

Priest Rapids Coordinating Committee (PRCC) Meeting

Microsoft Teams
Tuesday, January 27, 2026
9:00 a.m. to 12:00 p.m.

Conference Call Minutes

PRCC Representatives, Alternates, and Facilitation

Tom Dresser, Rod O'Connor (Alt),	Keely Murdoch, Brandon Rogers (Alt), YN
Tim Taylor (Alt), GPUD	Tom Lorz, CRITFC
Scott Carlon, Emi Melton (Alt), NMFS	Pete McHugh (Alt), CRITFC for CTUIR
Bill Gale, USFWS	Clayton Buck, Wanapum
Chad Jackson, Andrew Murdoch (Alt), WDFW	Larissa Rohrbach, Anchor QEA, Facilitator
Kirk Truscott, Casey Baldwin (Alt), CTCR	Caitlin Burd, Anchor QEA, Technical Support

Meeting Attendees

Larissa Rohrbach, Anchor QEA, Facilitator	Scott Carlon, NMFS
Caitlin Burd, Anchor QEA, Technical Support	Chad Jackson, WDFW
Pete McHugh, CRITFC for CTUIR	Andrew Murdoch, WDFW
Kirk Truscott, CTCR	Bill Gale, USFWS
Tom Dresser, GPUD	Keely Murdoch, YN
Rod O'Connor, GPUD	
Tim Taylor, GPUD	

Action Items

- L. Rohrbach will work with T. Dresser to identify proposed dates for a PRCC Policy Committee meeting, including a timeline for materials preparation. *(This item is ongoing.)*
- The Joint Fisheries Parties (JFP) will review and respond to Grant PUD's revisions to the draft statement of agreement (SOA) *Survival Evaluations - Path Forward*. *(This item is ongoing.)*
- L. Rohrbach will send questions to Real Time Research (RTR) pertaining to whether the goals of *Task 3.2.b RIS Yearling Chinook PIT-tagging* in their 2026

proposal can be achieved using passive detections at Rocky Reach Juvenile Bypass instead of tagging additional spring Chinook Salmon at Rock Island Dam. Responses will be discussed during the PRCC conference call on February 24. *(Note: The PRCC's questions were sent to RTR on January 28, and RTR responses were distributed to the PRCC by K. Geris on February 20, 2026.)*

- Grant PUD will review JFP edits to the revised draft SOA *Decoupling Summer Subyearling Survival Estimates From Juvenile Steelhead Survival Estimates* for discussion during the PRCC conference call on February 24. *(Note: A revised SOA for approval was distributed to the PRCC by K. Geris on February 19, 2026.)*
- Grant PUD will verify whether dead fish releases were used in the studies presented in the ongoing review of past survival studies. *(This item is ongoing.)*
- Grant PUD will consider looking into route-specific survival data as they relate to avian predation presented in the ongoing review of past survival studies. *(This item is ongoing.)*
- Grant PUD will update the draft White River Spring Chinook Program Public Outreach and Stakeholder Engagement Guide with suggested responses to the talking points. *(This item is ongoing.)*
- Grant PUD will inquire about updating next year's annual Fish Mode Summary Memorandum to include minutes, hours, and date ranges when fish mode at Wanapum Dam operated below 11,800 cubic feet per second (11.8 kcfs). *(This item is ongoing.)*
- Grant PUD and other PRCC parties will review the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) Fishway Prescriptions requirements and processes related to recording adult counts of all species. *(This item is ongoing.)*

Review Items

- A draft *White River Spring Chinook Program Public Outreach and Stakeholder Engagement Guide* was distributed to the PRCC by K. Geris on September 22, 2025.
- The revised draft SOA *Survival Evaluations - Path Forward* was distributed to the PRCC by K. Geris on November 20, 2025.
- The revised draft SOA *Decoupling Summer Subyearling Survival Estimates From Juvenile Steelhead Survival Estimates* was distributed to the PRCC by K. Geris on January 23. *(Note: A revised SOA for approval was distributed to the PRCC by K. Geris on February 19, 2026.)*
- The *Juvenile Steelhead Survival Synthesis Priest Rapids Project (2008-2017)* was distributed to the PRCC by K. Geris on January 26, 2026, for the PRCC to

review and identify questions to use as a reference upon receiving the forthcoming 2026 survival study results.

