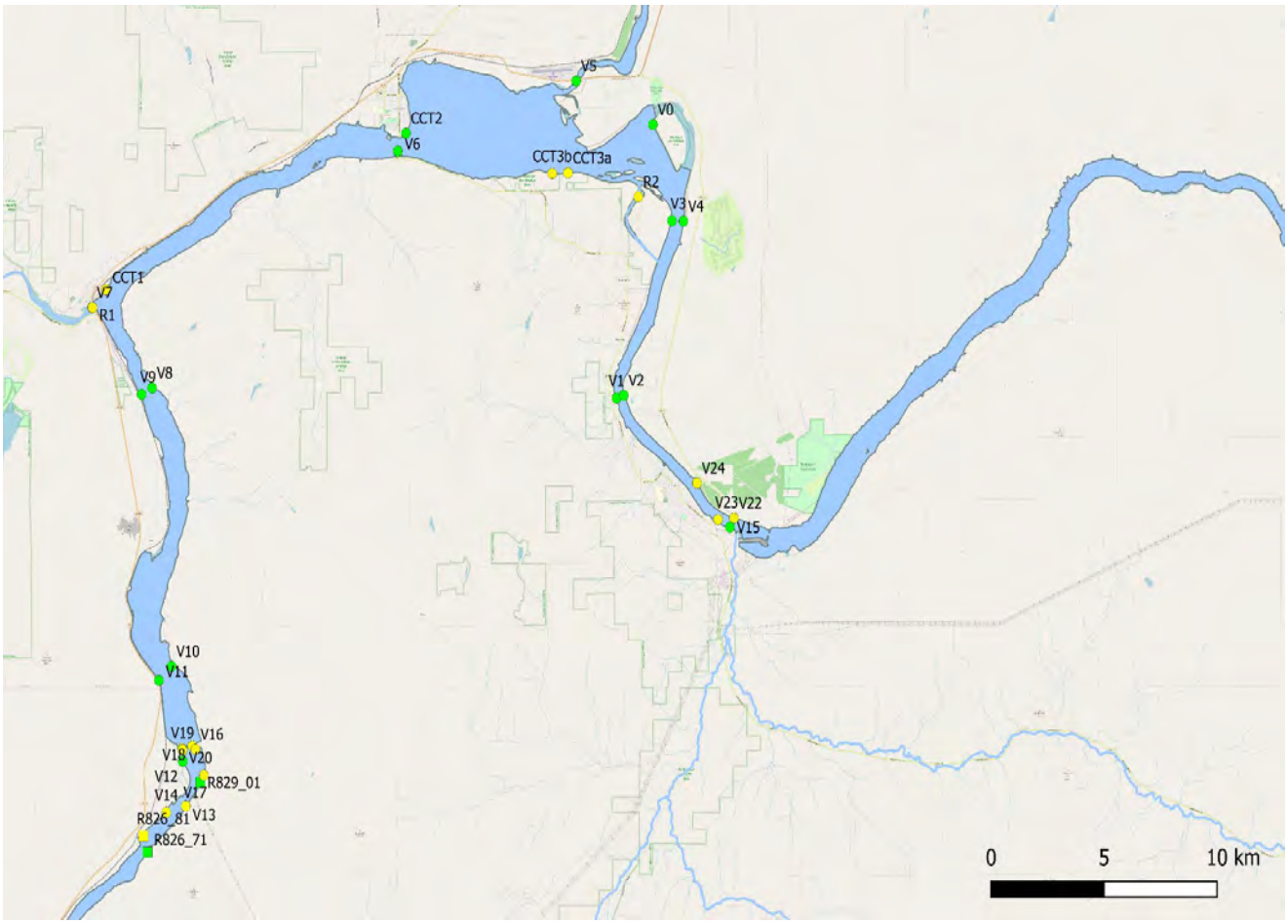

Figure 1. **Douglas (circle) and Chelan (square) PUD's receiver locations in the study area. Inset: details of the Wells tailrace area. Some receivers sited have full-study coverage (green) while others (yellow) were removed, lost, or added partway through the study. Not shown: three receivers in the Okanogan River. For deployment schedule and to decipher label abbreviations see Appendix A of the White Sturgeon Supplementation and Management Plan Implementation in the Wells Reservoir, 2020-21 (Robichaud and Gingerich, 2022*).***

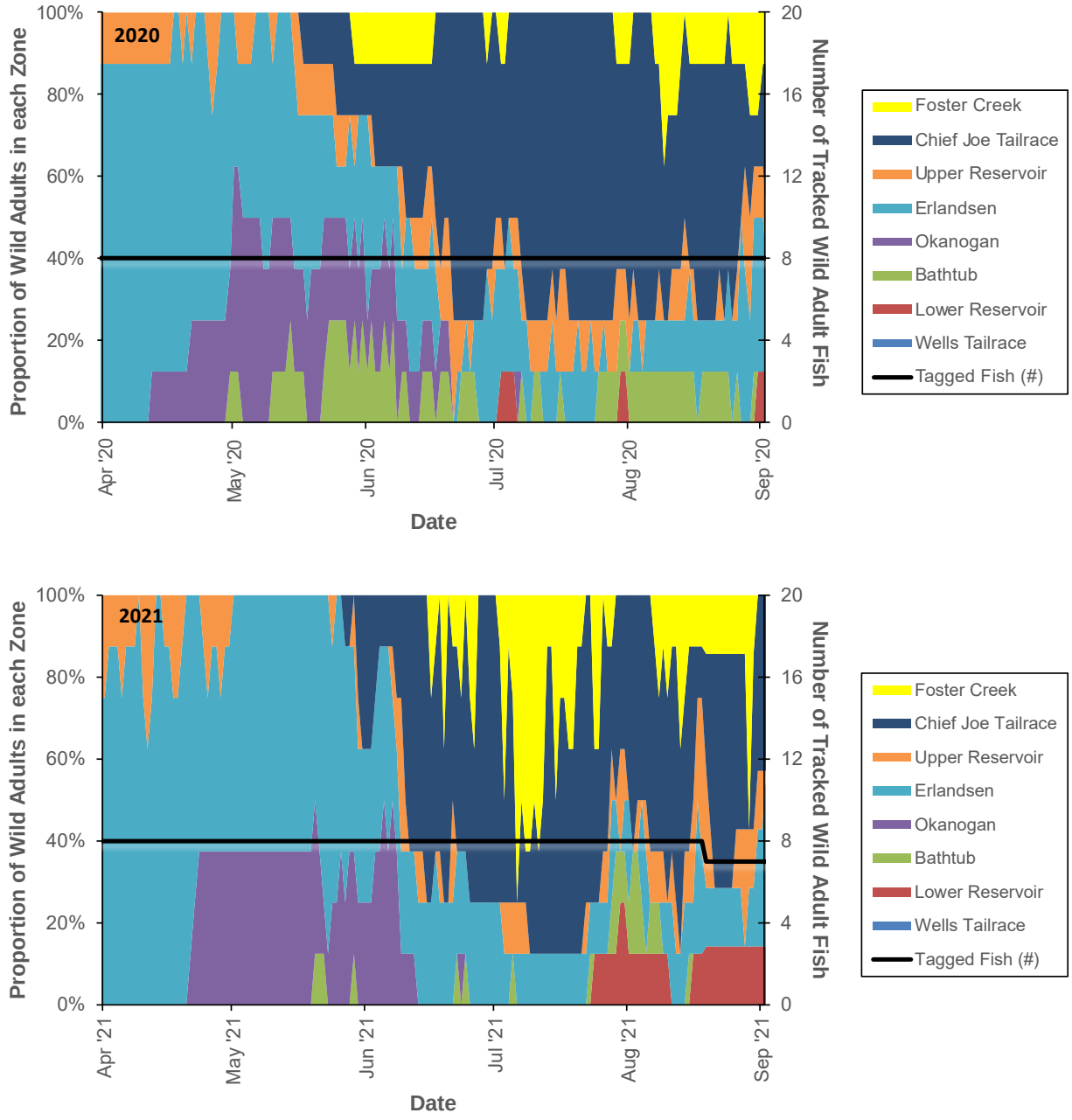

Figure 2a. **Detection history plots for eight acoustic-tagged wild-origin adult White Sturgeon that were tracked in the Wells Reservoir in 2020 and 2021. While only 2020-2021 data are provided data since 2017 show highly repeatable seasonal movements (Robichaud and Gingerich, 2022).**

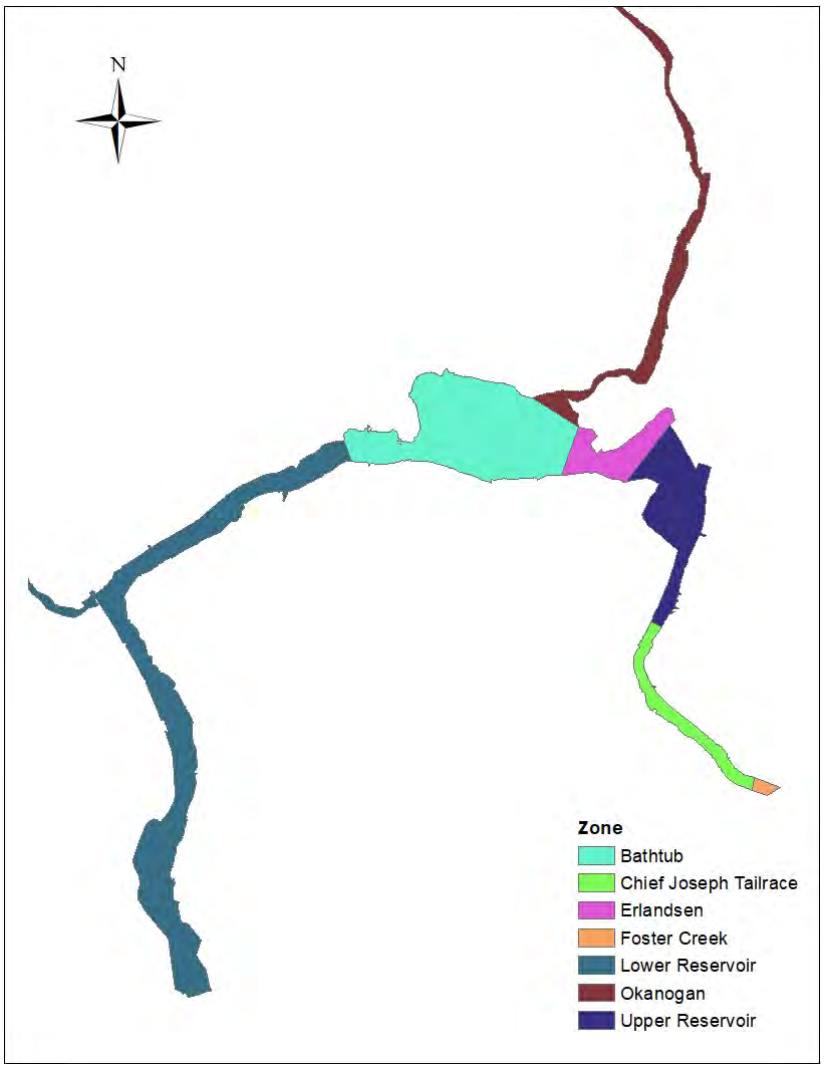

Figure 2b. Map of acoustic tracking zones in the Wells Project.

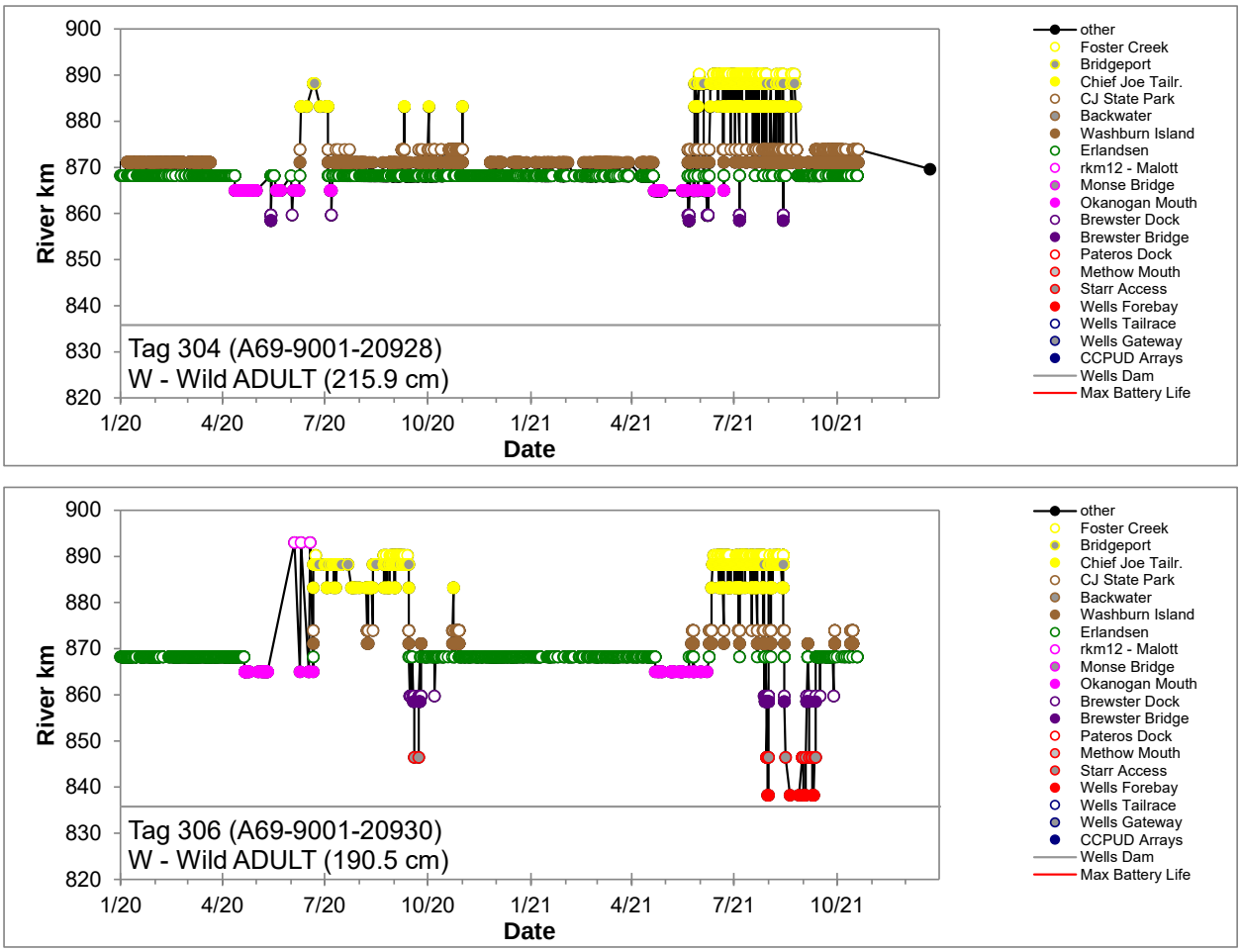

Figure 3. **Example acoustic-tagged wild-origin adult White Sturgeon that were tracked in the Wells Reservoir in 2020 and 2021. Fork length (cm) of fish at time of tagging at bottom of each panel. (Robichaud and Gingerich, 2022).**

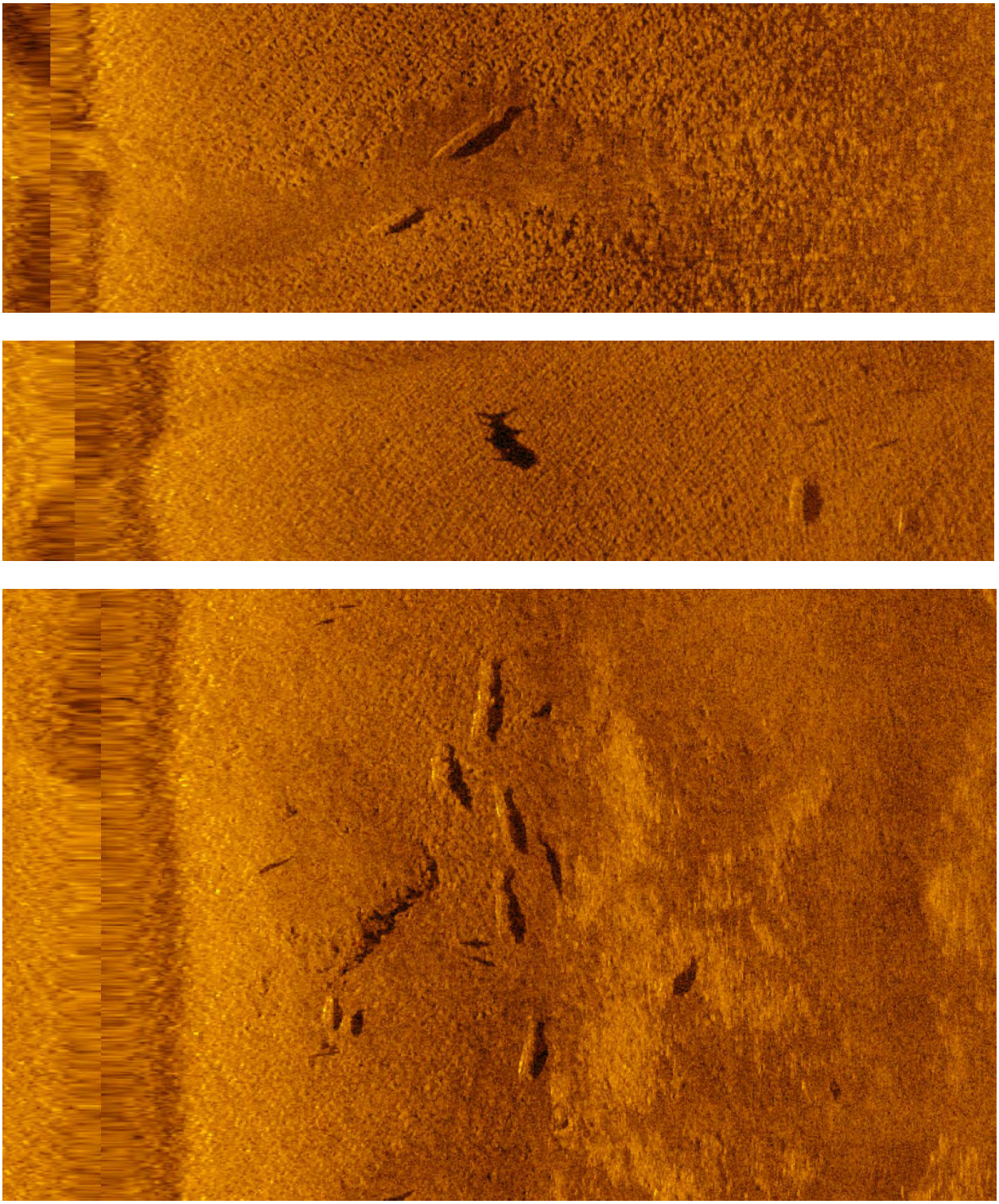

Figure 1. **Images of large-sized (> 160 cm) White Sturgeon detected in or near the Okanogan River mouth using side-scan sonar, June 22, 2018.**

Eight years of data suggest that most of the adult White Sturgeon carrying acoustic tags shift to the upper portion of the Wells Reservoir from June through September near Bridgeport, WA but approach the Foster Creek acoustic array routinely (Figures 2a & 3). In fact, tracking data suggest that larger fish occupy the upper most portions of the Wells Reservoir during June and July in every year since tagging. While these movements and congregations of adult size, presumably mature White Sturgeon have been observed during times and conditions when spawning is known to occur in other areas in the Columbia River, no investigations of spawning activity had been conducted in the Wells Reservoir prior to 2022. However, wild juveniles captured during monitoring and evaluation efforts since 2014 suggest that recruitment occurred within the Wells Project most recently in 2011 and/or 2012 or juveniles were entrained to the Wells Project from successful spawning events upstream of the project.

In order to complete a one year study required in Section 4.2.3 of the WSMP and pursuant to determine the natural reproductive potential of White Sturgeon in the Wells Project area, Douglas PUD developed a Wells Reservoir White Sturgeon Reproduction Assessment Study Plan in April 2022. The Aquatic SWG provided edits and revisions to the study plan and on May 11, 2022 the Aquatic SWG approved the study plan.

This report presents the results of monitoring activities designed to describe the movements of adult, presumably mature White Sturgeon during the spawning season and to determine locations and timing of potential spawning activities and if successful, that reproduction is occurring. These monitoring activities are intended to provide baseline data on White Sturgeon reproduction in the Wells Reservoir and will serve as the first of five assessments to be carried out over the course of the Wells Project's FERC License.

2.0 OBJECTIVES

1. Identify specific locations where adult White Sturgeon congregate during the spawning season (June-July, or when water temperature exceed 14^{o}C).
2. Determine if White Sturgeon are spawning and successfully reproducing (presence of eggs/free embryos/larvae) in the Wells Reservoir.

3.0 METHODS

3.1 Side-scan Sonar (Objective 1)

We attempted to use side-scan sonar surveys to determine the presence of adult White Sturgeon at potential spawning locations; however, high river flows resulted in dangerous conditions that prevented us from accessing areas intended for survey. In addition, the side-scan sonar transducer became damaged during egg mat monitoring and was inoperable during the presumed spawning period.

3.2 Egg Mat Monitoring and Larval Drift Net Monitoring (Objective 2)

Artificial substrate egg mats were deployed to collect White Sturgeon eggs in locations where spawning was predicted to occur. Egg mats were constructed and deployed in a similar manner to that of McCabe and Beck (1990) and consisted of a piece of coarse polyester filter fiber "hog hair" material measuring 76 X 91 cm secured inside a steel angle-iron frame and anchored to the river bottom. Specific locations for deployment of egg mats were selected downstream of potential spawning locations. Previous acoustic telemetry data suggest that White Sturgeon may spawn in the tailrace of Chief Joseph Dam near Bridgeport, WA (Figure 5). An effort was made to deploy egg mats in a grid pattern across the river channel; however, high flows limited the areas where mats could be deployed and anchored effectively. Twelve egg mats (six locations, two mats each) were deployed beginning on July 7, 2022, one day after the water temperature reached 14°C on the Chief Joseph Dam tailwater gage and egg mat monitoring efforts concluded on August 8, 2022 (Figure 6). Egg mats at two locations were lost during the first deployment. These were replaced with single mats at two alternate locations which resulted in a total of eight mats deployed at five locations (three double mats, two single mats) (Figure 7). Egg mats were retrieved every three to four days and redeployed at the same locations. Upon retrieval, substrates were inspected for White Sturgeon eggs.

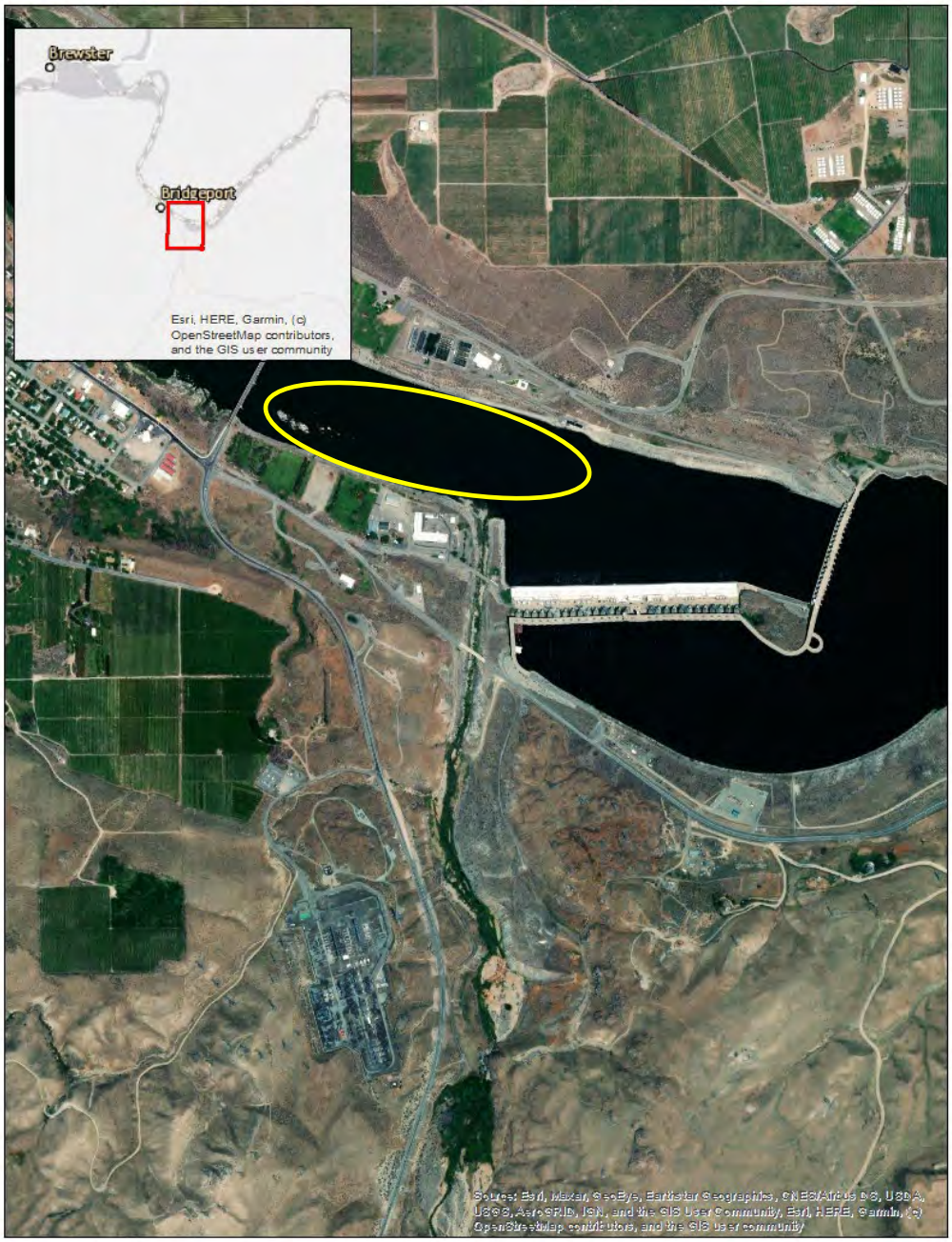

Figure 5. **Suspected White Sturgeon spawning location (yellow oval) determined by previous acoustic telemetry data from eight acoustic tagged adult fish.**

Figure 6. **Water temperature and discharge (24hr rolling average) at the Chief Joseph Tailwater gage during the 2022 White Sturgeon potential spawning period. Shaded rectangles denote the duration of egg mat (blue) and larval drift net (green) monitoring.**

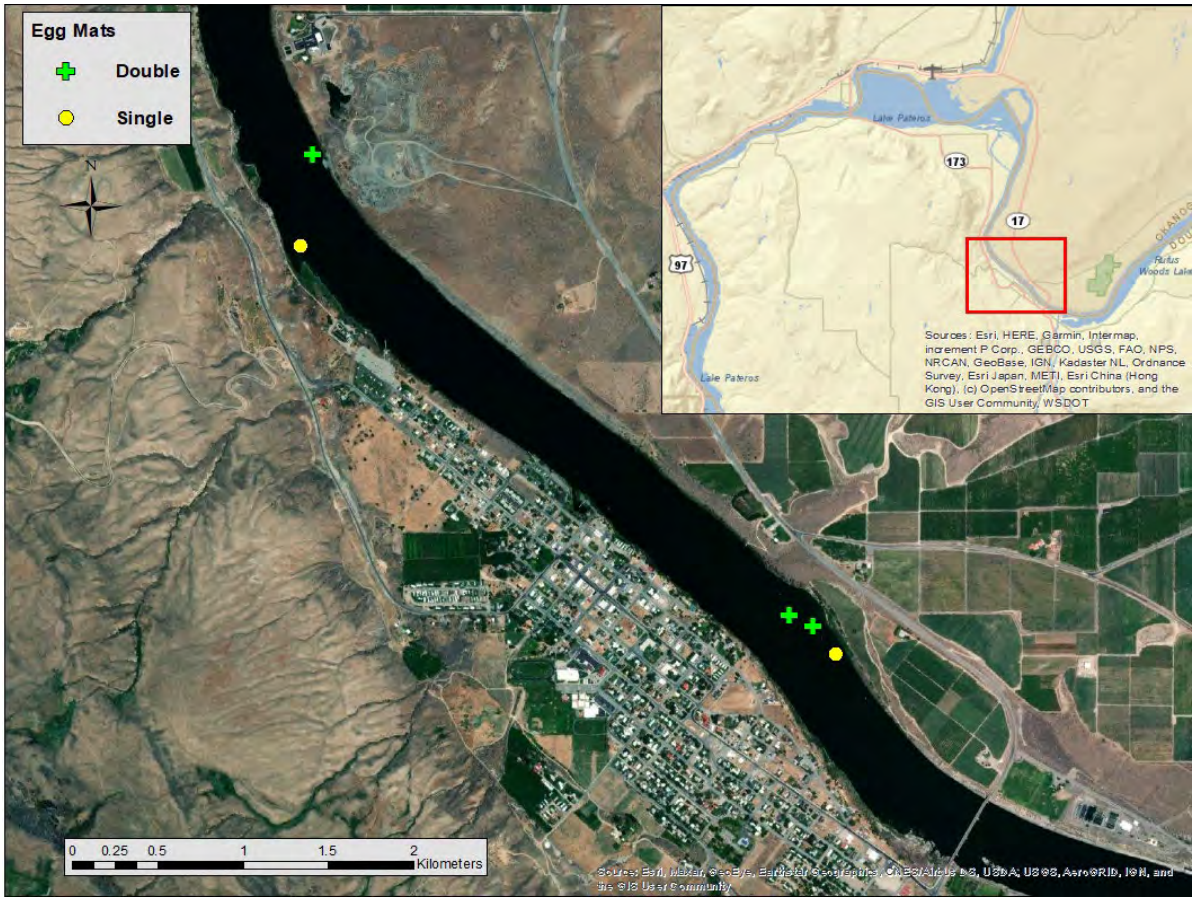

Figure 7. Egg mat monitoring locations (single mats-yellow dots, double mats-green crosses).

Drift nets were fished to collect White Sturgeon larvae downstream of potential spawning locations. Drift net gear deployment techniques followed those developed and used by Confederated Tribes of the Colville Reservation to capture drifting larvae in Lake Roosevelt (Howell and McLellan, 2013). Net frames were constructed from 2.54 cm steel pipe and incorporate two rectangular (61 cm H x 76 cm L) openings for net attachment. Nets were approximately 4 m long and constructed from 1.6 mm knotless delta mesh. Sample collection buckets were fabricated from 24.6 L (6.5 gal) screw top pails and attached to the cod end of each net.

Ten drift nets were deployed at five locations; each location consisting of one frame with two nets attached (Figure 8). An overnight test deployment of one net frame (2 nets) was conducted on July 18, 2022 to assess debris loading and determine if nets could be fished overnight without clogging. Debris loading was low following the initial net set, therefore nets were allowed to fish overnight without the need of retrieval until the following day for the remainder of sampling. Following the retrieval of nets each day, larval fish were separated from debris and enumerated. Nets were cleaned of debris and re-deployed at the same locations each day. Larval drift net monitoring began on July 19, 2022 and nets were deployed four days per week through August 9, 2022 (Figure 6).

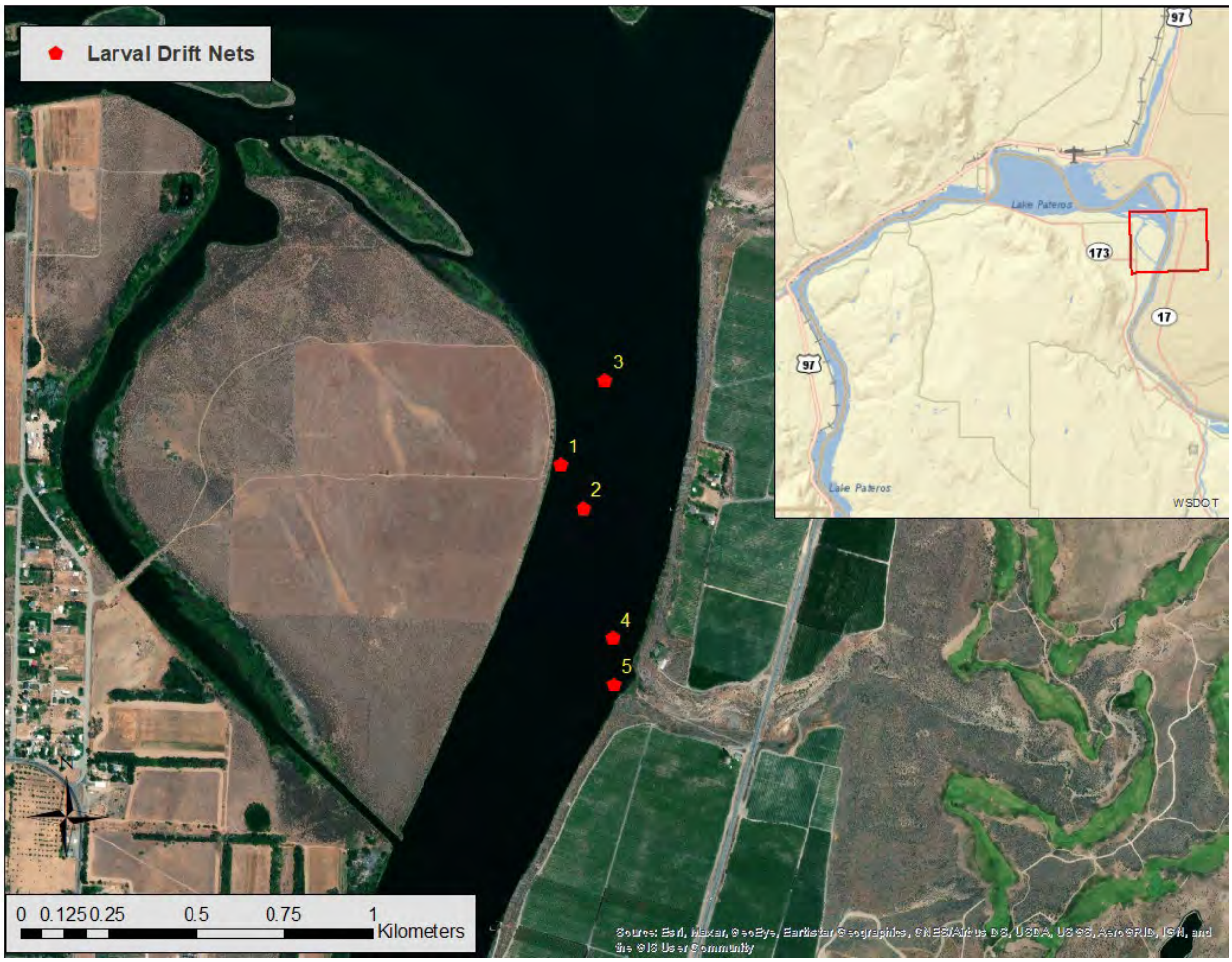

Figure 8. Larval drift net montiroing locations (red pentagons).

4.0 RESULTS

4.1 Side Scan Sonar

High river flows in July 2022 resulted in dangerous conditions in the tailrace of Chief Joseph Dam which prevented our ability to perform side-scan sonar surveys of presumed Sturgeon spawning locations. In addition, the side-scan sonar transducer was damaged during egg mat monitoring and was not operable during the expected spawning time-frame in July 2022. Side-scan sonar surveys will be conducted periodically in the future as conditions allow.

4.2 Egg Mat Monitoring

Egg mats were retrieved and checked for Sturgeon eggs eight times between July 11, 2022 and August 3, 2022. Retrieval and reset dates were: July 11, July 14, July 18, July 22, July 25, July

27, and August 1, with a final retrieval and removal on August 3, 2022. No Sturgeon eggs were observed on any of the egg mats over the course of the monitoring period.

4.3 Larval Drift Net Monitoring

Larval drift nets were retrieved and redeployed on the following dates: July 20, 21, 22; July 25, 26, 27; August 1, 2, 3; August 8, and retrieved a final time on August 9, 2022. This resulted in a total of 65 samples (two nets/sample buckets each). No larval Sturgeon were observed over the course of monitoring. Larval suckers (*Catastomas* spp.) and juvenile sculpin (*Cottus* spp.) were present in 99% and 87% of samples, respectively. Larval suckers were present in the greatest numbers, often averaging more than 100 per sample (Figure 9). Juvenile sculpin accounted for a smaller share of the catch, with their numbers declining later into the sampling period (Figure 10). Other organisms observed in samples, but not enumerated, included aquatic insect larvae and juvenile crayfish ranging in length from approximately 5 mm to 3 cm.

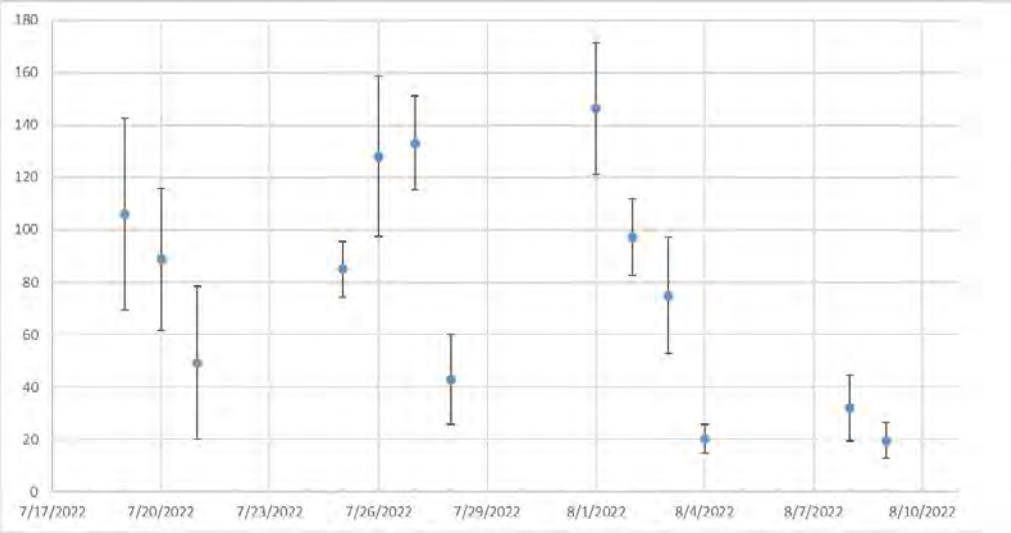

Figure 9. Average (+/- standard error) catch of larval suckers (*Catastomas* spp.) in larval drift nets by sample date.

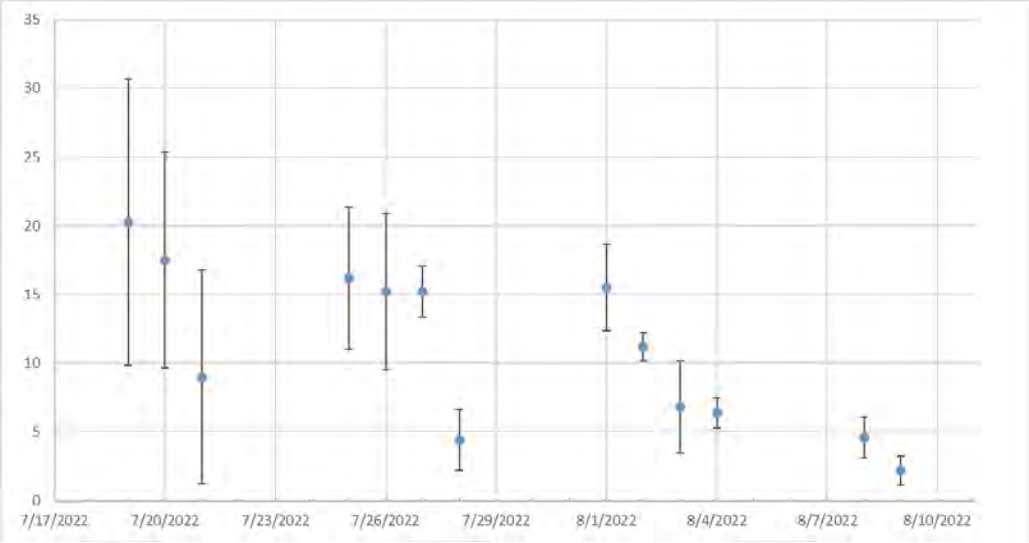

Figure 10. Average (+/- standard error) catch of juvenile sculpin (*Cottus* spp.) in larval drift nets by sample date.

5.0 DISCUSSION

We successfully deployed egg mats and larval drift nets to monitor for the presence of White Sturgeon eggs and larvae during their presumed spawning window in 2022. However, no evidence of White Sturgeon spawning or successful reproduction was observed over the six weeks of monitoring. Prior to this effort, no attempts to document White Sturgeon reproduction in the Wells Reservoir had occurred.