- The draft *APPENDIX C: Predation and Survival of Passively Recaptured Steelhead and Yearling Chinook in the Middle Columbia River*¹ was distributed to the PRCC by K. Geris on February 20 and is available for review with edits and comments due by March 13, 2026.
- The *Avian Predation in the Columbia River Basin: 2025 Draft Annual Report* was distributed to the PRCC by K. Geris on February 23 and is available for review with edits and comments due by March 13, 2026.
- A PRCC No Net Impact (NNI) Funds Specification Sheet for Grant PUD's and Chelan PUD's project titled *Tag Effects Evaluation for Summer Subyearling Chinook Salmon* was distributed to the PRCC by K. Geris on February 23, 2026.

Decisions and Approvals

- The PRCC approved the NNI funding (H601) request of \$359,882 from RTR for the project titled *Avian Predation on Juvenile Salmonids on the Middle Columbia River, 2026* with the condition that *Task 3.2.b RIS Yearling Chinook PIT-tagging* is postponed until further information is received from RTR about use of passive detections as an alternative approach.
- B. Gale and S. Carlon volunteered to be the agency spill representatives for the 2026 spill season.
- The PRCC approved the NNI funding (H601) request of \$25,000 from Quincy Valley Chamber of Commerce/Tourism Association for the project titled "2026 Northern Pikeminnow Fishing Derby – Wanapum Reservoir."

I. Welcome, Announcements, Agenda Review, and Meeting Minutes Approval

L. Rohrbach welcomed the PRCC and reviewed the agenda. No additions or changes were requested by PRCC members, and the agenda was approved by all members in attendance.

The PRCC reviewed revised December 15 PRCC conference call minutes, and the minutes were approved by members who attended that meeting.

The draft January 14 PRCC conference call minutes were approved by members who attended that meeting.

¹ In fulfillment of RTR's 2025 Avian Predation Work, Subobjective 4.1, as approved by the PRCC on April 22, 2025, and for inclusion in RTR's 2025 Avian Predation Annual Report.

II. Actions Items Review

Action items from the PRCC December 15 conference call and follow-up discussions were as follows (*Note: Italicized text corresponds to agenda items from the December 15 conference call.*):

- *L. Rohrbach will work with T. Dresser to identify proposed dates for a PRCC Policy Committee meeting, including a timeline for materials preparation.*
This item is ongoing.
- *Grant PUD will update the revised draft SOA Survival Evaluations - Path Forward to retain content where there is agreement and consider documenting in a background section topics that were discussed but will not be included in the agreement.*
This item is ongoing.
- *The JFP will submit additional edits to the revised draft SOA Decoupling Summer Subyearling Survival Estimates From Juvenile Steelhead Survival Estimates in the version distributed on November 20, for discussion during the PRCC conference call on January 27, 2026.*
A revised SOA was distributed to the PRCC by K. Geris on January 23, 2026.
This item was discussed at today's meeting.
- *Grant PUD will verify whether dead fish releases were used in the studies presented in the ongoing review of past survival studies.*
This item is ongoing.
- *Grant PUD will consider looking into route-specific survival data as they relate to avian predation presented in the ongoing review of past survival studies.*
This item is ongoing.
- *Grant PUD will update the draft White River Spring Chinook Program Public Outreach and Stakeholder Engagement Guide with suggested responses to the talking points.*
This item is ongoing.
- *Grant PUD will look into updating next year's annual Fish Mode Summary Memorandum to include minutes, hours, and date ranges when fish mode at Wanapum Dam operated below 11.8 kcfs.*
This item is ongoing.
- *Grant PUD and other PRCC parties will review the USFWS and NMFS Fishway Prescriptions requirements and processes related to recording adult counts of all species.*
This item is ongoing.
- *Grant PUD will review the annual reporting requirements for the Northern Pike Removal NNI-Funded Project, and Anchor QEA will reach out to the*

Confederated Tribes of the Colville Reservation (CTCR) about a presentation, if needed.

A 2025 Lake Roosevelt Northern Pike Suppression Memorandum was distributed to the PRCC by K. Geris on January 6.

III. DECISION: RTR Avian Predation Study

The PRCC NNI Funds Specification Sheet for RTR's 2026 Avian Predation Study (Attachment A) was distributed to the PRCC by K. Geris on January 22.

L. Rohrbach shared the objectives of RTR's proposal titled *Avian Predation on Juvenile Salmonids on the Middle Columbia River, 2026* on the screen. Objective 5 was planned but not implemented in 2025 but will be implemented in 2026 due to a 1-year delay in Grant PUD's smolt survival study, and reads as follows:

- *Estimate spatially- and temporally explicit avian predation rates on steelhead and yearling Chinook that are tagged as part of survival studies in the Priest Rapids Project (Wanapum and Priest Rapids dams and reservoirs) in 2026 (work that was approved by the PRCC in 2025, but was postponed until 2026).*

Keely Murdoch said that Yakama Nation (YN) has concerns with Task 3.2.b, which reads as follows:

- *RIS Yearling Chinook PIT-tagging: In collaboration with Chelan County PUD, we propose to also PIT tag ~5,000 Upper Columbia River yearling Chinook at Rock Island Dam in 2026.*

K. Murdoch emphasized that the YN supports PRCC investment in avian predation studies using NNI funds. However, she does not want to approve for the YN without addressing how smolts are selected for these studies because design choices may introduce behavioral bias and produce instances of other sources of mortality.

K. Murdoch said that passive integrated transponder (PIT) tagging of spring Chinook Salmon at Rock Island Dam (RIS) introduces additional handling effects and raises expenses without a clear management trigger. She said it would be preferable to implement a study design that minimizes impacts by using passive detections of previously PIT-tagged fish at Rocky Reach Dam Juvenile Bypass (RRJ) for data collection. Passive detections at RRJ currently sample 50% of the yearling spring Chinook Salmon run. This sample would be representative of avian predation on fish exhibiting typical migration behavior. The Columbia River/Snake River region has been pushing towards reducing tagging events at mainstem dams and increasing tagging operations in tributaries. The analysis of passive detections from RRJ and the Wenatchee PIT Barge as a sample population by RTR is not yet complete; the YN would push to avoid expanding tagging efforts on spring Chinook Salmon without a comparison to these passive detections as an alternative to additional handling.

Rod O'Connor said Grant PUD's interest in tagging an additional 5,000 spring Chinook Salmon was to make comparisons with RTR's steelhead predation and survival studies. Spring Chinook Salmon would need to be tagged at RIS in the same fashion as steelhead to make a direct comparison. R. O'Connor said he would be willing to ask RTR's opinion. K. Murdoch said that it would be beneficial to review the completed 2025 analysis to identify trends in predation rates between spring Chinook Salmon and steelhead. Passive detections could be used in 2026 if predation rates were observed to be similar.

K. Murdoch said the YN would propose using passive detections of spring Chinook Salmon at RRJ to lessen the impact of multiple handling events on spring Chinook Salmon and would have preferred to have had the results from RTR to help inform that idea. The YN is not pushing back on tagging steelhead at RIS, however, because of the length of that time series.

Tim Taylor said that RTR provided Grant PUD with a status update for the 2025 report. RTR requested a 3-week, no-cost extension for the completion of Task 6 for the analysis on passive detections because funding was acquired later in the schedule than anticipated. RTR currently has stock-specific estimates of predation for RRJ and the Wenatchee barge. Task 6 will be completed no later than February 20, 2026 and will be submitted as a stand-alone report.

Tom Dresser agreed that unlike steelhead, the spring Chinook Salmon tagging would not build on a long-term dataset. He said that RTR sees this 2026 predation study as an opportunity to initiate a similar database for spring Chinook Salmon. The Avian Salmon Predation Working Group has identified white pelicans and cormorants as primary drivers of avian predation in recent years; however, it is unclear whether predation rates by avian species are consistent throughout each island in the Upper Columbia River Basin. This is a data point that the region does not have.