The number of large, reproductively mature, White Sturgeon in the Wells Reservoir is likely low. Since 2015, fewer than 10 adult White Sturgeon have been captured in the Wells Reservoir during index monitoring activities. Acoustic telemetry data from 2022 showed that of the seven acoustic tagged adult White Sturgeon in the Wells Reservoir, as many as four were residing in the area within the presumed spawning location downstream of Chief Joseph Dam during the monitoring period (Figure 11). While this confirms the presence of adult-sized White Sturgeon in the area, it was not possible to discern if they were spawning. High flow conditions, and damage to sonar equipment, hampered the ability to perform side-scan sonar surveys to attempt to observe and quantify the number of adult-sized Sturgeon present in the area in addition to the known acoustic tagged fish. The low number of adult White Sturgeon in the Wells Reservoir, coupled with the fact that fish may not spawn every year, may have resulted in limited or no spawning activity in 2022. If spawning activity occurred in 2022, it may have occurred at a level that was undetectable to the monitoring effort.

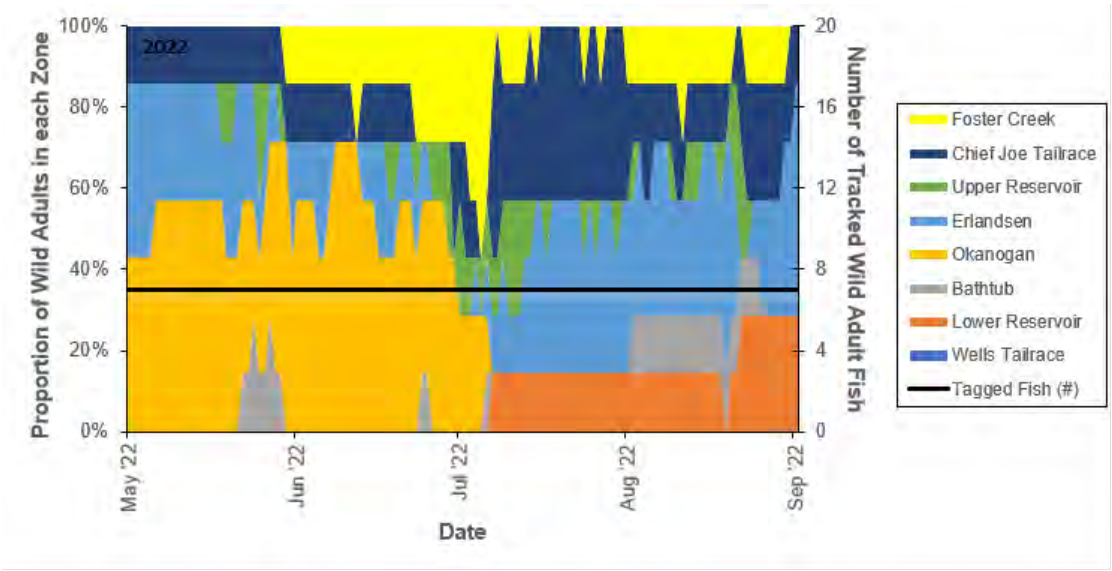

Figure 11. Proportions of acoustic tagged wild adult White Sturgeon, by sampling zone and date. Foster Creek and Chief Joseph Tailrace Zones are presumed spawning locations.

When considering the timing of future White Sturgeon reproduction assessments the Aquatic SWG should take into consideration uncertainties regarding the spawning periodicity and synchronicity within the small population, which may affect the detectable numbers of early life stages in any given year.

Since 2014, over 21,000 White Sturgeon have been stocked in the Wells Reservoir and the most recent data from index monitoring yielded an abundance estimate of 2,432 fish. Approximately 58% of this total abundance is attributed to fish released in 2014 and 2015 (Gingerich and Robichaud 2022). It is anticipated that many of these fish will reach maturity within the next 10 years, resulting in a larger cohort of fish with the potential to spawn in future years compared to 2022. The Aquatic SWG should consider data from continued index monitoring of the White Sturgeon population in the Wells Reservoir when determining the timing of the next reproduction assessment.

Future reproduction assessments should also consider sampling other potential spawning locations within the Wells Project area, particularly within the Okanogan River. Patterns of movement of acoustic tagged adult White Sturgeon show that a large proportion of these fish utilize the Okanogan River each year, typically from April to June (Figure 2a, Figure 11). While this time period is earlier than that of the spawning period of White Sturgeon in other parts of the mainstem Columbia River, the Okanogan River water temperature may warm more quickly in spring and provide for an earlier spawning opportunity. This is an area that warrants investigation prior to future reproduction assessments.

According to Section 4.2.3 of the WSMP, five surveys of natural reproduction will be carried out over the course of the license. The initial survey's findings, which are presented here, suggest that no, or limited, White Sturgeon reproduction occurred in 2022 in the upper Wells Reservoir.

However, considering the factors mentioned above, including the current abundance and age distribution of the White Sturgeon population, their multi-year spawning cycle, and the possibility of other spawning areas, further research is necessary to assess the reproductive capability of White Sturgeon in the Wells Project.

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Appendix L
Statement of Agreement Regarding Evaluation and Implementation of White Sturgeon Adult Passage Measures (WSMP Objective 5; Section 4.4)

Aquatic Settlement Agreement
Wells Aquatic Settlement Work Group

Statement of Agreement Regarding Evaluation and Implementation of White Sturgeon Adult Passage Measures (WSMP Objective 5; Section 4.4)

Date of Approval: November 8, 2023

Statement

To meet the year 11 requirement found in Section 4.4 of the White Sturgeon Management Plan (WSMP), Public Utility District No. 1 of Douglas County (Douglas PUD) in concert with the Aquatic Settlement Work Group (Aquatic SWG) will:

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 hydro-electric 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. Within fishway acoustic tag detections and video count data will also be included, where available. A draft technical memorandum summarizing these data will be completed by the end of 2024.

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 the Wells Fish Hatchery during 2014-2023. Data derived from these samples will be used to estimate the genetic diversity (e.g., allelic diversity) of the existing White Sturgeon population in the Wells Project. Genetic samples may be analyzed at the request and approval of the Aquatic SWG no sooner than 2025 and may include up to 400 unique individuals in the Wells Project area. Results of this analysis will be considered in the assessment of the biological merit of fish passage in the context of connectivity with other White Sturgeon populations in the Columbia River. This step will be completed and approved following the review and approval of steps 1 & 2 above.

Following the completion of items 1-5, the Aquatic SWG may elect to defer additional analyses or steps until 2033 during the next scheduled review of the WSMP Section 4.4 requirement.

Background

In the summer of 2023 Douglas PUD and the Aquatic SWG began discussing an approach to meeting the year 11 requirements found in White Sturgeon Management Plan (WSMP)

Objective 5 of Section 4.4. After discussing, 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. The language in this statement of agreement is aimed to help inform criteria (i) and (ii) in the WSMP's Section 4.4 and show reasonable and effective progress towards meeting Objective 5 during the duration of the existing license.

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 (the intent is to provide connectivity to the Hanford Reach white sturgeon population). If all three criteria above are met, Douglas, in consultation with the Aquatic SWG shall develop adult passage measures that are consistent with measures being implemented by other mid-Columbia project operators.

Appendix M
Wells Hydroelectric Project No. 2149, Low Pool Elevation Bull Trout Survey – License Article 402

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 – rd_nelle@fws.gov

June 12, 2023

RD Nelle
Native Fish Program Lead
Mid-Columbia Fish and Wildlife Conservation Office
U. S. Fish and Wildlife Service
7501 Icicle Road
Leavenworth, WA 98826-9011

Subject: **Wells Hydroelectric Project No. 2149**
Low Pool Elevation Bull Trout Survey – License Article 402

Dear Mr. Nelle,

Pursuant to Article 402 of the license for the Wells Hydroelectric Project (Wells Project), the Public Utility District No. 1 of Douglas County (Douglas PUD) developed a Bull Trout Stranding, Entrapment, And Take Study Plan (Plan). This document was developed collaboratively with the United States Fish and Wildlife Service (USFWS) and the Aquatic Settlement Work Group (ASWG). The Plan was filed with the Federal Energy Regulatory Commission (FERC) on September 24, 2013 and approved by the FERC 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 Wells Project. 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 Service's 2013 Section 10 Biological Opinion, Section 18 Fishway Prescriptions for the Wells Project, and Douglas PUD's Bull Trout Management Plan.

Since issuance of the new Operating License three stranding surveys have taken place within the first five years. 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 Wells Project forebay reached 773' msl. This low elevation was a result of Wells 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 River. 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 2017-2022 since water levels within the Wells Project area did not meet 773' msl with duration. 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 Wells Project area.

More recently, Douglas PUD lowered the reservoir as required to facilitate the scour of sediment from the mouth of the Methow River. On May 15, 2023 the Wells Reservoir was lowered to 772' msl. Although the Plan does not require Bull Trout stranding surveys beyond the first five years of license issuance, Douglas PUD staff felt it prudent to conduct one. On May 16, 2023, Douglas PUD biologists conducted a Bull Trout stranding survey. This was the fourth Bull Trout stranding survey conducted since the issuance of a new operating license for the Wells Project.

Results of the survey are as follows:

- Pool approximately three miles downstream of Brewster, west shore adjacent to Highway 97 – Estimated over 8ft deep, partial connection with main river channel. Several schools of three-spined stickleback observed. No large fish observed.

- Kirk Islands - Three pools found containing small numbers (<100) of three-spined stickleback.

- El Rio Road bed (across from Okanogan River mouth) – Estimated 6ft deep. Small number (<100) of three-spined stickleback observed. (Figure 1).

- Bridgeport Bar Islands - Five pools, two pools less than 6 inches deep containing no fish, three pools with water depth of 2ft-3ft containing small numbers (<100) of three-spined stickleback. (Figure 2 and Figure 3)

No Bull Trout or adult fish of any species, except three-spined stickleback, were observed.

Figure 1. El Rio Road Bed Stranding Pool.

Figure 2. Bridgeport Bar Islands Stranding Pool.

Figure 3. Bridgeport Bar Islands Small Shallow Stranding Pool.

If you have any questions or require further information regarding the above sampling, please feel free to contact Andrew Gingerich at (509) 881-2323, andrew.gingerich@dcpud.org.

Sincerely,

Andrew Gingerich
Natural Resources Supervisor

Cc: Wells Aquatic Settlement Work Group
Mr. Shane Bickford – Douglas PUD
Mr. Chas Kyger – Douglas PUD

Appendix N
2022 Annual Report Total Dissolved Gas Abatement Plan

2022 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 2023

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1 INTRODUCTION

The 2022 Wells Hydroelectric Project (Wells Project) Gas Abatement Plan (GAP) was approved by the Washington State Department of Ecology (Ecology) via conference call on February 9, 2022 and subsequently submitted to the Federal Energy Regulatory Commission (FERC) on February 24, 2022. The FERC approved the GAP on June 29, 2022. 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 2022 monitoring season and describes the background, operations, and results of GAP implementation at the Wells Project in 2022. In addition, this report contains TDG performance for the Wells Project during the 2022 fish passage season, and TDG performance outside of the fish passage season. Data summarized in this report includes monitoring from January 1, 2022 to December 31, 2022.

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 774,300 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. The forebay station (WEL) is located midway across the deck of Wells Dam (47° 56’ 50.28” N, 119° 51’ 54.78” W). The tailrace station (WELW) 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. 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. Data from the three stations are automatically transmitted by radio to Wells Dam, stored, forwarded to the USACE, and posted to the Douglas PUD 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. All three FMS are geographically represented by yellow pins in Figure 1.

Figure 1. TDG fixed monitoring stations (yellow pins) 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 provide 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 2022 monitoring season. Spill Gate 7 was unavailable during the 2022 bypass period and most of the 2022 non-bypass period due to scheduled maintenance work. It will become available again in 2023.

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 was started on April 9 (0:00 hrs.) and ended at 24:00 on August 9. 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 of these websites.

Data from 1969 to 2022 show that average monthly flows at Wells Dam range from a September low of 74.1 kcfs to a June high of 163.3 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, 1969-2022.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
2022	140.4	127.0	103.4	86.0	137.1	235.2	177.7	131.2	72.6	57.4	95.4	94.4	121.5
Average since 1969	109.5	108.9	105.8	117.0	152.8	164.7	134.3	106.0	74.1	74.0	88.2	101.2	
Minimum since 1969	67.4	69.9	56.0	51.9	55.2	73.7	53.4	63.9	53.3	55.4	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.	149.0	
10YR mean (2013-2022)	115.6	112.1	103.0	123.0	167.9	165.5	131.2	106.8	66.4	64.1	90.4	103.0	118.0

Observed flows at Wells Dam in 2022 were slightly above historic averages. Flows in January and February were higher than average. Below average flows from March – May can be partly attributable to a both a delayed freshet caused by a relatively cool spring, and water storage by the Federal Columbia River Power System (FCRPS) in Lake Roosevelt. June through August saw above average flows at Wells Dam, and 7Q-10 flood flows were observed on 17 days mainly in the second half of June and first part of July (Table 1; Figure 2).

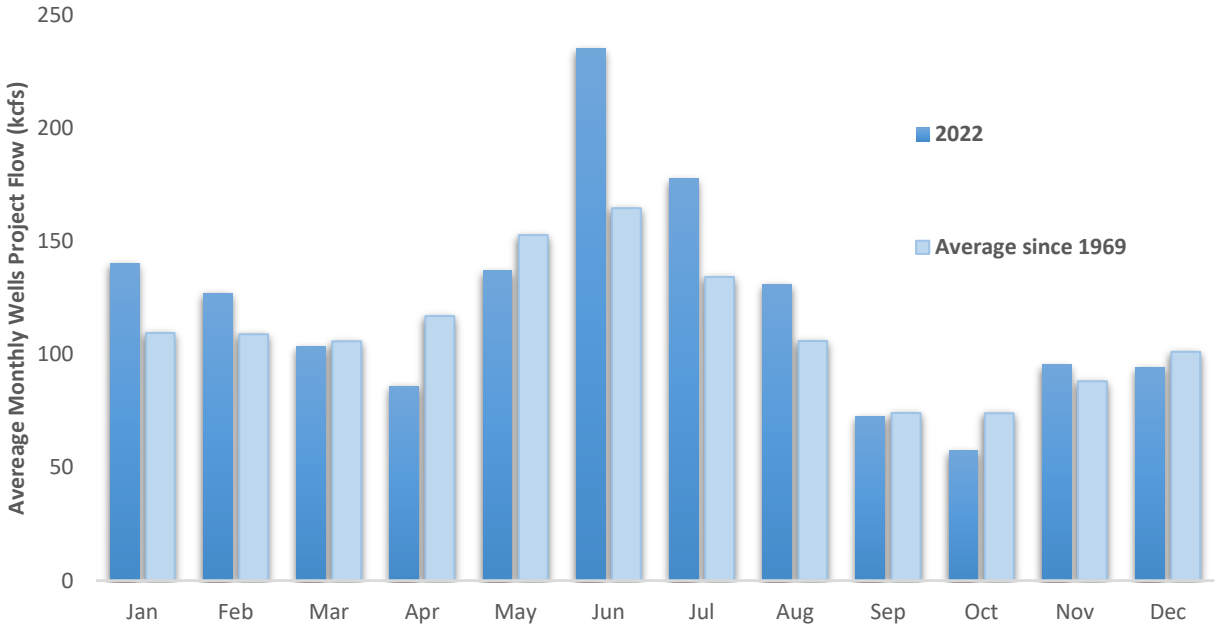

Figure 2. 2022 average monthly flows compared to overall monthly average since 1969.

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 3.1.2 below).

2.3 Fish Bypass Spill Quantities and Duration

The Wells Dam JBS uses up to 2,200 cfs 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 and available online at https://www.cbr.washington.edu/analysis/rt. Juvenile anadromous salmonids that pass Wells Dam

[1] Using Rocky Reach Dam JBS index counts and program RealTime Forecasters will be a conservative approach since it will not correct for the passage 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 the two projects are more than 1 day and had a median of 13 days in the most recent analysis (Buchanan and Townsend 2022).

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).

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 2022. 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]).

3.1.2 Run-Timing Evaluation

Based on analysis conducted by Drs. Rebecca Buchanan and Richard Townsend of Columbia Basin Research, in 2022 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 2022). Prior to 2022, a 10-year evaluation of the estimated historical Wells Dam passage timing of outmigrating salmonids showed that no less than 95% of all Wells HCP Plan Species pass Wells Dam between April 9 and August 9. Responding to the data, Douglas PUD secured the permission of the HCP to reduce the JBS operating period to those dates beginning in 2021, and readily achieved the 95% standard. In 2022, Douglas PUD operated the JBS between April 9 and August 9 and the bypass operations provided non-turbine passage routes for 100% of the migration of Sockeye Salmon, 99.83% of yearling Chinook Salmon, 99.93% of Coho Salmon, 99.89% of steelhead, and 93.83% of subyearling Chinook Salmon (Buchanan and Townsend, 2022). The stop date necessary to have covered at least 95% of the PIT-tagged subyearling Chinook Salmon outmigration in 2022 was August 11, two days after the bypass stop date. Because of the failure to meet the 95% passage requirement, and given the limitations of a retrospective analysis, the HCP CC will consider in-season identification of the termination date for JBS operations using RealTime Forecasters tool that will indicate when 95% of subyearling Chinook outmigrants have passed Rocky Reach Dam.

3.1.3 Survival Studies

No Survival Studies were conducted in 2022. The average project survival estimate of all five survival studies on yearling spring migrants is 0.9604 (SE=0.0098). As such, the Wells Project has the highest rate of project survival for spring migrating fish on the Columbia and Snake Rivers.

3.2 Biological Monitoring

The 2022 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 2022 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 6 and continued through July 12, 2022 at Rocky Reach Dam consistent with the 2022 GAP. In total, 679 smolts and 62 resident fish were encountered in the Rocky Reach JBS and examined for GBT (see Table 2 and Table 3). Within the Wells Tailrace, 39 smolts and 1078 resident fish were examined for GBT (see Table 4 and Table 5). In 2022, no GBT was observed at the Rocky Reach JBS, but two instances of minor GBT were observed in the fins of Largescale Suckers in the Wells Tailrace on June 28 (see Table 4 and Figure 3). 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, fewer than 50 anadromous fish were observed during the weeks of April 4, April 11, April 18, July 4, and July 11. Presumably, this is because the majority of juvenile outmigration did not begin until after the week of April 18, and concluded prior to the week of July 4. TDG exceedances during the month of July in the Wells Tailrace resulted in an extension of GBT monitoring at the Rocky Reach JBS during the month of July. A summary of juvenile GBT sampling at Rocky Reach JBS is provided below in Table 2 and Table 3.

Table 2. Gas Bubble Trauma sampling on juvenile salmonids and other fish captured at the Rocky Reach JBS in April and May, 2022. No GBT was detected on any examined fish.

	6-Apr	12-Apr	19-Apr	26-Apr	3-May	10-May	17-May	24-May	31-May
Species	**Number Sampled**								
Chinook (yearling)	5	4	32	62	38	30			35
Chinook (subyearling)	16	17	3	3					
Steelhead	4	3	10	1	9	9			
Sockeye	0	0	0	0		11	52	50	15
Coho	2	9	1	3	7	1			6
Kokanee					1	1			
Stickleback	15	17	8	2					2
Total	42	50	54	71	55	52	52	50	58

Table 3. Gas Bubble Trauma sampling on juvenile salmonids and other fish captured at the Rocky Reach JBS in June and July, 2022. No GBT was detected on any examined fish.

	6-Jun	13-Jun	20-Jun	28-Jun	5-Jul	12-Jul
Species			**Number Sampled**			
Chinook (yearling)	6	1	1			
Chinook (subyearling)	42	37	33	52	5	27
Steelhead					2	
Sockeye	9	3	15			
Coho	7		1			
Kokanee			2			
Redside Shiner			1			
Stickleback	3	3	1	1	3	
Chiselmouth		1	1			
Total	67	45	55	53	10	27

In addition, resident fish sampling took place via boat electroshocking in the first two miles below Wells Dam weekly from April through July 15, 2022. A summary of resident fish sampling is provided in Table 4 and Table 5.