Pete McHugh said he has similar reservations as K. Murdoch but understands the opportunity. He agreed with K. Murdoch that it is imperative to review the results of the 2025 analysis before going forward with additional tagging at RIS. He questioned whether the sample size of double-tagged fish for Grant PUD's smolt survival study would be large enough to study predation or if 5,000 more PIT tags are needed. P. McHugh proposed that the plan be approved with the caveat that PIT tagging of an additional 5,000 yearling spring Chinook Salmon at RIS will occur for 1 year and is not a long-term commitment. Predation does seem elevated in areas such as McNary Pool and Miller Rocks, which is a reason to proceed with a clear understanding that it would not be the preferred approach. He subsequently walked back the proposal to conditionally approve yearling Chinook tagging in 2026, preferring to wait and see

whether RTR can provide an early indication (or draft report) of what might be possible using passive detections of upstream fish.

K. Murdoch said that the Smolt Monitoring Program did tag Chinook Salmon at RIS for decades, but she was uncertain whether predation was analyzed in overlapping years.

R. O'Connor said the additional 5,000 PIT tags would fortify the sample size and produce more complete estimates of predation survival; only 1,800 fish will be double-tagged fish as part of Grant PUD's smolt survival study. P. McHugh asked how RTR will marry PIT and acoustic tag data; R. O'Connor was uncertain of the exact analytical approach. K. Murdoch asked whether the intent of RTR's predation survival study is to compare predation rates between fish with one PIT-tagged versus double-tagged fish. Double-tagged fish may experience tagging effects that make them increasingly vulnerable to predation. R. O'Connor suggested this question be posed to RTR. The number of recoveries for double-tagged fish is small and only produces descriptive data. A larger sample size would be required to produce a valid predation estimate.

K. Murdoch inquired on the difference between using NNI funds for the currently implemented survival studies and the avian predation analysis. Are analytical costs for the avian predation study separate from the steelhead and spring Chinook Salmon survival studies? T. Dresser replied that the funding is separated between the studies. The interest in avian predation was generated from juvenile steelhead survival studies conducted from 2005 to 2010. A suite of research angles was pursued to identify why survival was low, and it was identified that a large amount of mortality was coming from avian predation outside of the project area. All that data from the early years fed into the Inland Avian Management Plan, identified as a regional concern and data was used by regional co-managers to move Bureau of Reclamation toward a better position to support predator management. The smolt survival study that has been approved is being funded 100% by Grant PUD, and PIT tags are being provided by Grant PUD. K. Murdoch asked, if that is the case, why is it necessary to tag spring Chinook Salmon at RIS?

T. Dresser said NNI funds are allocated to improving fish survival through the Priest Rapids Project. PRCC members in the past have agreed that NNI funding could be used for projects that improve resource survival upstream and downstream of the project and previously identified that avian predation as a concern to be investigated. It is informative to start with fish from RIS to know where the predation is coming from and what predation challenges are attributed to the Priest Rapids Project area specifically.

K. Murdoch said the Settlement Agreement does not identify a geographic boundary for where NNI funds are allocated; it states they are intended to improve the survival of

covered species. Many NNI-funded actions are not within the Priest Rapids Project area and are managed by relevance to covered species rather than geographic boundaries. T. Dresser said that the Settlement Agreement is clear that the main purpose of the NNI fund is to provide the parties with additional financial capacity to undertake measures to improve survivals of covered species prior to the time when the Project attains applicable juvenile project survival standards. The word “Project” refers to the Priest Rapids Project.

L. Rohrbach summarized that the hesitation to approve the proposed study lies within the additional handling impacts for yearling spring Chinook Salmon at RIS. On the other hand, tagging at RIS would focus the study in the Priest Rapids Project area with an understanding that geographic borders are not how all NNI funds are allocated. Options for approval include conditionally approving the other aspects of the proposal and pausing Task 3.2.b while waiting to receive information on passive detections from RTR or approving the entire proposal with the caveat that tagging of yearling spring Chinook Salmon at RIS would only occur for 2026.