Table 4. **Gas Bubble Trauma sampling on fish captured via boat electroshocking in the Wells Dam tailrace in April and May, 2022. No GBT was detected on any examined fish in April or May.**

	6-Apr	12-Apr	19-Apr	26-Apr	3-May	10-May	17-May	24-May	31-May
Species					**Number Sampled**				
Redside Shiner	47	42	37	71	62	23	34	39	13
Peamouth	2			4					1
Chiselmouth	9	5	2	2			2		
Northern Pikeminnow	7	5	3	2	1	6	1	2	22
Largescale Sucker	18	16	11	14	13	25	18	17	24
O. mykiss		1		1					
Cutthroat/Rainbow Hybrid		1							
Sucker spp.				1		2	1		
Kokanee					1		1		
Stickleback		3	7	7				1	3
Bluegill		2							
Mountain Whitefish		3	7	1	2		1		
Smallmouth bass									1
Walleye						2			
Bridgelip Sucker						2			
Cutthroat Trout							1		
Sculpin spp.							1		
Carp								2	1
Steelhead					2				
Chinook (yearling)				3					2
Chinook (subyearling)							3		
Coho								1	
Total	83	78	67	106	81	60	63	62	67

Table 5. **Gas Bubble Trauma sampling on fish captured via boat electroshocking in the Wells Dam tailrace in June and July, 2022. Minor GBT (<5% of an unpaired fin) was detected on two Largescale Suckers on June 28, 2022.**

	2-Jun	6-Jun	13-Jun	20-Jun	28-Jun	5-Jul	12-Jul
Species				**Number Sampled**			
Redside Shiner		16	43			42	39
Peamouth		14	15	2		2	
Chiselmouth		1	4				1
Brook Trout			1				
Cutthroat/Rainbow Hybrid		1					
Sucker spp.		3	7			1	4
Largescale Sucker		12	10	42	52*	9	7
Stickleback		3	4		1	4	1
Bluegill			1				
Mountain Whitefish		2					
Northern Pikeminnow	1	12	6			7	23
Walleye		1		1			
Bridgelip Sucker		2			2	1	
Carp		1		2	1		
Smallmouth bass	14	2		2			
Chinook (yearling)		1	2				
Chinook (subyearling)		6	7	1	5	1	
Coho			1				
Sockeye (adult)							4
Total	15	77	101	50	61	67	79

*** Two Largescale Suckers were observed to have minor GBT (see Figure 3).**

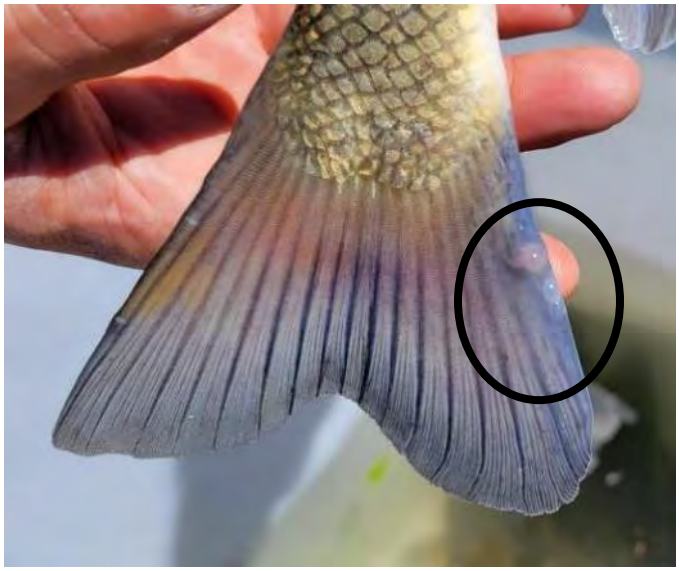

Figure 3. An example of GBT seen in <5% of the caudal fin in a Largescale Sucker sampled below Wells Dam on June 28, 2022.

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 2022, Douglas PUD participated in monthly water supply webinars provided by the 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 has occurred since 1984 when forebay stations were first established. TDG monitoring in the tailrace of Wells Dam began in 1997 by actively collecting data at four points across the width of the river. Based on these data, the location for a FMS was established in 1998. Subsequent analysis verified that both monitoring station locations are appropriate and representative of mixed river condition, particularly during high flows (EES et al. 2007; Politano et al. 2009). 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 is of 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 (WEL), tailrace of Wells Dam (WELW), and forebay of Rocky Reach Dam (RRH), or from the DCPUD.org dataset. 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 2022 fish passage adjustment that must be met in association with operation at the Wells Project as described in the 2022 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 fifteen hourly instances over the course of seven different days in which TDG values were observed higher than 110% outside of the fish bypass season during 2022 (Figure 4). These exceedances were largely associated with acute instances in which turbine unit availability was temporarily reduced and incoming flows to the Wells Project exceeded turbine capacity during periods of high forebay elevation.

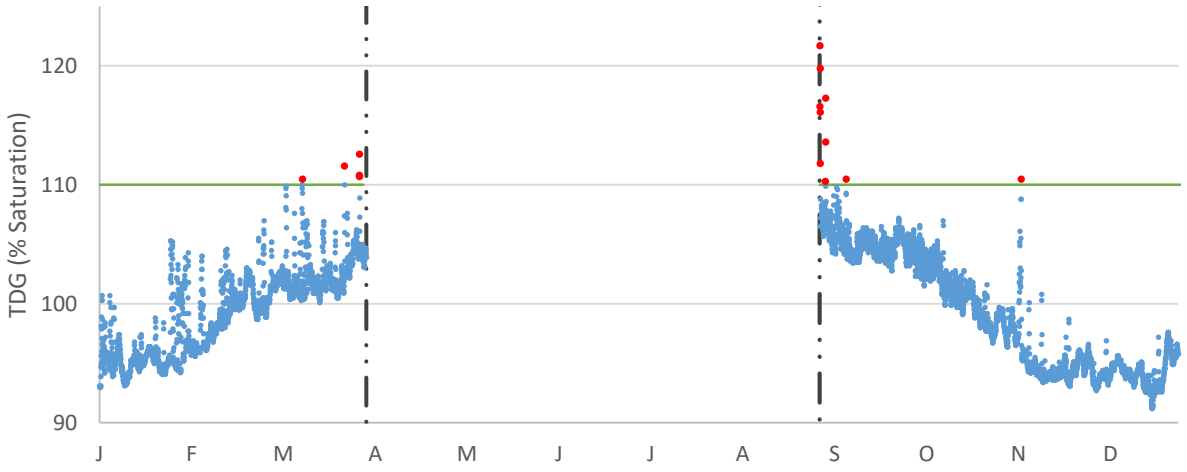

Figure 4. Hourly TDG data for the Wells tailrace during the non-fish bypass season in 2022. Values colored red and appearing above the horizontal green line represent exceedances of the standard.

3.5.2 Spring Fish Passage Season (April through June) Compliance

Wells Tailrace 125% 12-Hour Standard

In 2022, TDG in the Wells tailrace exceeded the 125% 12-hour standard on 16 instances during the April – June period, but only during instances of 7Q-10 flows.

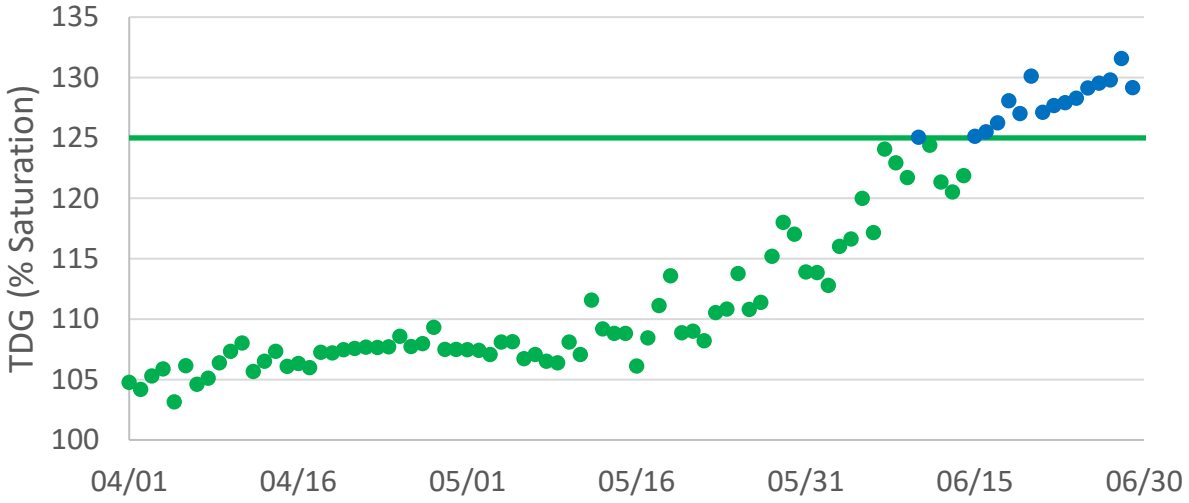

Figure 5. Wells tailrace TDG Compliance with the 125% 12-hour standard April through June 2022. The green dots are instances of compliance, the horizontal green line represents the compliance threshold, and the blue dots are instances above the 125% 12-hour standard, but that occurred during 7Q-10 flows when the 125% 12-hour standard is waived.

Wells Tailrace 126% 2-Hour Standard

In 2022, there was one exceedance of the 126% 2-hour standard in the Wells tailrace during the April-June period. This noncompliance occurred on June 13, at 2:00 PM after a period of prolonged spill while one or more generating units were taken offline, incoming flows exceeded hydraulic capacity, and, had spill not occurred, forebay elevations could have exceeded the forebay elevation levels permitted by Douglas PUD's FERC license. There were 273 other exceedances of this standard, all of which occurred during 7Q-10 flows.

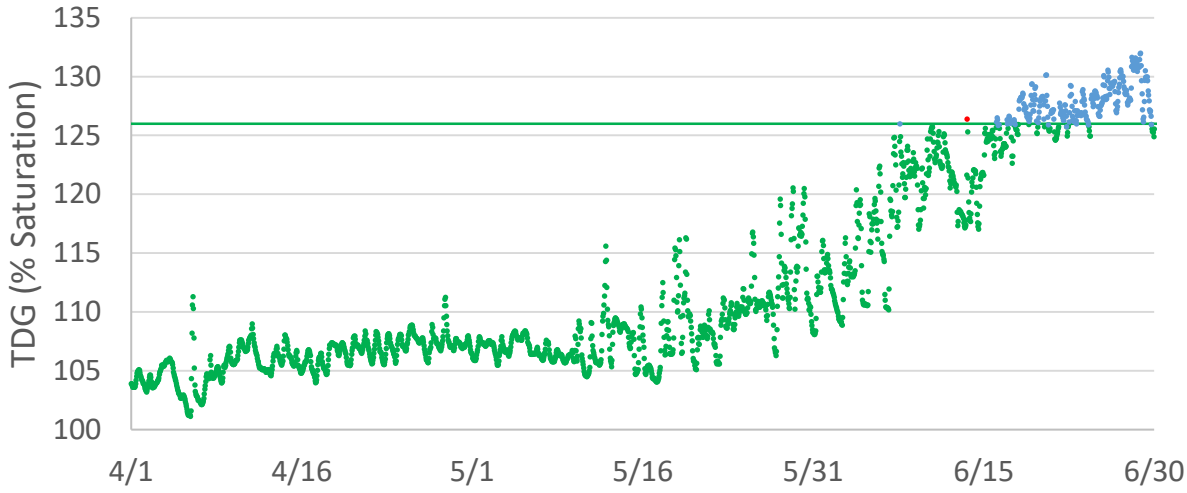

Figure 6. **Wells tailrace TDG Compliance with the 126% 2-hour standard April through June 2022. The green dots are instances of compliance, the blue dots are instances above the 126% 2-hour standard that occurred during 7Q-10 flows, the red dot is the instance of noncompliance, and the horizontal green line represents the compliance threshold.**

3.5.3 Summer Fish Passage Season (July and August) Compliance

Wells Tailrace 125% Hourly Standard

In 2022, TDG in the Wells tailrace exceeded the 125% hourly standard in the July – August period on four instances, one of which occurred during 7Q-10 flows. The noncompliant events for this standard occurred when flows were high and incoming TDG concentrations were above the WQS entering the Wells Project because of the operations of the FCRPS above Wells Dam.

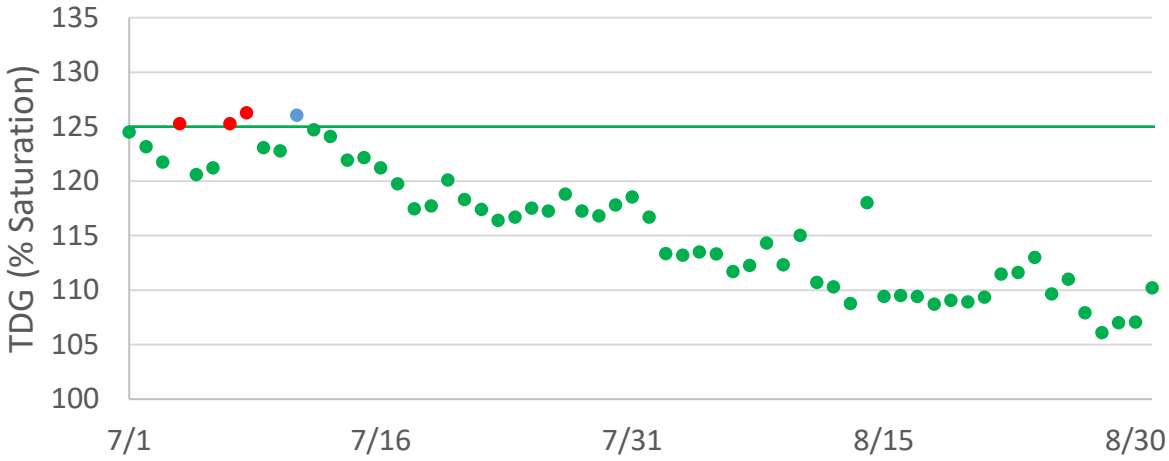

Figure 7. Wells tailrace TDG Compliance with the 125% hourly standard July through August 2022. The green dots are instances of compliance, the blue dot is an instance above the 125% hourly standard that occurred during 7Q-10 flows, the red dots are the instances of noncompliance, and the horizontal green line represents the compliance threshold.

Wells Tailrace 120% 12C-High Standard

In 2022, TDG in the Wells tailrace exceeded the 120% 12C-high standard on 16 instances during the July – August period, one of which occurred during 7Q-10 flows. Noncompliant events for this standard occurred when flows were high and incoming TDG concentrations were above the WQS entering the Wells Project because of the operations of the FCRPS above Wells Dam.

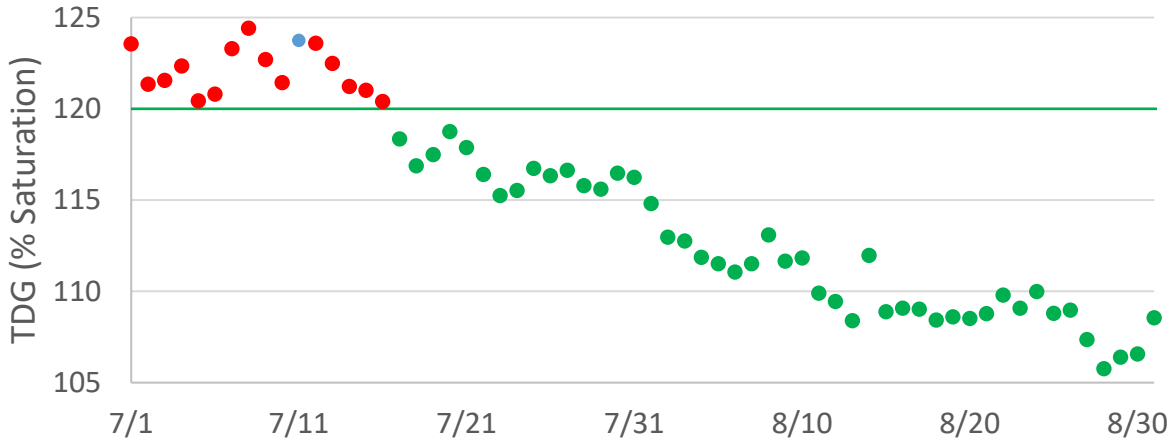

Figure 8. **Wells tailrace TDG Compliance with the 120% 12C-high standard July through August 2022. The green dots are instances of compliance, the blue dot is an instance above the 125% 12C-high standard that occurred during 7Q-10 flows, the red dots are the instances of noncompliance, and the horizontal green line represents the compliance threshold.**

Rocky Reach Forebay 115% 12C-High Standard

In 2022, TDG in the Rocky Reach forebay exceeded the 115% 12C-high standard on 24 instances during the July - August period, one of which occurred during 7Q-10 flows. Noncompliant events for this standard occurred when flows were high and incoming TDG concentrations were above the WQS entering the Wells Project because of the operations of the Federal Columbia River Power System (FCRPS) above Wells Dam.

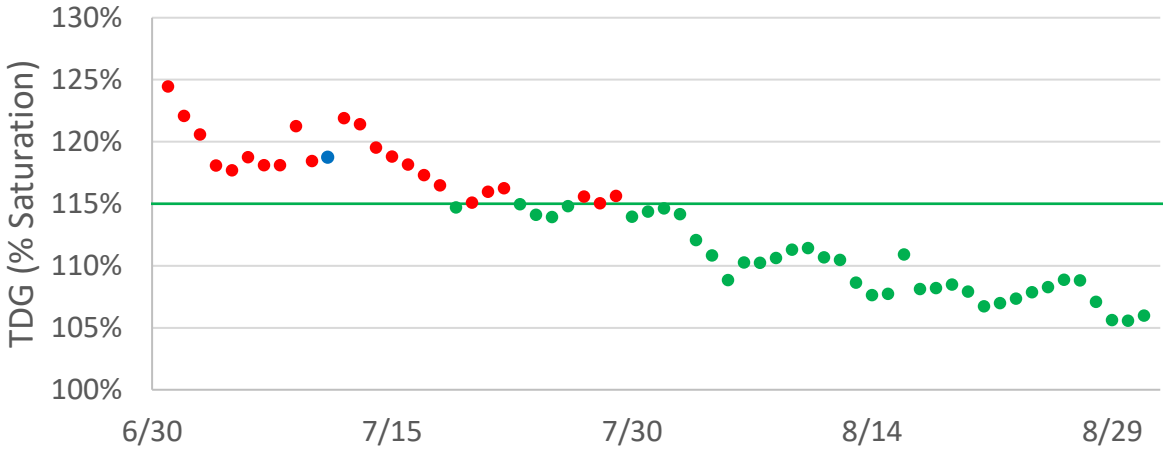

Figure 9. **Rocky Reach Forebay TDG compliance with the 115% 12C-high standard July through August 2022. The green dots are instances of compliance, the blue dot is an instance above the 115% 12C-high standard that occurred during 7Q-10 flows, the red dots are the instances of noncompliance, and the horizontal green line represents the compliance threshold.**

Wells Forebay TDG Compliance

The Wells Project's level of compliance in 2022 with the WQS for TDG was lower than it has been in previous years, especially with regard to the 120% Wells tailrace standard and the 115% Rocky Reach forebay standard during the month of July. Higher than average flows during the month of July (see Figure 2) often exceeded the hydraulic capacity of Wells Dam, necessitating spill, which resulted in elevated TDG levels downstream, and instances at or near the 7Q-10 flows threshold in early July complicating compliance. Additionally, received water in the Wells forebay was consistently above the compliance threshold and occasionally higher than 115% (Figure 10). The TDG standards are set values that do not vary based on incoming levels of TDG saturation received in the Wells forebay. Because the amount of spill Douglas can release from Wells Dam while remaining in compliance with the WQS depends on the TDG saturation of the waters in its forebay, elements outside of the control of Douglas PUD can severely influence its ability to maintain compliance. In 2022, the combination of high flows and highly gasified water received in the Wells forebay during the month of July prevented Douglas from remaining in constant compliance with all of the WQS.

Figure 10. Wells forebay TDG during the month of July. The green line represents the compliance threshold of waters received by Wells Dam and as discharged from the FCRPS above Wells Dam.

Yearly TDG Compliance Summary

Table 6 TDG compliance at the Wells Project for the entire 2022 season.

		Compliance
April - June	**Wells Tailrace 125% - Mean 12 Highest Hourly / Day**	
	Non-compliant measurements	0
	7Q-10 flow measurements	16
	Total measurements	91
	DCPUD compliance	**100%**
	Wells Tailrace 126% - Two Consecutive Hourly Values	
	Non-compliant measurements	1
	7Q-10 flow measurements	273
	Total measurements	2184
	DCPUD compliance	**99.9%**
July & August	**Wells Tailrace 125% Hourly Standard**	
	Non-compliant measurements	3
	7Q-10 flow measurements	1
	Total measurements	62
	DCPUD compliance	**95.2%**
	Wells Tailrace 120% 12C-High Standard (one day)	
	Non-compliant measurements	15
	7Q-10 flow measurements	1
	Total measurements	62
	DCPUD compliance	**75.8%**
	Rocky Reach Forebay 115% 12C-High Standard (one day)	
	Non-compliant measurements	23
	7Q-10 flow measurements	1
	Total measurements	62
	DCPUD compliance	**62.9%**
Jan - Mar & Sept - Dec	**Wells Tailrace <110% Standard**	
	Non-compliant measurements	15
	Total measurements	5086
	DCPUD compliance	**99.7%**

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). The compliance schedule outlines a step-wise approach toward meeting compliance with the TDG WQS. In 2022 (Year 9), the WQAP called for continued adaptive management and implementation of the Spill Playbook, biological monitoring (i.e., GBT monitoring in biota, as needed), and the identification of key Project operating parameters that could be used towards developing a database that would house fine-scale operation data. Future year's data would be used to identify fine-scale operation changes that might improve TDG compliance.

In 2022, modifications were made to the Spill Playbook to accommodate the unavailability of Spill Gate 7, which was undergoing maintenance activities for a prolonged period of time. Biological monitoring (i.e., GBT monitoring in biota, as needed) continued in 2022 toward determining the impact on salmonids and resident fish pursuant to the Biological Monitoring Plan portion of the 2022 Wells Dam GAP.

Notably, in the spring of 2016 (Year 3) Douglas PUD reviewed Wells Project operations data collection with Wells Dam Hydro Operations staff and the Information Systems Department. The objective of this analysis was to conduct a comprehensive evaluation of both operational and structural data collection that could ultimately improve compliance with the TDG WQS criteria. A fine-scale spill-data collection database was completed in 2017 (Year 4). New data includes spillbay "openness" indication on nine of the eleven spillways (most frequently used). In addition, a new energy accounting system was developed in 2017. This new data collection process should allow for Douglas PUD to collect robust operations data over the balance of the WQAP. This new data can be used for subsequent modeling, if necessary, and towards improving compliance. As of 2017, data was being collected to meet the schedule of the WQAP Implementation Plan.

The IIHR TDG model suite (i.e., rigid lid and VOF models) developed during the Wells Project relicensing process in 2008 was operated under a set of assumptions (as required for all quantitative predictive models) for hydrodynamic characteristics such as gas volume fraction, bubble size, various free-surface features, and incoming TDG levels. However, Douglas PUD has no data that support improving or modifying model assumptions. Rather, over the last several years, spill volume seems to be the most important variable in determining TDG addition at Wells Dam. Improved turbine unit reliability and improved turbine unit capacity is expected to occur once the rebuild of the 10 units at Wells Dam is complete. Having 10 units available is expected to improve TDG performance over the coming years, potentially allowing the District to become fully complaint with the WQS when flows are below 7Q-10 volumes. Since 2013, Wells Dam has never had 10 units available, because at least one unit has been out for extended unit rebuild each year.

In 2022, Douglas 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 https://www.cbr.washington.edu/analysis/rt. At times when incoming flows are forecast to exceed the hydraulic capacity of Wells Dam, Douglas staff consult the model to guide decision making as to spill quantity, maintenance scheduling that would reduce hydraulic capacity further, Project participant minimum generation requirements, 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.

4.2 Operational

In 2022, a delayed freshet flow caused below average flow at Wells Dam in April and May, which was followed by a higher than average peak in June and a period of above average flow that lasted until the late-summer (Table 1; Figure 2, and Figure 11). Bypass barriers were removed in Spillbay 8 from June 3 until July 20, Spillbay 10 from June 8 until July 13, and Spillbay 4 from June 16 until July 1, because a sustained period of flow in excess of 175 kcfs triggered a JBS barrier removal criteria. With the bypass system and Spill Playbook operating normally, Douglas PUD was able to demonstrate high TDG compliance with Washington State WQS in 2022. System Operator training and additional Energy Accounting System (EAS) enhancements are expected to further improve TDG performance outside of the bypass period when the WQS is 110%.

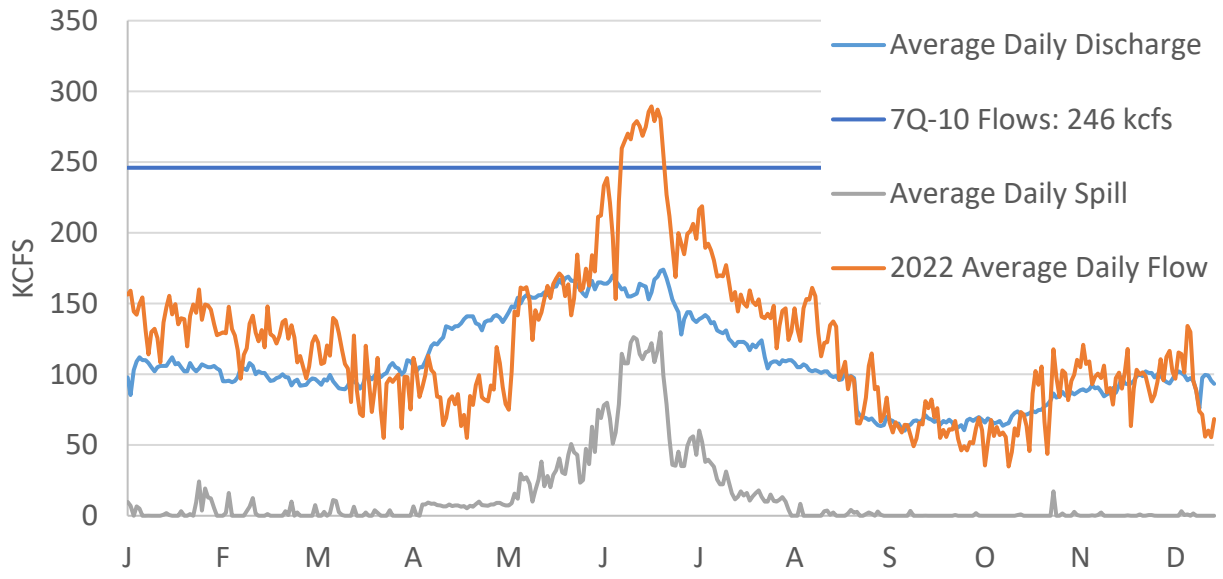

Figure 11. Average daily flow and average daily spill at Wells Dam during 2022 relative to the twenty-year average flow.

4.3 Structural

No permanent structural modifications were proposed or completed during the 2022 monitoring season. Continued maintenance work on Spill Gate 7 precluded the release of spill through Spillbay 7 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 Wells Dam during the 2022 season was good overall, but high flows and highly gasified water received in the Wells forebay made maintaining compliance with the Wells tailrace 120% standard and the Rocky Reach forebay 115% standard difficult during the first two weeks of July. 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 a handful of exceedances of the 110% TDG standard occurring outside the bypass period that were avoidable, and these events are expected to continue to decrease as Douglas maintains its emphasis on system operator training, utilization of the CBR'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. This increases the challenge with maintaining compliance because when Wells Project inflow exceeds the reduced turbine capacity, the amount of spilled water must increase. 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.

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Appendix O
2023 GAP/BOP

2023 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
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And

Aquatic Settlement Work Group

February 2023

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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 2023 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.

INTRODUCTION AND BACKGROUND

The 2023 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 2023 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. 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 2023 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. 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 774,300 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 sides 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).

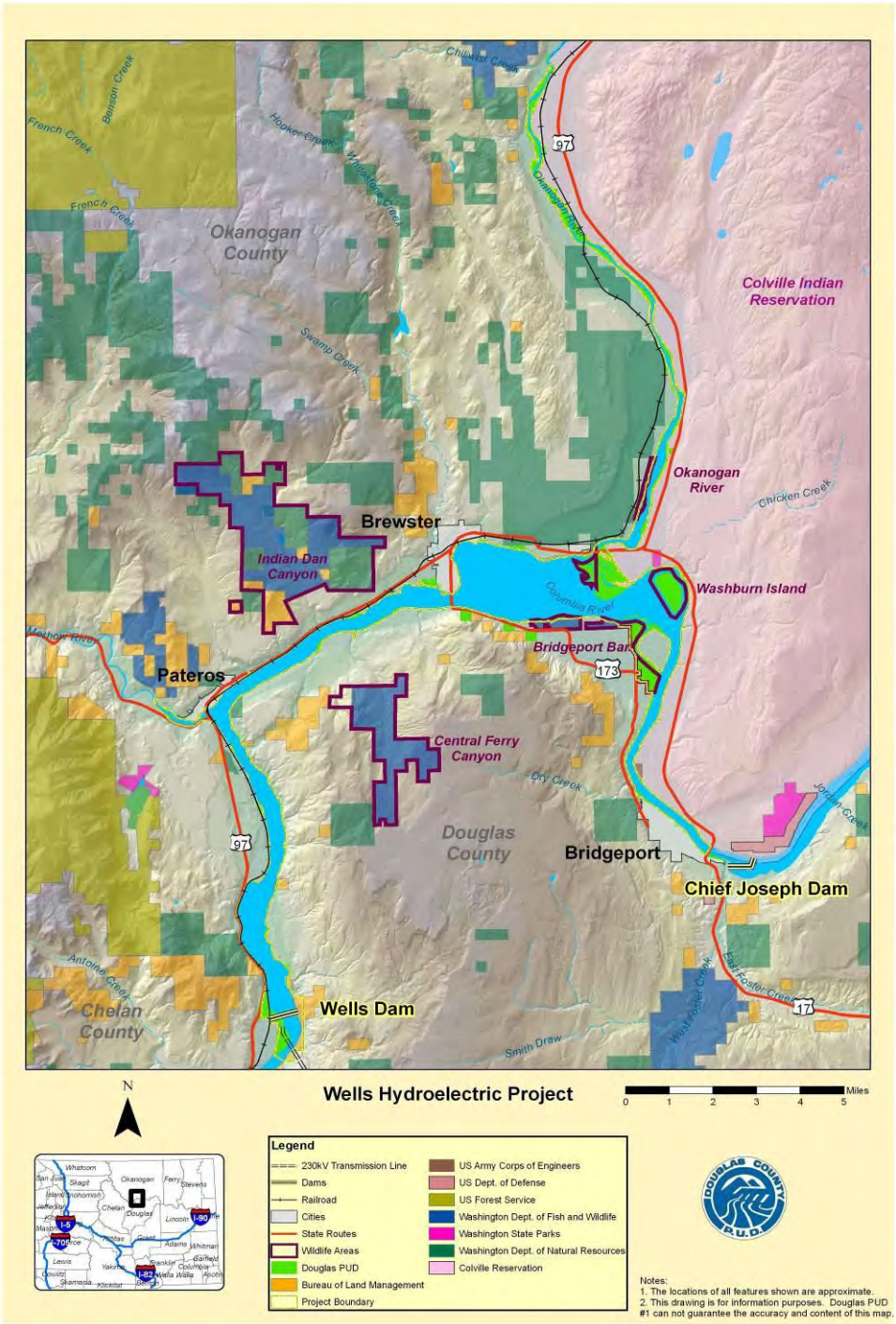

Figure 1. Map of the Wells Hydroelectric Project in Central Washington.

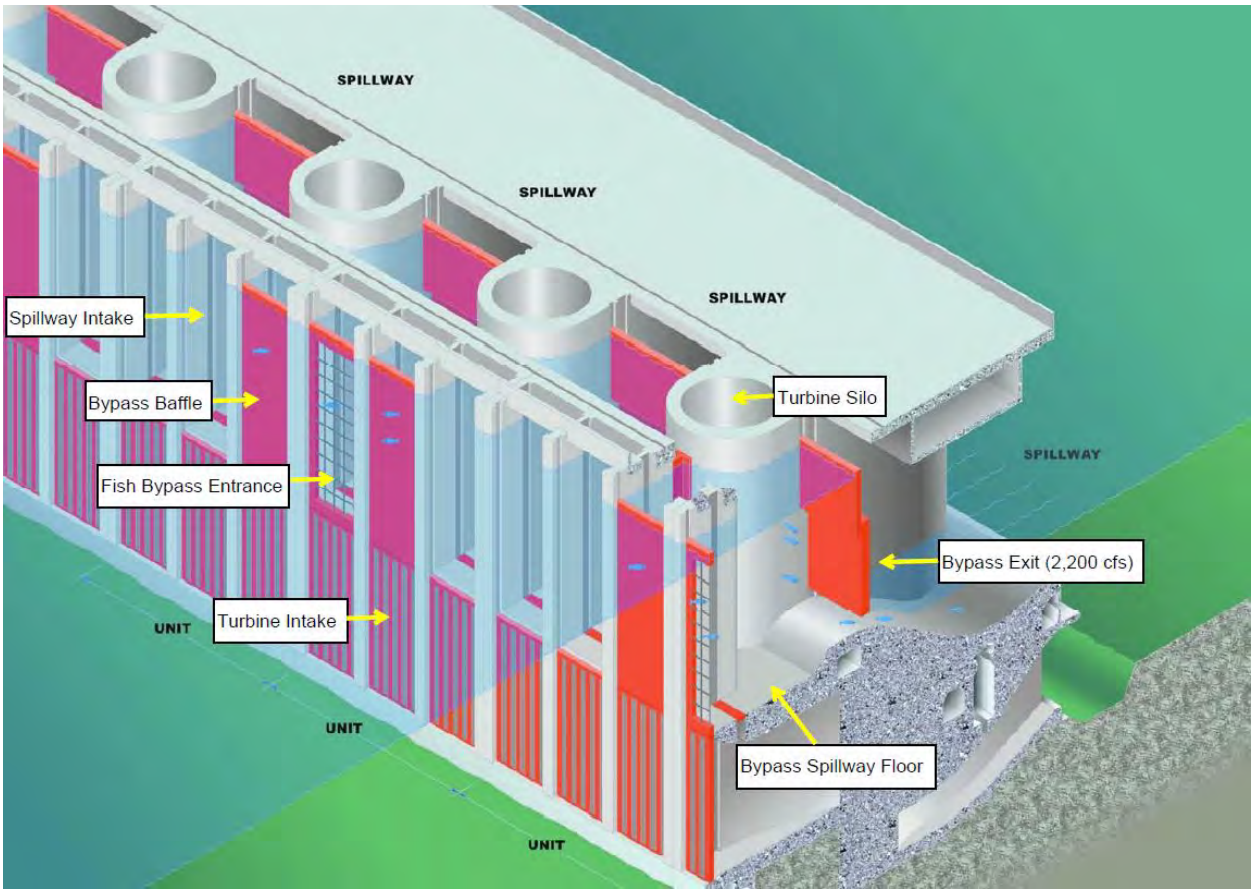

Figure 2. Artistic depiction of Wells Dam illustrating its hydrocombine design and Juvenile Bypass System.

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* (which is the spillway gate). *Fish Bypass Entrances* provide 64, 4x4-foot openings in the first 75 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 (Colville Confederated Tribes), 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 in order 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 2023 Bypass Season, Douglas PUD will request 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 Indian Reservation. Wells Project operations do not affect TDG levels in tribal waters, where the Colville Confederated Tribes' 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 but in particular, 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, the Colville Confederated Tribes, 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 the Colville Confederated Tribes, 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 (Pickett et al. 2004; Colville Confederated Tribes 2010).

Since 2016 the TDG standard in the Chief Joseph and Grand Coulee tailraces was 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 purposes 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 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 in order 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. In order 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 December 30, 2019.

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 to 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 the USACE's upstream water management activities at Chief Joseph Dam and Reclamation's activities at Grand Coulee Dam.

Since the completion of spill deflectors at Chief Joseph Dam in 2008, there has been a significant increase in the amount of spill at the Chief Joseph Project resulting from wind integration and transmission congestion issues and operational constraints on the other dams in the Federal Columbia River Power System (FCRPS). Increases in the amount of spill at Chief Joseph Dam have resulted in a dramatic rise in the volume of supersaturated water entering the Wells Project. For example, in 2012, Wells Dam received non-compliant water (>110% [EPA and Colville Confederated Tribes standard]) on 125 days of the 133-day juvenile fish passage season. 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%. Since 2017, Chief Joseph appears to be lower on the FCRPS' spill priority list; however, in 2017, 2018, and 2022, TDG concentrations above 110% and 115% were observed in the Wells Project forebay over an extended period of time. 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 2022, the Wells Dam forebay (WEL) TDG station observed hourly TDG values that were above the 110% WQS on 1367 occasions between June 1 and August 12 (Figure 3). Of these observations, 455 occurred during 7Q-10 flows. 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 FCRPS above Wells Dam is required to meet these WA State WQS, Douglas PUD continues to receive non-compliant water from these Projects.

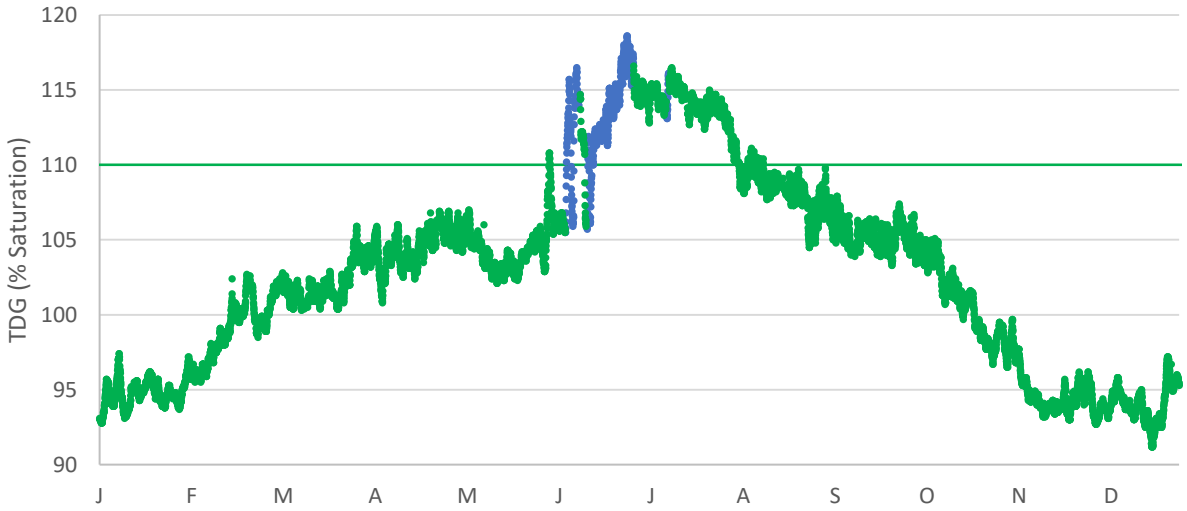

Figure 3. **Hourly TDG values observed in the Wells Dam forebay during the 2022 calendar year. Points above the horizontal green line are above the 110% WQS and represent noncompliant waters in the Wells Dam forebay. Blue colored points represent TDG values occurring during 7Q-10 flows.**

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 (see 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. 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 (Table 1; Figure 4). 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 (Figure 4). Juvenile anadromous salmonid migration occurs within a regime of reduced high flows during the spring migration period.