T. Dresser raised the concern that if the PRCC did not approve the proposal it would be difficult to get a change order in place prior to when RTR needs to move forward with hiring. Grant PUD asked the PRCC whether they could approve the proposal and budget as presented, with the caveat that *Task 3.2.b RIS Yearling Chinook PIT-tagging* would be placed on hold until the PRCC received additional information from RTR. Some potential questions for RTR would include understanding near-term labor and contracting needs for PIT tagging at RIS versus RRJ, and needs for “seeding” avian colony islands with PIT tags for both species’ studies. K. Murdoch said that the methods of desktop analysis are acceptable; however, it is unclear which Upper Columbia River spring Chinook Salmon group would be most appropriate to use in avian predation rate analyses. The PRCC representatives agreed this would be acceptable to approve the budget but send questions to RTR about Task 3.2.b to refine the scope of that analysis in the coming weeks.

L. Rohrbach will sent the following questions to Grant PUD to share with RTR pertaining to whether the goals of *Task 3.2.b RIS Yearling Chinook PIT-tagging* in their 2026 proposal can be achieved using passive detections at Rocky Reach Juvenile Bypass instead of tagging additional spring Chinook Salmon at Rock Island Dam:

- *The PRCC understands you are still finalizing the results of your analyses using the passive detections at RRJ and the Wenatchee Barge. Can these early results be shared with the PRCC in the next couple of weeks to help inform the PRCC whether it’s feasible to estimate survival and predation from the passive detections?*

- *What consequences would there be to the analysis of spring Chinook survival and predation if using passive detections as a starting point?*
- *The PRCC understands your earliest task is to ‘seed’ the islands with PIT tags. Do you need to confirm the spring Chinook study group sooner than later to move forward on seeding the islands?*
- *Any other feedback on how selecting a different starting population for spring Chinook would influence the study implementation or potential outcomes is helpful.*

Responses will be discussed during the PRCC conference call on February 24, 2026.

The PRCC approved the NNI funding (H601) request of \$359,882 from RTR for the project titled *Avian Predation on Juvenile Salmonids on the Middle Columbia River, 2026* with the condition that activities under *Task 3.2.b RIS Yearling Chinook PIT-Tagging* is postponed until further information is received from RTR about use of passive detections as an alternative approach.

IV. Decoupling Summer Subyearlings and Steelhead SOA

A revised draft SOA, *Decoupling Summer Subyearling Survival Estimates From Juvenile Steelhead Survival Estimates*, was distributed to the PRCC by K. Geris on November 20. The PRCC discussed the JFP’s comments and edits to the document during the meeting.

Bill Gale provided the PRCC with the JFP’s updated version titled *JFP-Revised SOA-Decoupling Summer Subs from Steelhead* (Attachment B), which was distributed to the PRCC by K. Geris on January 23. This version accepted and cleared out the older tracked changes. The JFP and Grant PUD had consensus on the first four bullet points under the Statement section.

The following bullet point was discussed during the meeting:

- *The parties agree in principle that No-Net-Impact (NNI) funds may be used to partially or completely fund PRCC approved pilot or laboratory studies directly supporting development of a subyearling Chinook survival study plan. All proposed expenditures require PRCC consensus approval of scope, budget, and protocols prior to obligation, consistent with the NNI Fund; Guidance Document and Spec Sheet.*

T. Dresser inquired into the meaning behind the use of “in principle.” B. Gale replied that this statement intends to clarify that the JFP is comfortable using NNI funds for PRCC-approved studies, or studies directly supporting the development of a subyearling Chinook Salmon survival study plan. However, the JFP is uncomfortable with blanket approvals of study plans and budgets without undergoing the normal PRCC review process. With this language, the JFP were trying to be responsive to Grant

PUD's concerns while also being responsive to the JFP's concerns about agreeing to a specific dollar amount associated with use of NNI funds. T. Dresser agreed this meaning makes sense but still felt that "in principle" implied lack of clear commitment and may not be clear enough if future PRCC members were to pick up this SOA and suggested "may be used." Chad Jackson suggested that "in principle" could be replaced with "may" or "can" to clarify that language. The most important point is that the JFP acknowledges that any use of NNI funds would be approved through the PRCC's procedures. T. Dresser tentatively agreed to a suggestion to delete the words "The parties agree in principle..."

B. Gale said edits made to the sixth bullet refine the reference to the Settlement Agreement language.

B. Gale said edits to the seventh bullet reflect consensus within the JFP to identify in this agreement what happens at the end of this 5-year agreement. Absent PRCC consensus on a new direction for subyearling survival standards, the JFP recommend the default determination is to go back to what is already in the Settlement Agreement (to recouple the subyearling Chinook Salmon survival standard with steelhead), because through this agreement the PRCC are not creating any new standard beyond the 5-year term of the SOA. This SOA creates the foundation for this group to come to consensus within 5 years and avoid defaulting to the Settlement Agreement language. T. Dresser said he can see the JFP is trying to move this forward and appreciates those efforts. Grant PUD will have to think carefully about what this means 5 years from now; simply going back to recoupling survival standards for these species is still a concern. B. Gale said, to be clear, no party of the JFP wants to recouple these species; we want to build a path toward measuring subyearling survival, but do not want to leave this uncertainty at the end of 5 years.

Grant PUD will review JFP edits to the revised draft SOA *Decoupling Summer Subyearling Survival Estimates From Juvenile Steelhead Survival Estimates* for discussion during the PRCC conference call on February 24, 2026.

V. Past Survival Studies Review

R. O'Connor presented Grant PUD's *Juvenile Steelhead Survival Synthesis Priest Rapids Project (2008-2017)* (Attachment C), which was distributed to the PRCC by K. Geris on January 26. This document is a synthesis of Grant PUD's juvenile steelhead survival studies and contains all previous reports that will be compared with the 2026 survival study results. K. Murdoch asked whether questions and comments could be addressed during a future PRCC meeting. R. O'Connor replied that questions and discussion on the document is welcome, and this is the purpose of preparing this

synthesis; however, it should be noted that the synthesis is based on the results of previously approved studies, so he is not anticipating making revisions to the content.

VI. 2026-2028 Smolt Survival Study Preparations

R. O'Connor said that Grant PUD is coordinating with the study contractor LGL Limited's representatives before actively placing equipment in the field. L. Rohrbach asked what actions can be anticipated in February 2026? R. O'Connor replied that all equipment will be assembled at the end of February and ready for deployment in March 2026.

VII. Annual Progress and Implementation Report

T. Dresser said that the report will be distributed to the PRCC for review on approximately February 15, 2026, for a 30-day comment period.

VIII. 2025 Fish Passage Operations Report

L. Rohrbach said the PRCC needs to identify Agency Spill Representatives for 2026 Spill Season.

B. Gale and S. Carlon volunteered to be the agency spill representatives for the 2026 spill season.

A. Fish Ladder Inspections

No updates were shared.

B. Fish Spill Updates

No updates were shared.

C. Adult Fish Counts for 2025 (April 15 to November 15)

The following are final adult fish counts from April 15 through November 15:

Project	Spring Chinook Salmon ^a		Summer Chinook Salmon ^b		Fall Chinook Salmon ^c		Sockeye Salmon	Coho Salmon	Steelhead
	Adults	Jacks	Adults	Jacks	Adults	Jacks			
PRD	15,932	842	38,260	920	21,707	1,272	141,503	16,221	9,363
WAN	15,784	1,470	41,158	993	10,410	723	139,607	16,063	9,110
RIS	14,532	1,017	39,868	1,194	7,905	306	139,677	15,874	7,880

Notes:

a: Chinook Salmon counted from April 15 to June 13 are considered spring Chinook Salmon.

b: Chinook Salmon counted from June 14 to August 13 are considered summer Chinook Salmon.

c: Chinook Salmon counted after August 14 are considered fall Chinook Salmon.