Table 1. Recent and Average Monthly Flows (kcfs) at Wells Dam.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
2022	140.4	127.0	103.4	86.0	137.1	235.2	177.7	131.2	72.6	57.4	95.4	94.4	121.5
Average since 1969	109.5	108.9	105.8	117.0	152.8	164.7	134.3	106.0	74.1	74.0	88.2	101.2	
Minimum since 1969	67.4	69.9	56.0	51.9	55.2	73.7	53.4	63.9	53.3	55.4	63.8	72.6	
Maximum since 1969	159.2	180.7	193.9	203.8	266.3	348.7	253.8	181.3	123.0	108.9	110	149.0	
10YR mean (2013-2022)	115.6	112.1	103.0	123.0	167.9	165.5	131.2	106.8	66.4	64.1	90.4	103.0	118.0

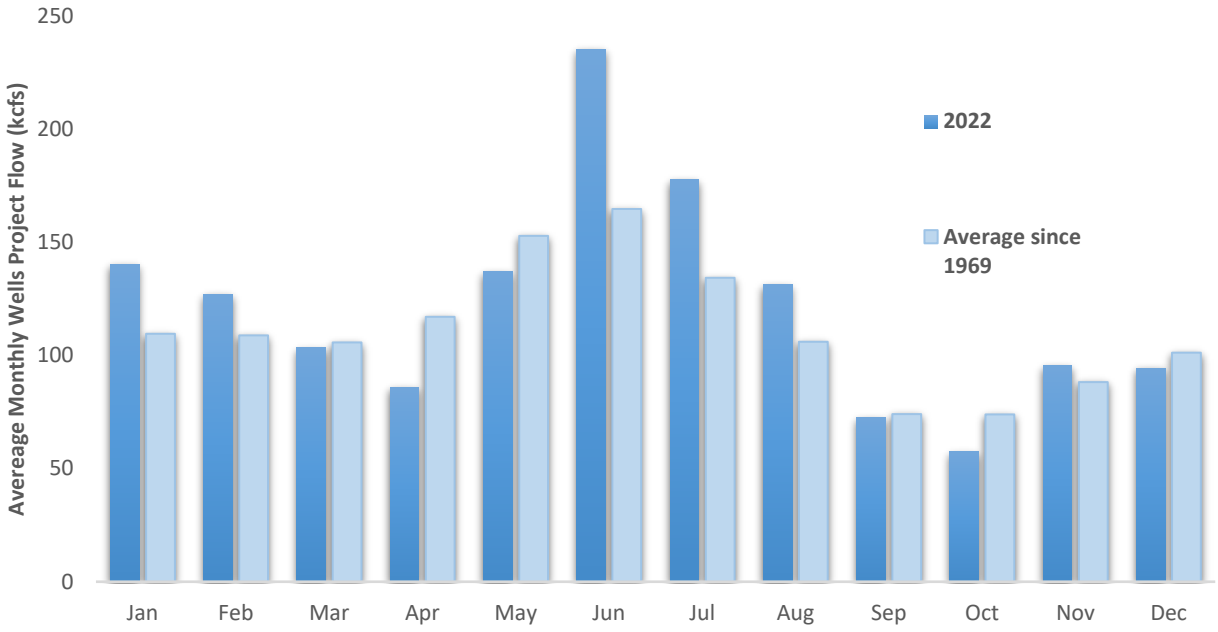

Figure 4. 2022 and average hydrograph observed at Wells Dam.

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 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. Although daily average estimates are provided by BPA, actual flows can vary dramatically around the daily average. This variability is termed "shape." For example, FCRPS-forecasted Chief Joseph Dam discharges on December 14th and 15th in 2022 were 120 kcfs and 125 kcfs, respectively, but actual discharge on both days ranged from 48 kcfs to 168 kcfs (Figure 5). Flows often vary 50% above and below the daily average, which complicates run-of-the-river operations at Wells Dam and makes minimizing spill volume difficult at times. Nevertheless, BPA discharge estimates remain the only forecast of FCRPS inflow into the Wells Project. When inflow values are expected to exceed turbine discharge capacity, or when there is reason to believe that spill is otherwise likely, Douglas PUD institutes minimum generation requirements on all participants (power purchasers) of the Wells Project to maximize turbine discharge. Douglas PUD has the ability to put minimum generation requirements on the Wells Project directly, as well as enforce and control these requirements. Douglas PUD will generate

to whatever minimum requirement(s) is/are on the Wells Project and without regard to the signals it receives from its participants, should those signals be less than the required minimum project generation. 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 5. Total incoming flows to Wells Dam (blue) December 14-15, 2022 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 10 kcfs. During periods of extreme high flow, one or more set 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. Wells Hydroelectric Project Juvenile Bypass System Efficiency.

Species	% JBS Passage
Yearling (spring) Chinook	92.0
Steelhead	92.0
Sockeye	95.7
Subyearling (summer/fall) Chinook	96.2

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 will consider the use of RealTime Forecasters for estimating cumulative passage of juvenile salmonids at Wells Dam, and to end the JBS each year once 95% passage has been reached at Rocky Reach Dam[4], rather than on a date fixed at the beginning of the season. 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.

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 because fish passing through the spillways survive at a higher rate relative to fish passing through a turbine. Turbulence in the tailrace generated by spill in excess of power demand increases tailrace velocities and reduces

[4] Using Rocky Reach Dam JBS index counts and program RealTime Forecasters will be a conservative approach since it will not correct for the passage-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 are more than one day and had a median of 13 days in the most recent passage dates analysis (Buchanan and Townsend 2022).

tailrace egress times. The reductions in tailrace egress time and increases in water turbulence and velocity is expected to reduce predation on juvenile salmonids attempting to migrate through the Wells Project.

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 has to be spilled until turbine operation can be restored. These events are extremely rare, and account for approximately 10 minutes in 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 oddnumbered 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 2015–2021 Spill Playbooks returned to concentrating spill over 40 kcfs through Spillway 7 rather than Spillway 5, since turbine unit 7 returned to service.

The 2022 GAP and BOP used a concentrated spill pattern that was identified as having a preferred TDG abatement during relicensing studies. However, unlike 2015-2021, in 2022 spill was concentrated through Spillways 9, 8, and 10 (listed in priority order). This modification was necessary to address spillway maintenance needs on Spillway 7 and turbine-unit 5. The extensive maintenance was required due in part to the extra use Spillway 7 had received over the preceding decade. Having completed the Spillway 7 maintenance in late 2022, concentrated spill over Spillway 7 will return for the 2023 bypass season, and Wells Dam will use a Spill Playbook similar to that employed from 2015-2021.

1.3.3.2 Structural and maintenance

No structural modifications to the spillways or bypass system were implemented (none were scheduled) during the 2022 fish passage season, although bypass barriers were removed from three spillways: Spillway 8 from June 3 to July 20, Spillway 10 from June 8 to July 13, and Spillway 4 from June 16 to July 1, because a sustained period of flow in excess of 175 kcfs triggered sequential criteria for JBS barrier removal. Unit 10 was brought back into service after completion of a generator rebuild in 2022. As with previous versions of the GAP/BOP, the ongoing turbine rebuild project at Wells Dam will not require any additional changes in the 2023 Spill Playbook or GAP implementation apart from the condition that one turbine unit will be unavailable because of the rebuild. No other structural modifications are expected in 2023.

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 2023 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 2022

In 2022, five standards were monitored closely during the juvenile fish passage season towards determining effectiveness and developing the 2023 GAP. TDG compliance during the juvenile fish passage season was good in 2022 (Table 3), but high flows in July necessitated spill, and complicated compliance with the 115% Rocky Reach Forebay and 120% Wells Tailrace standards. A sixth standard (<110% standard) is included in Table 3 below to provide comprehensive compliance reporting but is not related to fish passage season. Flows were above seasonal average at the Wells Project for most of the fish bypass season, but were lower than the historic monthly averages in April and May (See above Figure 4).

Table 3. 2022 TDG Compliance Summary.

		Compliance
April - June	**Wells Tailrace 125% - Mean 12 Highest Hourly / Day**	
	Non-compliant measurements	0
	7Q-10 flow measurements	16
	Total measurements	91
	DCPUD compliance	**100%**
	Wells Tailrace 126% - Two Consecutive Hourly Values	
	Non-compliant measurements	1
	7Q-10 flow measurements	273
	Total measurements	2184
	DCPUD compliance	**99.9%**
July & August	**Wells Tailrace 125% Hourly Standard**	
	Non-compliant measurements	3
	7Q-10 flow measurements	1
	Total measurements	62
	DCPUD compliance	**95.2%**
	Wells Tailrace 120% 12C-High Standard (one day)	
	Non-compliant measurements	15
	7Q-10 flow measurements	1
	Total measurements	62
	DCPUD compliance	**75.8%**
	Rocky Reach Forebay 115% 12C-High Standard (one day)	
	Non-compliant measurements	23
	7Q-10 flow measurements	1
	Total measurements	62
	DCPUD compliance	**62.9%**
Jan - Mar & Sept - Dec	**Wells Tailrace <110% Standard**	
	Non-compliant measurements	15
	Total measurements	5086
	DCPUD compliance	**99.7%**

2.0 PROPOSED OPERATIONS AND ACTIVITIES

2.1 Operational Spill

Based on the Wells Project's TDG performance as a result of 2012-2022 operations implementing the Wells Project Spill Playbook, similar operating principles will be implemented for the 2023 juvenile fish passage season. The most notable change from the 2022 Spill Playbook will be returning to a modified version of the playbook employed from 2015–2021 because of the completion of the maintenance work on Spillway 7.

The 2023 Spill Playbook (Appendix 1) proposes to concentrate spill through Spillways 7, 6, and 8. Concentrated spill through Spillway 7 was selected because spill through this bay best maintains the concentrated spill pattern determined to produce the smallest increase in TDG per unit of water spilled and turbine-unit 5 is out for overhaul in 2023. The turbine discharge from units 6 and 7 is also expected to reliably enhance the surface jet being spilled through Spillway 7.

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

[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.

nuisance species) in the Wells Project's Aquatic Settlement Agreement (developed in support of the 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 reaching 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 2023, 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 in order 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%.

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, in the event that 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 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. Additionally, in the event that TDG values in the Wells tailrace exceed the 125% water quality standard in the April-June or July-August period, additional sampling for GBT in resident fish 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. 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

[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)*.

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.

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. The USACE meets with PUD technical leads to review yearly data collections and completeness. In addition, 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. The WQAP also allows time for the completion of the necessary studies or for the resolution of the issue of elevated incoming TDG from upstream projects through rule-making or other means. The WQAP was developed to meet the requirements of WAC 173-201A-510(5).

If implementing the compliance schedule does not result in compliance with TDG criteria at the time the compliance schedule expires, Douglas PUD may explore other alternative approaches available in the water quality standards, including a second compliance schedule or alternatives provided in WAC 173-201A-510(5)(g).

Specific measures in the WQAP that will be conducted in 2023 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).

- In 2023, 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 and ten-year compliance report).

3. Employ the fifth year of a new 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.

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.

After three years of successful implementation of the new 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 2023, 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.

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.

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 2023, Douglas PUD will continue to monitor TDG at Washburn Island, and the forebay and tailrace stations located around Wells Dam.

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, with the exception of monthly rather than bi-weekly calibration of sensors. A spare probe is available and field-ready at all times in the event that 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 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, 2024 will be for all GAP activities conducted in 2023) 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 2023 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.

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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 2023 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. 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.

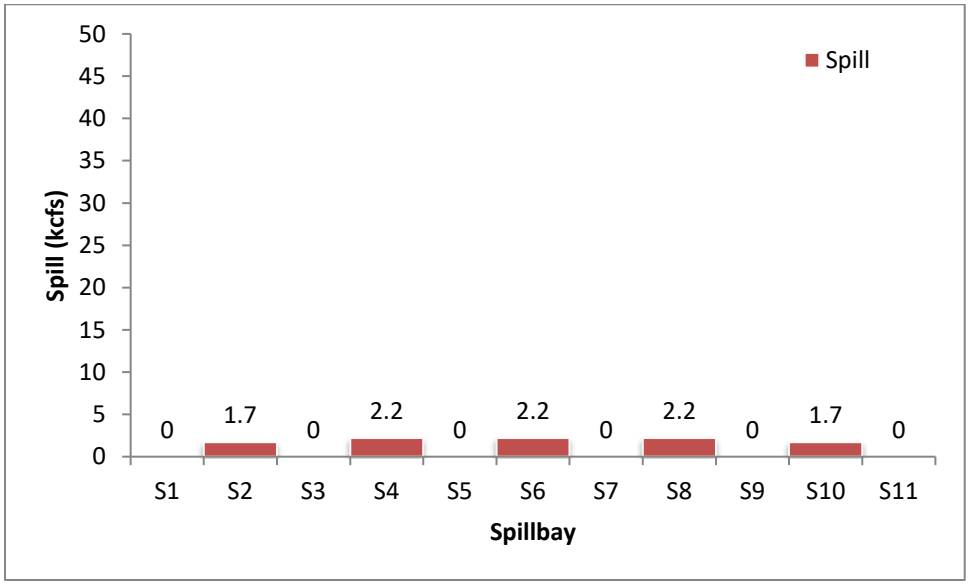

Figure 1. Operational configuration under no forced spill (JBS only).

II. Total Spill ≤ 53.0 kcfs, JBS Barriers in Place

As forced spill increases, Project Operators should allocate all spill through *S7* until the maximum capacity is reached through that spillbay (~43.0 kcfs). Note that *S7* spill requires support of generation flows from turbine units 6 and 7 to minimize TDG production. This, along with the already established JBS spill (10.0 kcfs) would equal 53.0 kcfs (Figure 2). Over 90% of the spill events over the past decade could have been handled under this configuration.

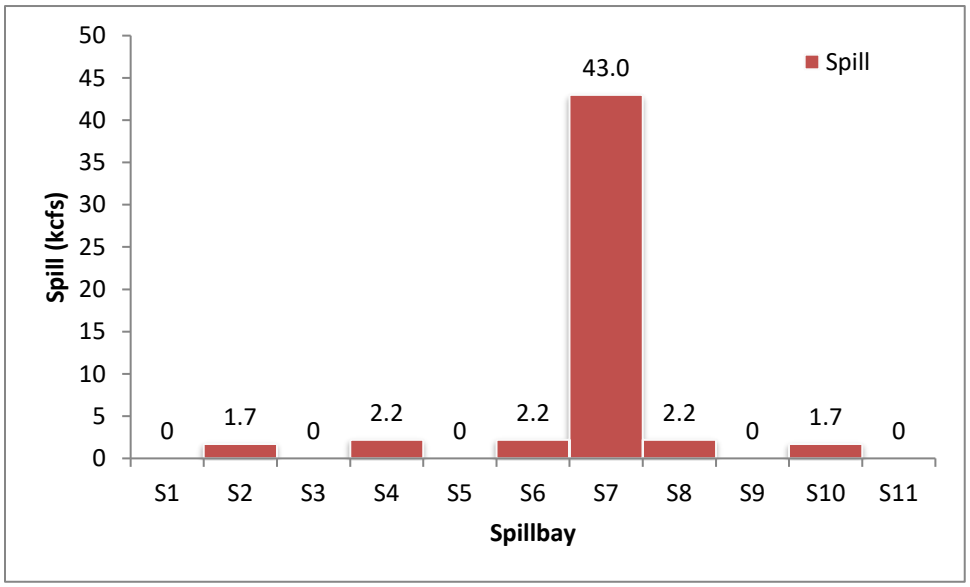

Figure 2. Operational configuration under spill ≤ 53.0 kcfs (including JBS).

JBS Barrier Removal Criteria

When either of the following occurs, remove the JBS barriers in *S6*:

Spill in *S7* 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 kcfs. After the JBS barriers are removed from *S6* and when flow through S7 is at least 30 kcfs, shift 15 kcfs to *S6* (Figure 3) at all times until the JBS barriers are reinstalled. It is best to have generating units 5, 6, and 7 operating to support this spill configuration, with U6 being the most important to provide surface degassing of spilled water via draft tube discharge. After at least 15 kcfs is being spilled through *S6*, additional spill can be allocated to *S7* until 43.0 kcfs is reached. The 15 kcfs minimum spill through *S6* is necessary to provide attraction of fish away from generating units 6 and 7 and to maintain sufficient spillway flow to engage the spillway lip below the ogee, which significantly attenuates TDG in the tailrace. The removal of the JBS barriers from *S6* reduces the flow net in the forebay that attracts fish away from generating units 6 and 7 to safely pass via *S6.*

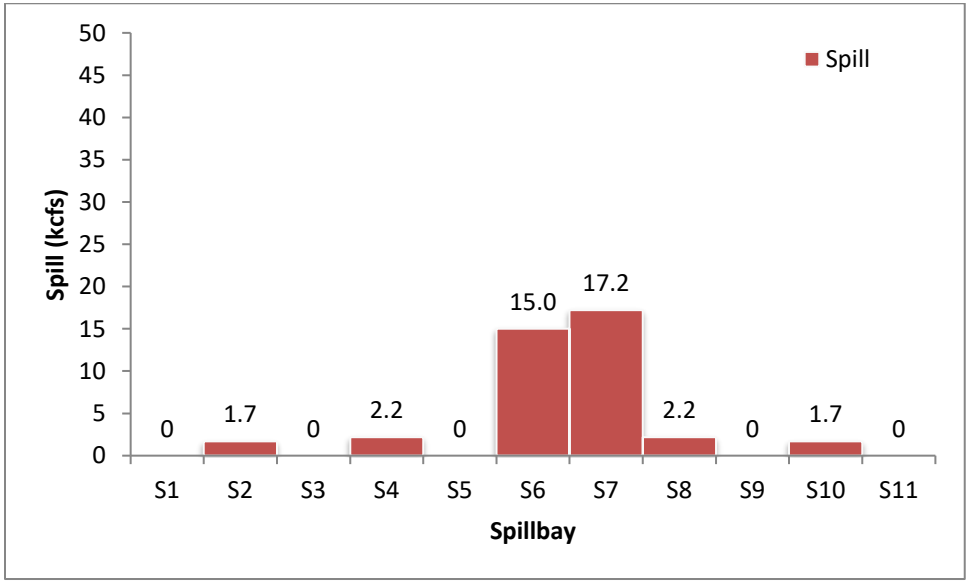

Figure 3. Operational configuration once spill reaches 30 kcfs in S7 and is expected to be above 40 kcfs for more than 8 hours (JBS removed from S6). Shift sufficient spill from S7 to maintain a minimum of 15 kcfs spill at S6.

Short Duration Decreases in Forced Spill (<53.0 kcfs) and JBS Barriers in *S6* Removed

If after removal of JBS barriers in *S6*, total spill drops below 53 kcfs (between 10-53 kcfs), and is expected to stay in this range for only a short period (4 days or less), direct spill through *S6* up to 15 kcfs (total spill < 22.9 kcfs). When total spill exceeds 22.8 kcfs, direct the remainder of spill through *S7*.

III. Forced Spill (> 53.0 kcfs) and JBS Barriers in *S6* Removed

After spill through *S7* reaches 43.0 kcfs, additional spill should be allocated to *S6* (*S6* is already spilling at least 15.0 kcfs). As flow increases, spill should continually increase through *S6* (e.g., 43.0 kcfs through *S7* and 26.0 kcfs through *S6*; Figure 4), until spill through *S6* will also reach 43.0 kcfs (93.8 kcfs, Figure 5). Note that 31.2 kcfs it the minimum discharge in *S7* without having to return to Section II above (See Spill Lookup Table VII).

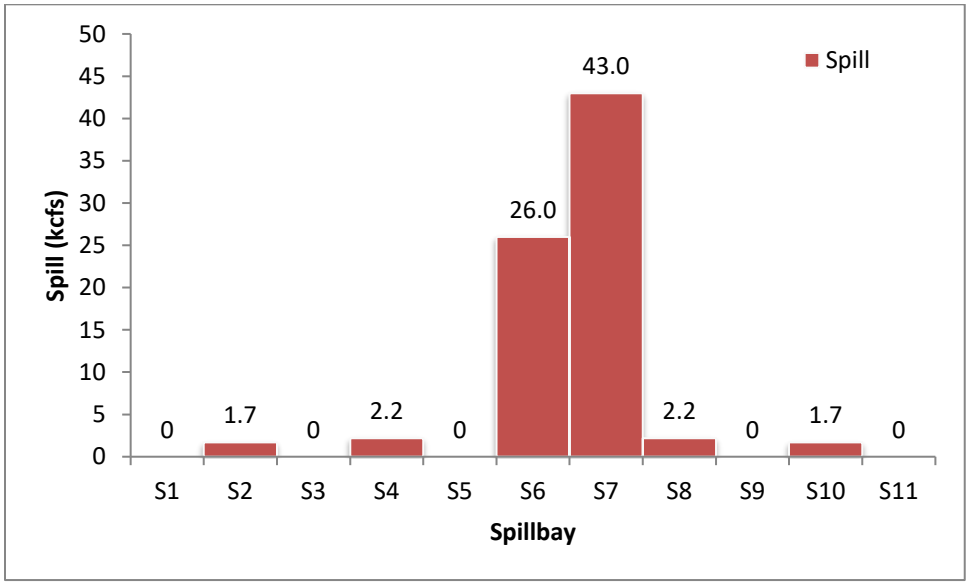

Figure 4. Operational configuration under forced spill > 53.0 kcfs (including JBS flow, with removal of JBS barriers in *S6*). In this instance spill has reached the 43.0 kcfs maximum in *S7* and additional spill is being allocated to *S6* (26.0 kcfs).