PRD = Priest Rapids; WAN = Wanapum; RIS = Rock Island

UPDATES

VIII. Review of Outstanding NNI-Funded Projects

- **Lower Wenatchee Instream Flow Enhancement Project Phase II**

Updates were provided to the PRCC Habitat Subcommittee in their November 13, 2025, and January 8, 2026, meetings. L. Rohrbach said that demolition of the pump station occurred in early October 2025 and the new pipeline was installed in early December 2025. The pump house building was installed in early January 2026.

- **Northern Pike Removal**

A 2025 Lake Roosevelt Northern Pike Suppression Memorandum was distributed to the PRCC by K. Geris on January 6.

- **WDFW PIT-Tag Detection Barge**

No updates were shared.

- **2026 Quincy Northern Pikeminnow Derby**

T. Dresser said that Quincy Valley Chamber of Commerce is requesting \$25,000 in NNI funding to hold the Northern Pikeminnow Fishing Derby from May 15 through May 17, 2026 (Attachment D). Anglers will be targeting larger pikeminnow and will not be using bait that attract smaller fish or juveniles.

The PRCC approved the NNI funding (H601) request for \$25,000 from Quincy Valley Chamber of Commerce/Tourism Association for the project.

- **2026 RTR Avian Predation Study**

Covered above.

IX. Subcommittee Updates

K. Geris will continue to forward subcommittee notes and materials to PRCC members and alternates as follows:

- Priest Rapids Fish Forum – met December 3, next meeting January 7.
- Habitat Subcommittee – met December 11, next meeting January 8.
- Fall Chinook Work Group – met October 7, next meeting April 30.
- Hatchery Subcommittee – will meet December 17 to 18, next meeting January 20 and January 29.

X. SOAs Discussed in 2026

SOA number	Key Words	Last Discussed	Status
2026-XX	Decoupling Summer Subyearling Survival	January 27, 2026	In Review
2026-XX	Survival Evaluations - Path Forward	November 25, 2025	In Review

XI. Next Meetings

The next PRCC meeting will be on Tuesday, February 24, 2026, from 9:00 a.m. to 12:00 p.m., to be held virtually. A joint session with the Habitat Conservation Plan

Coordinating Committee (HCP-CC) for a Subyearling Chinook Salmon Workshop Recap (Joint Session 14) will be held from 12:30 p.m. to 1:00 p.m. (schedule TBD).

XII. Attachments

Attachment A – PRCC NNI Funds Specification Sheet for RTR’s 2026 Avian Predation Study

Attachment B – *JFP-Revised SOA_Decoupling Summer Subs from Steelhead*

Attachment C – *Juvenile Steelhead Survival Synthesis Priest Rapids Project (2008-2017)*

Attachment D – PRCC NNI Funds Specification Sheet for Quincy Valley Chamber of Commerce/Tourism Association’s 2025 Northern Pikeminnow Derby

XIII. Subyearling Workshop Recap (Joint Session 13 with Habitat Conservation Plan Coordinating Committee)

The PRCC and HCP-CC convened Joint Session 13 to discuss PUD updates on draft study plans (see separate joint session minutes).

**PRCC NNI Funds
Project Specification Sheet
Avian Predation on ESA-Listed Juvenile Salmonids – 2026**

Date submitted: January 26, 2026
Project Sponsor: Real Time Research, Inc. (RTR)
Project Liaison: PRCC Representative – Tom Dresser ~ TDresser@gcpud.org
Project Title: Avian Predation on Juvenile Salmonids on the Middle Columbia River, 2026
Project Type: Research (Avian Predation)

Location: The avian predation research activities will be conducted in the Columbia River Plateau (CRP) region and include colonies that are within foraging distance of the middle Columbia River. This encompasses/includes Potholes Reservoir, Lenore Lake, Banks Lake, Island 20, Hanford Island, and any incipient colonies that form in the CRP region above the Snake River confluence

Requested Funding Amount: \$359,882.00.

Project description: Similar to prior years, this work is part of a comprehensive program to implement avian predation management plans (including adaptive management), evaluate action effectiveness of those plans, and identify emerging predation concerns. Five primary objectives are included in this proposal as follows. Specific details on each objective can be reviewed in the proposal.