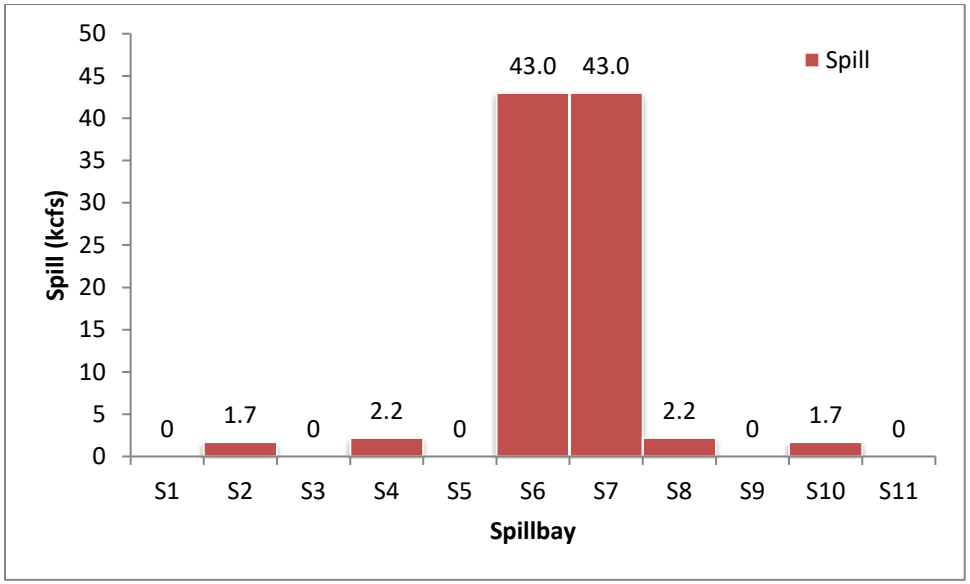

Figure 5. Operational configuration under forced spill > 53.0 kcfs (including JBS). In this instance (93.8 kcfs of spill), *S6* has been fully allocated and 43.0 kcfs is now allocated through both *S7* and *S6*.

IV. Forced Spill (> 93.8 kcfs) and JBS Barriers in *S6* and S8 Removed

After both *S7* and *S6* reach 43.0 kcfs, 86 kcfs (or 93.8 kcfs including fish bypass flow) in total is being spilled. Additional, spill discharge is unlikely to occur without the removal of bypass barrier in *S8* (e.g. 8 units with 18 kcfs in total discharge plus 93.8 kcfs of spill would have a total discharge of 237.8 kcfs at Wells Dam in this scenario). Two hundred and five kcfs of total discharge necessitates the removal of bypass barrier 8 to meet Emergency Action Plan constraints outlined in Appendix 2; Table 1 (see Bypass Operating Plan). As such, operators shall remove barrier 8 and provide minimum spill discharges in *S*6 and *S*8 of 15 kcfs. Spill discharge in bay 7 should be used to maintain discharge in S6 and S8, Since a minimum of 15.0 kcfs is needed to fully engage the submerged spillway lip below the ogee, some spill through *S6* should be relocated to *S8* (Figure 6). After this point, both *S6* and *S8* can be increased until all three spillways have reached 43.0 kcfs (134.6 kcfs of spill, Figure 7).

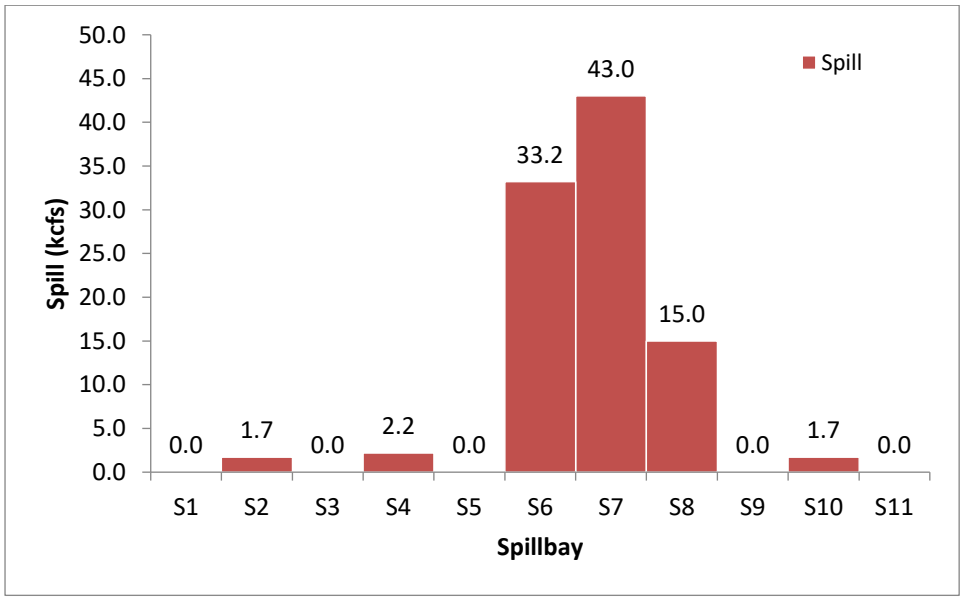

Figure 6. Operational configuration under forced spill > 96.0 kcfs. In this example (96.8 kcfs of total spill), spill from *S6* is relocated to *S8* to maintain concentrated flow and a minimum of 15 kcfs per spillway to engage the submerged spillway lip.

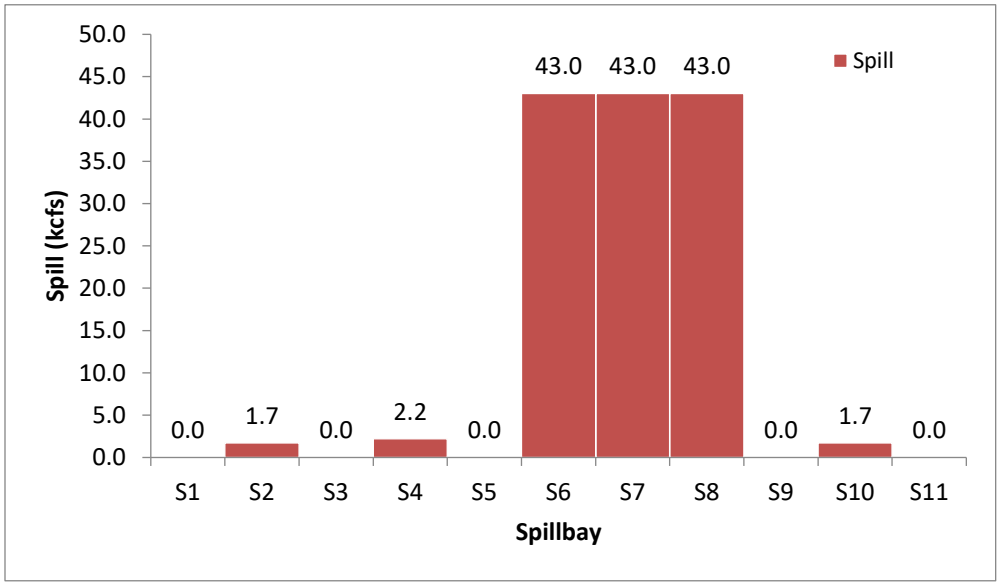

Figure 7. Operational configuration under forced spill > 96.0 kcfs (with removal of JBS barriers in *S6*). In this instance (134.6 kcfs of total spill), 43.0 kcfs is allocated through *S6*, *S7,* and *S8*.

V. Forced Spill (> 134.6 kcfs)

Forced spill exceeding 134.6 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 205 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 *S2*, *S4*, *S6*, and *S8*. Project Operators may pass spill through *S5* in a similar fashion to operations mentioned 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 S8 first and then *S6 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	0	1.7	0	2.2	0	2.2	0	2.2	0	1.7	0
II. Spill (≤ 53.0 kcfs), min.	11	0	1.7	0	2.2	0	2.2	1	2.2	0	1.7	0
II. Spill (≤ 53.0 kcfs), max.	53	0	1.7	0	2.2	0	2.2	43	2.2	0	1.7	0
III. Spill (> 53.0 kcfs, *S6* JBS out), min.	54	0	1.7	0	2.2	0	15	31.2	2.2	0	1.7	0
III. Spill (> 53.0 kcfs, *S6* JBS out), max.	93.8	0	1.7	0	2.2	0	43	43	2.2	0	1.7	0
IV. Spill (> 93.8 kcfs, *S6 & S8* JBS out), min.	93.9	0	1.7	0	2.2	0	30.3	43	15	0	1.7	0
IV. Spill (> 93.8 kcfs, *S6 & S8* JBS out), max.	134.6	0	1.7	0	2.2	0	43	43	43	0	1.7	0
V. Spill (>134.6 kcfs, *S6 & S8* JBS out[8]), min.	134.7	0	1.7	0	2.2	0.1	43	43	43	0	1.7	0
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 *S7*, *S6*, *S5*, *S9*, and *S3* (in that order).

[8] Should barriers in S4 be removed maintain 15 kcfs of discharge through it.

Appendix 2 Wells Hydroelectric Project Bypass Operating Plan

Wells Hydroelectric Project

2023 Juvenile Fish Bypass Operating Plan

Approved February 13, 2023

Operation of the Wells Dam juvenile bypass system throughout the 2023 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, 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 175	None
175 – 205	Spillway 6
205 – 240	Spillways 6, 8
240 – 275	Spillways 6, 8, 4
275+	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.*

* 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[9] kcfs per spillway.

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 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, for a period of at least four days is predicted, the respective

[9] 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 are over 140 kcfs (See Figure 1 in the Spill Playbook; IX. Spill Lookup Table), and known as bypass (spill) volumes.

bypass barriers would be reinstalled. At river flows greater than 205 kcfs, bypass barriers would be removed from additional bypass bays as described above (see Table 1) and reinstalled sequentially as appropriate.

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 2023 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 2023 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 2023 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.

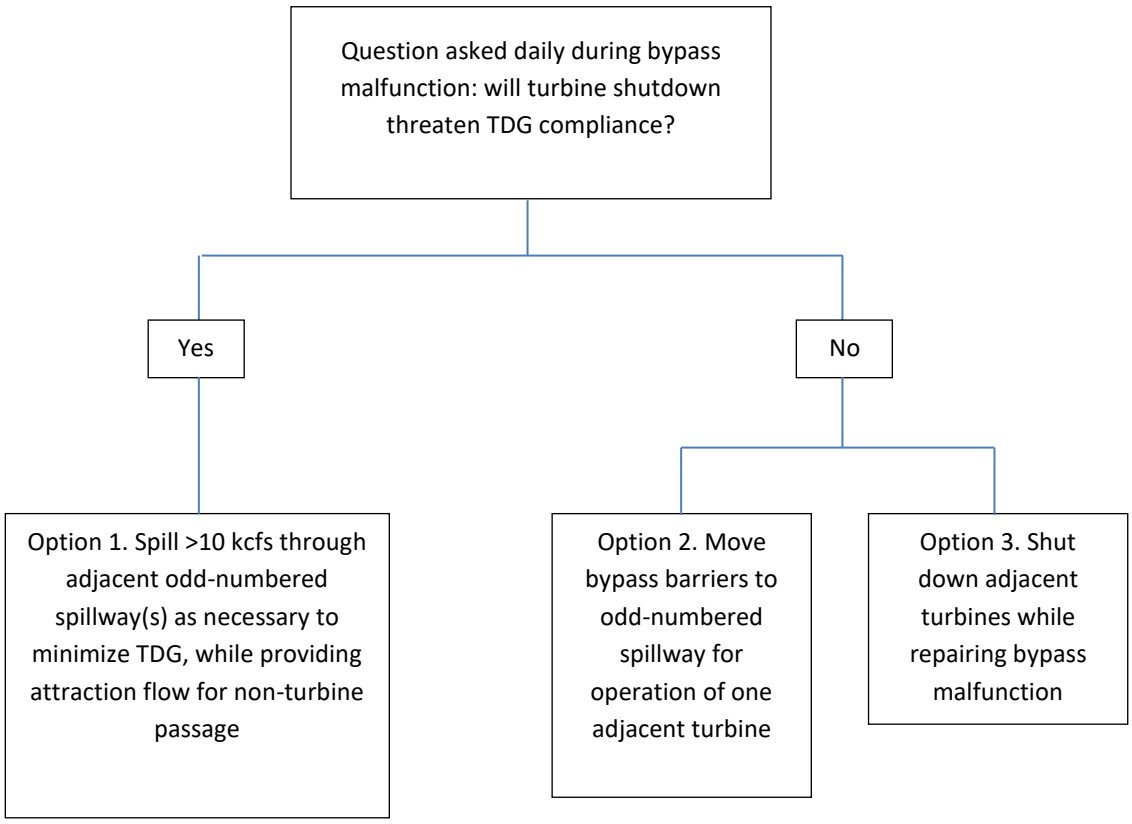

Figure 1. Evaluation flow chart for daily decisions regarding bypass, spill, and turbine operations during a bypass malfunction.

Appendix P
To Translocate Adult Pacific Lamprey from Priest Rapids Dam to Areas Within or Upstream of the Wells Project 2023–2024

Aquatic Settlement Agreement
Wells Aquatic Settlement Work Group
Statement of Agreement
To translocate adult Pacific Lamprey from Priest Rapids Dam to areas within or upstream of the Wells Project 2023-2024

Date of Approval: June 14, 2023

Statement

The Aquatic Settlement Work Group (Aquatic SWG) agrees that Public Utility District No. 1 of Douglas County (Douglas PUD) will translocate to areas within or upstream of the Wells Project, adult Pacific Lamprey captured at Priest Rapids Dam in 2023 and 2024. Douglas PUD will fund 12 nights of trapping at Priest Rapids Dam each year in a continuous, four-week block. In addition, Douglas PUD will translocate Pacific Lamprey delivered to Kirby Billingsley Hydro Park by Grant PUD for up to four more weeks after the Douglas PUD-funded four-week trapping period, or until 1000 Pacific Lamprey have been translocated within a single year, whichever occurs first. Within each year's overall translocation period (four weeks of Douglas PUD-funded trapping and up to four additional weeks of translocated Pacific Lamprey that have been delivered to Kirby Billingsley Hydro Park) Douglas PUD will endeavor to translocate no fewer than 500 Pacific Lamprey per year. Douglas PUD will PIT tag and collect a fin clip from all translocated Pacific Lamprey.

This translocation activity will represent steady progress towards identifying and addressing any Project related impacts on Pacific Lamprey passage consistent with Objective 1 of the Pacific Lamprey Management Plan (PLMP; Sections 4.1.5-7). Apart from the ongoing acoustic telemetry study beginning in 2022, no new telemetry or passage study will be completed at Wells Dam in 2023 or 2024. The Aquatic SWG will determine the objectives and methods of a 2025 approach or passage evaluation at Wells Dam in 2024 and/or early 2025.

During the period of Pacific Lamprey translocation, Douglas PUD, in consultation with the Aquatic SWG, will continue to implement measures prescribed by the Pacific Lamprey Management Plan (PLMP) that are not reliant on data collected from upstream passage evaluations. These measures shall include: developing study plans for future passage evaluations; gathering information on lamprey passage modifications at other hydroelectric projects, identifying and prioritizing fishway modifications, designing and engineering fishway modifications, continuing fishway counts, passively monitoring PIT tagged Pacific Lamprey that interact with Wells Dam, and developing a Pacific Lamprey passage literature review. In the event a passage impediment is identified during implementation of this SOA, based upon monitoring data, the Aquatic SWG will make a good faith effort to resolve the issue within the time period of this SOA.

Background

Douglas PUD is currently implementing the Wells Dam 2022 Adult Lamprey Approach and Passage Study (2022 Study), which is designed to determine if the approach rate to Wells Dam of Pacific Lamprey in 2022 differs from what was observed in 2016, following four years of Pacific Lamprey

translocation from Priest Rapids to locations upstream of Wells Dam. Additionally, the 2022 Study is intended to produce an overall Wells Dam passage rate for adult Pacific Lamprey.

Following the completion of the 2022 Study and the approval by the Aquatic SWG of an associated report, the Aquatic SWG will consider designing and implementing a study that is designed to make steady progress towards meeting one or more of the objectives found in the Pacific Lamprey Management Plan (PLMP). To ensure sufficient time to design and prepare for such a study, implementation would begin no earlier than 2025. During the interim and between studies, the Aquatic SWG feels that translocation of adult Pacific Lamprey to locations upstream of Wells Dam is an appropriate action to take and represents reasonable progress towards achieving objectives in Sections 4.1.5-7 of the PLMP. This is because recent dam counts at Wells Dam and the observation of juveniles upstream in the Okanogan basin in locations not previously detected suggest that translocation is supporting lamprey conservation and passage success at Wells Dam. In addition, these observations may support the goal of adult Pacific Lamprey volitionally approaching and ascending Wells Dam commensurate with passage performance at other mainstem hydroelectric projects.

Appendix Q
Wells Dam Lamprey Trapping and Fishway Modifications 2024

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 2024
DATE: November 20, 2023

Public Utility District No. 1 of Douglas County (Douglas PUD) proposes to trap lamprey in the Wells Dam fishways in 2024 using overflow-weir adult-lamprey traps deployed above pool 40 of both the East and West Fishways (Figure 1). The goal of the trapping effort is to determine the feasibility of trapping sufficient numbers of lamprey in the fishways for use in future adult lamprey passage studies in support of the objectives of the Wells Pacific Lamprey Management Plan. Traps will be deployed nightly from 21:00 to 08:00 up to four nights per week from August 1 to September 30, 2024.

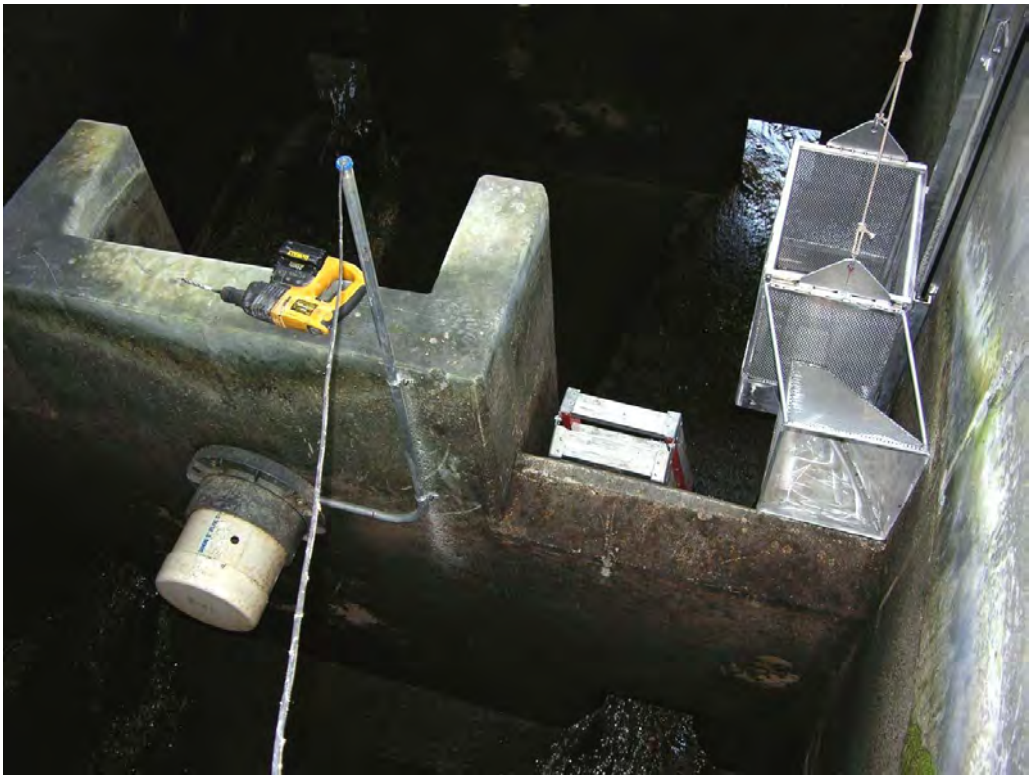

Figure 1. Overflow-weir adult-lamprey trap. Pictured during fishway maintenance while fishway is dewatered.

In an effort to improve trap efficiency, Douglas PUD proposes installing perforated aluminum plates on the floor of the fishway within and adjacent to the bottom orifices directly below the overflow-weir traps. Floor plates are 1/4" perforated aluminum raised ½" off the fishway floor, with ramped and rounded edges that are flush with the floor (Figure 2, Figure 3). The perforated

plates are intended to limit the ability of lamprey to attach to the floor of the fishway to pass through the bottom orifices, thereby encouraging passage via the overflow weirs where traps will be deployed. These perforated plates were installed in the fishways during a previous lamprey trapping effort in 2008 and did not negatively impact salmonid passage. Installation of the perforated plates would occur during winter fishway maintenance November 2023 to January 2024**. Douglas PUD seeks approval from the Wells HCP Coordinating Committee to install the perforated plates towards testing lamprey trapping feasibility in 2024.**

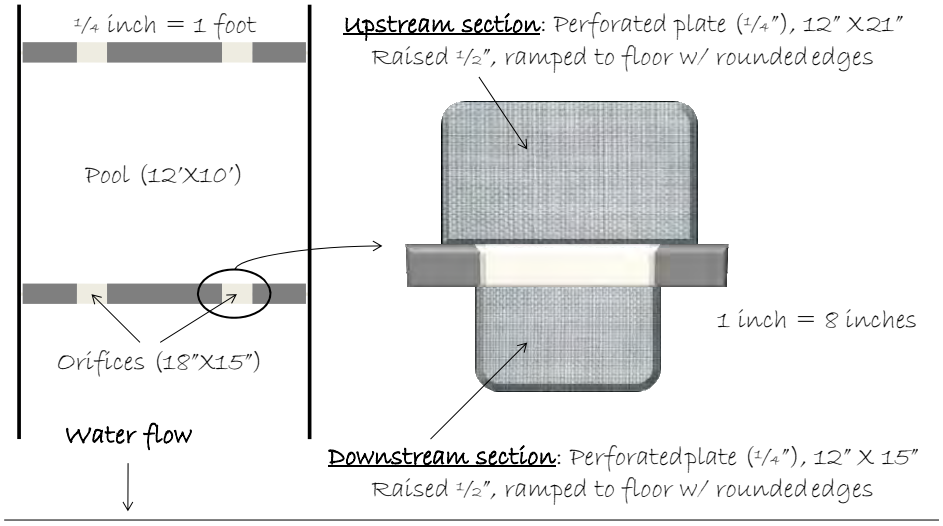

Figure 2. Proposed modification to orifice floors directly below overflow-weir traps to increase lamprey trapping efficiency.

Figure 3. Photograph of perforated aluminum floor plate (uninstalled).

Appendix R
2022 Public Utility District No. 1 of Douglas County Northern Pikeminnow Removal and Research Program

2022 PUBLIC UTILITY DISTRICT NO. 1 OF DOUGLAS COUNTY NORTHERN PIKEMINNOW REMOVAL AND RESEARCH PROGRAM

WELLS HYDROELECTRIC PROJECT

FERC NO. 2149

Final Report
August 1, 2022

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, LLC has been contracted by the District to perform Northern Pikeminnow removal in the 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. From 2000 to 2022, 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 2022 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 17, 2022 and were completed on August 22, 2022.

Northern Pikeminnow removal efforts were conducted throughout the Wells Project; from below the boat restricted zone (BRZ) tailrace of Chief Joseph Dam downstream to Wells Dam. A scientific collection permit was obtained from the Washington Department of Fish and Wildlife allowing crews to place setlines throughout the 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 (see 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.

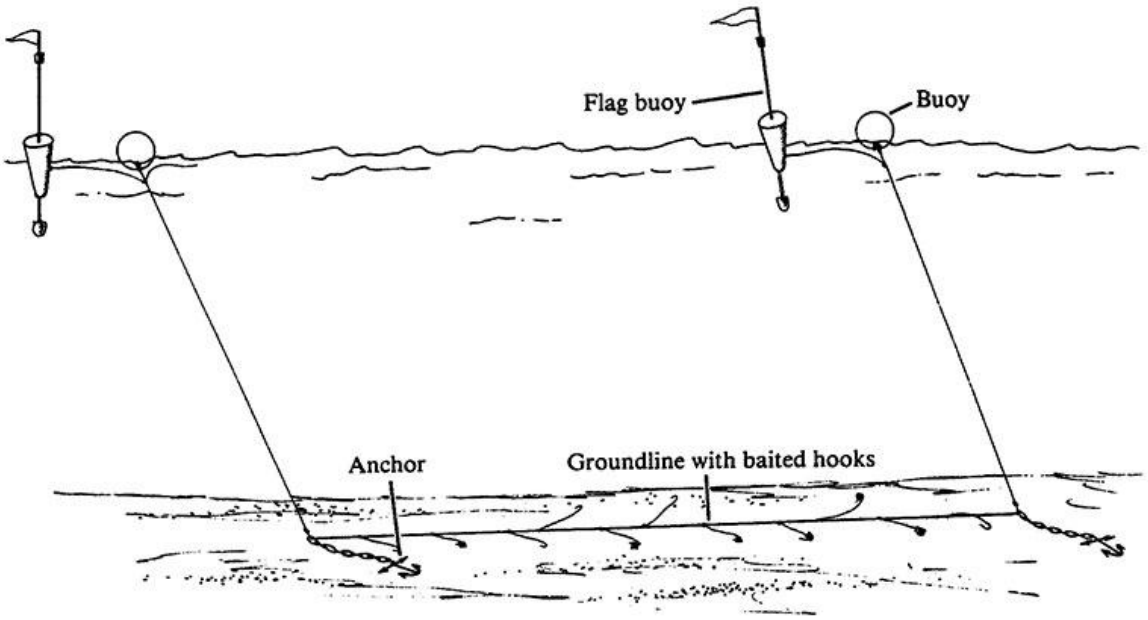

Figure 1. Schematic of a typical bottom-fishing setline (Sea Grant California 2022).

3.0 RESULTS

A total of 6,492 Northern Pikeminnow were captured during the 2022 project. Of these fish, 6,386 were over 229 mm and 106 were under 229 mm. These fish were captured during 2,998 hours of effort. A total of 4617 pikeminnow were captured on setlines during 2312 hours of effort resulting in a CPUE of 2.0. A total of 1875 pikeminnow were captured via hook-and-line angling during 686 hours of angling effort, resulting in a CPUE of 2.7. All Northern Pikeminnow in 2022 were captured in Wells Reservoir.

Pikeminnow were captured in four main locations (Figures 2 and 3). Location A was directly where the Methow River drops into the Columbia River. Location B was upstream of the confluence area within the Methow River. All pikeminnow in location B were captured on hook-and-line gear. Location C was located approximately 4 miles upstream from Wells Dam near Starr Boat Launch. Another productive location was the immediate Wells Forebay marked location D on Figure 3.

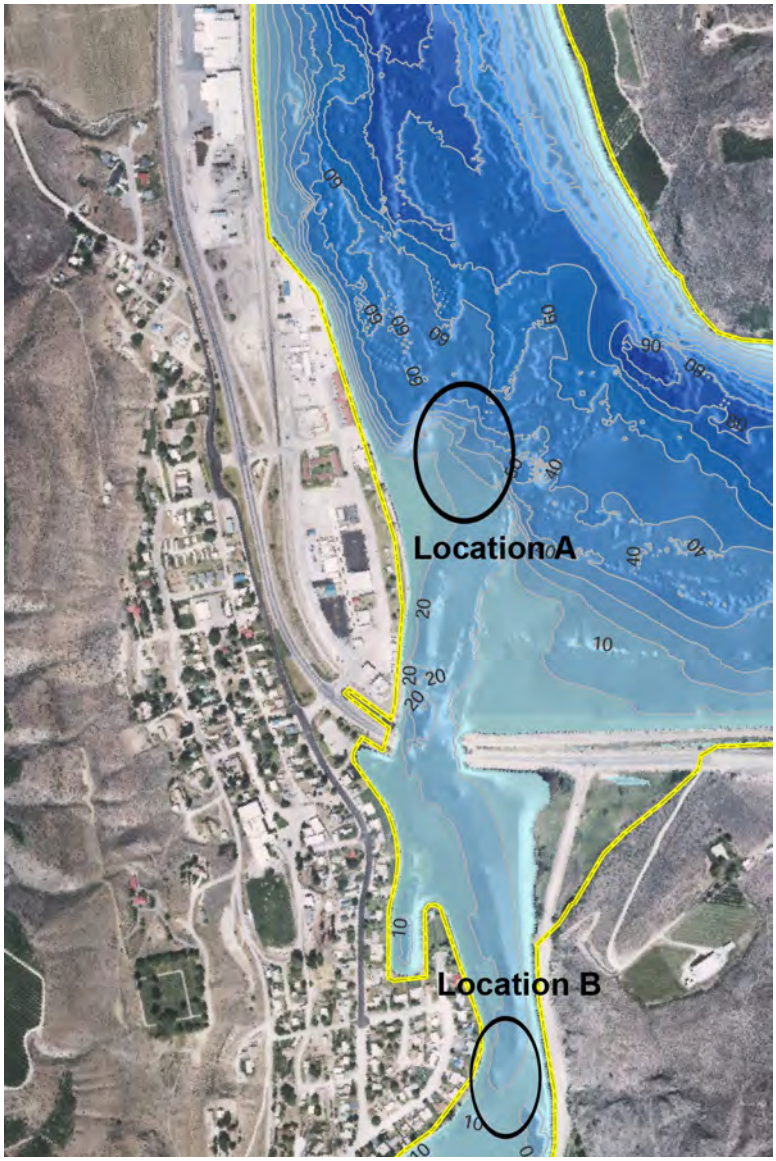

Figure 2. Capture locations of Northern Pikeminnow at the Columbia River / Methow River confluence area.

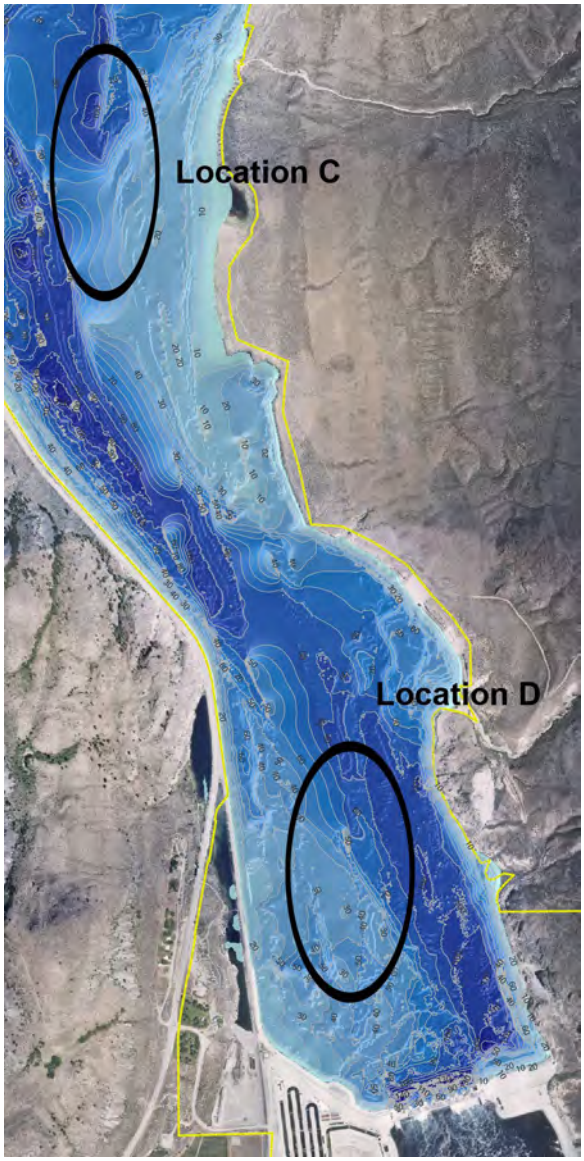

Figure 3. Catch locations of Northern Pikeminnow in Wells Dam forebay.

No ESA-listed species or HCP Plan Species were encountered during the Northern Pikeminnow fishery. A total of 1,283 non-target fish were captured and released. Incidental encounters consisted of nine taxa: 578 Peamouth (*Mylocheilus caurinus*), 543 Chiselmouth (*Acrocheilus alutaceus*), 90 suckers (*Catostomus* spp.), 25 Burbot (*Lota lota)*, 18 sculpin (*Cottus* spp.), 15 Redside Shiner (*Richardsonius balteatus*), 10 Northern Pikeminnow / Chiselmouth hybrids, 3 White Sturgeon (*Acipenser transmontanus*), and 1 Brown Bullhead (*Ameiurus nebulosus*). All non-target fish were released alive.

4.0 DISCUSSION

The 6,492 Northern Pikeminnow captured in 2022 bring the cumulative total catch over the life of the program to approximately 364,000 pikeminnow. Low catch and CPUE levels have been

documented in recent years with the fishery in 2021 and 2022 marking the lowest catch levels to date. Nevertheless, the pikeminnow removal program has successfully removed approximately 360,000 Northern Pikeminnow of piscivorous size, 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. Three White Sturgeon were encountered in the Wells Reservoir. These encounters are attributed to the release of juvenile sturgeon by the District in Wells Reservoir as part of their White Sturgeon supplementation program. All three incidentally captured White Sturgeon were determined by scute-mark identification to be 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.

References

Sea Grant California. (2022). Fishing Gear and Methods. Available Online at https://caseagrant.ucsd.edu/california-commercial-fisheries/fishing-gear-and-methods.

EXHIBIT B

PRE-FILING CONSULTATION RECORD SUPPORTING THE APPROVAL OF THE 2023 AQUATIC SETTLEMENT AGREEMENT ANNUAL REPORT, 2023 AQUATIC SETTLEMENT AGREEMENT MANAGEMENT PLAN REPORTS, AND 2023 WATER TEMPERATURE REPORT

EMAIL NOTICE TO THE AQUATIC SETTLEMENT WORK GROUP FOR A 45-DAY REVIEW OF THE DRAFT 2023 AQUATIC SETTLEMENT AGREEMENT ANNUAL REPORT AND SIX AQUATIC RESOURCE MANAGEMENT PLAN ANNUAL REPORTS

From: Kristi Geris <kgeris@anchorqea.com>
Sent: Friday, March 8, 2024 8:48 AM
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>
Subject: Aquatic SWG: Draft 2023 ASA Annual Report + MP Annual Reports for ASWG 45-day review

Hi ASWG Technical Reps: the draft 2023 Aquatic Settlement Agreement Annual Report and appended six aquatic resource management plan annual reports are now available for a 45-day review with edits and comments due to me by **Monday, April 22, 2024**.

The following files can be downloaded from the Aquatic SWG Extranet site under: Documents > Reports (instructions below). Please let me know if you have Qs! –kristi

- 2024_03_08 Douglas - Draft 2023 ASA Annual Report_forASWGreview.docx
- 2024_03_08 Douglas - Draft 2023 ANSMP Annual Report.docx
- 2024_03_08 Douglas - Draft 2023 BTMP Annual Report and ITS.docx
- 2024_03_08 Douglas - Draft 2023 PLMP Annual Report.doc
- 2024_03_08 Douglas - Draft 2023 RFMP Annual Report.docx
- 2024_03_08 Douglas - Draft 2023 WQMP Annual Report and appended Water Temperature Report.docx
- 2024_03_08 Douglas - Draft 2023 WSMP Annual Report.docx

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
Managing Scientist

kgeris@anchorqea.com
Tri-Cities WA
O (509) 492-3102
M (360) 220-3988

ACTION ITEMS FOR THE AQUATIC SETTLEMENT WORK GROUP CONFERENCE CALL SHOWING REQUEST FOR REVIEW OF THE 2023 AQUATIC SETTLEMENT AGREEMENT MANAGEMENT PLANS AND ANNUAL REPORT

DRAFT

Conference Call Action Items

Aquatic Settlement Work Group

To: Aquatic SWG Parties **Date:** April 10, 2024

From: John Ferguson, Chair, Anchor QEA, LLC

Re: **Draft Action Items of the April 10, 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, April 10, 2024, from 10:00 a.m. to 10:30 a.m. Attendees are listed in Attachment A. These action items include the following:

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).
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. 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.

Attachment A – List of 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

CONFEDERATED TRIBES OF THE COLVILLE RESERVATION EDITS AND COMMENTS ON THE DRAFT 2023 AQUATIC SETTLEMENT AGREEMENT ANNUAL REPORT, DRAFT 2023 BULL TROUT MANAGEMENT PLAN AND INCIDENTAL TAKE ANNUAL REPORT, DRAFT 2023 AQUATIC NUISANCE SPECIES MANAGEMENT PLAN, AND DRAFT 2023 WHITE STURGEON MANAGEMENT PLAN

_____
From: Jason McLellan <Jason.McLellan@colvilletribes.com>
Sent: Wednesday, May 1, 2024 10:08 AM
To: Chas Kyger
Subject: Re: Aquatic SWG: Draft 2023 ASA Annual Report + MP Annual Reports for ASWG 45-day review

Great. Thanks.

On Wed, May 1, 2024 at 7:50 AM Chas Kyger <chas.kyger@dcpud.org<mailto:chas.kyger@dcpud.org>> wrote:
Hi Jason,

Thanks for reviewing the annual reports and providing comments. Based on your comments on the ANS MP Annual Report, I added an explanation on how positive eDNA results would be verified (essentially the process that was outlined in the N. Pike monitoring plan would be applied to Dreissenids or any other species monitored for using eDNA). Regarding the question of the purpose of annual crayfish monitoring - It is a requirement of the 401 Water Quality Certification, oddly. The revised report is attached. All of your edits to the other reports have been accepted.

Chas

Chas Kyger
Aquatic Resource Biologist
Douglas County Public Utility District
(509) 881-2388

_____
From: Jason McLellan <Jason.McLellan@colvilletribes.com<mailto:Jason.McLellan@colvilletribes.com>>
Sent: Friday, April 19, 2024 11:38 AM
To: Kristi Geris
Cc: Andrew Gingerich; Chas Kyger; John Ferguson; John Rohrback; Mariah Mayfield
Subject: Re: Aquatic SWG: Draft 2023 ASA Annual Report + MP Annual Reports for ASWG 45-day review

Hello Everyone,

The CTCR comments and suggested edits for the various annual reports are attached. They are minor. We reviewed but did not have comments/edits for the other reports.

As always, please let me know if you have any questions or concerns.

Best Regards,
Jason

On Fri, Mar 8, 2024 at 8:47 AM Kristi Geris <kgeris@anchorqea.com<mailto:kgeris@anchorqea.com> <mailto:kgeris@anchorqea.com>>> wrote:
Hi ASWG Technical Reps: the draft 2023 Aquatic Settlement Agreement Annual Report and appended six aquatic resource management plan annual reports are now available for a 45-day review with edits and comments due to me

by Monday, April 22, 2024.

The following files can be downloaded from the Aquatic SWG Extranet site under: Documents > Reports (instructions below). Please let me know if you have Qs! –kristi

* 2024_03_08 Douglas - Draft 2023 ASA Annual Report_forASWGreview.docx
* 2024_03_08 Douglas - Draft 2023 ANSMP Annual Report.docx
* 2024_03_08 Douglas - Draft 2023 BTMP Annual Report and ITS.docx
* 2024_03_08 Douglas - Draft 2023 PLMP Annual Report.doc
* 2024_03_08 Douglas - Draft 2023 RFMP Annual Report.docx
* 2024_03_08 Douglas - Draft 2023 WQMP Annual Report and appended Water Temperature Report.docx
* 2024_03_08 Douglas - Draft 2023 WSMP Annual Report.docx

Instructions:
To gain access to the Aquatic SWG Extranet Homepage, please use the following procedure:
* Visit:
https://extranet.dcpud.net/sites/nr/aswg/<https://url.us.m.mimecastprotect.com/s/MzuzCn5GJEFgNpvU9eP_q?domain=extranet.dcpud.net/><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<mailto:jmcgregor@dcpud.org><mailto:jmcgregor@dcpud.org>>; (509) 881-2236] and we will gladly assist you with questions or issues.

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FINAL ACTION ITEMS FOR THE AQUATIC SETTLEMENT WORK GROUP CONFERENCE CALL SHOWING APPROVAL OF THE REVISED 2023 AQUATIC SETTLEMENT AGREEMENT MANAGEMENT PLANS AND ANNUAL REPORT

FINAL

Conference Call Action Items

Aquatic Settlement Work Group

To: Aquatic SWG Parties **Date:** May 8, 2024

From: John Ferguson, Chair, Anchor QEA, LLC

Re: **Final Action Items of the May 8, 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, May 8, 2024, from 10:00 a.m. to 11:00 a.m. Attendees are listed in Attachment A. These action items include the following:

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*, 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. 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. There are no documents that have been recently finalized.

Attachment A – List of 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