- Objective 1. Evaluate response of Caspian terns and other piscivorous colonial waterbirds to nest dissuasion activities on Goose Island and elsewhere in Potholes Reservoir.
- Objective 2. Determine changes in nesting distribution and colony size of Caspian terns and other piscivorous colonial waterbirds on or near the mid-Columbia River
- Objective 3. Determine changes in survival and predation rates on salmonid smolts by Caspian terns and other piscivorous colonial waterbirds nesting on or near the mid-Columbia River.
 - ✓ Task 3.1.a. *RIS Steelhead PIT-tagging*
 - ✓ Task 3.2.b. *RIS Yearling Chinook PIT-tagging*
 - ✓ Task 3.2 *PIT tag recovery*
 - ✓ Task 3.3. *Survival and predation rate analyses*
- Objective 4. Provide technical assistance to GPUD/PRCC in developing and adaptively managing short- and long-term plans to reduce avian predation on juvenile salmonids.
- Objective 5. Conduct an analysis of avian predation on double-tagged steelhead and yearling Chinook in the Priest Rapids Project.

Project Justification: This proposal provides NNI funds to ensure the continuation of a comprehensive program which informs and aids the co-managers in the implementation of the avian predation management plans (including adaptive management), provides data to evaluate the effectiveness of those plans and identify emerging predation concerns.

Project Cost: Real Time Research, Inc. is requesting \$359,882.00. Similar to years past, cost sharing provided by other agencies in 2026 (i.e., BPA, USACE, and BOR) reduces the costs to do the work proposed below with funding from the PRCC.

Estimated cost of the work proposed to the GPUD/PRCC in 2026 are provided by objective (see below). As was the case in previous years, most of the funding for avian predation RM&E in the Columbia River Basin in 2026 will come from other sources (e.g., BPA).

Objective	Description	Estimated Cost
1	Evaluate response of Caspian terns and other piscivorous colonial waterbirds to nest dissuasion activities on Goose Island and elsewhere in Potholes Reservoir	\$48,866
2	Determine changes in the nesting distribution and colony size of Caspian terns and other piscivorous colonial waterbirds on or near the mid-Columbia River	\$90,755
3	Determine changes in survival and predation rates on PIT-tagged salmonid smolts by Caspian terns and other piscivorous colonial waterbirds nesting on or near the mid-Columbia River	\$206,486
4	Provide technical assistance to GPUD/PRCC in developing and adaptively managing short- and long-term plans to reduce avian predation on juvenile salmonids	\$13,775
	Total Cost (newly proposed)	\$359,882
5	Conduct an analysis of avian predation on double-tagged steelhead and yearling Chinook in the Priest Rapids Project	\$36,549 (previously approved)

Estimated Timeline: The field and data collection, data analysis, and reporting activities for the avian predation project are anticipated to begin in February and extend through October 2026. Like prior years, a draft report to the PRCC is anticipated to be provided to the PRCC in February 2026. Below is a proposed schedule for this proposal.

- (1) Feb – Mar 2026: Hire field crew & submit research permit applications (WDFW, USFWS, BOR)
- (2) Apr – Jul 2026: Colony monitoring.
- (3) Apr – Jun 2026: PIT-tagging of steelhead and yearling Chinook at Rock Island Dam.
- (4) Jul – Oct 2026: PIT tag recovery on bird colonies.
- (5) Jan 2027: Submit draft annual report.
- (6) Mar 2027: Submit final annual report

Deliverables: Research results would be presented in (1) an Annual Report, (2) periodic in season reports, (3) peer-reviewed journal articles, and (4) presentations at regional planning meetings and other professional meetings.

**Priest Rapids Coordinating Committee
Statement of Agreement**

**Decoupling Summer Subyearling Survival Estimates
From Juvenile Steelhead Survival Estimates**

Submitted to the Priest Rapids Coordinating Committee: _____

Approved by the Priest Rapids Coordinating Committee: _____

Statement: The Priest Rapids Coordinating Committee (PRCC) recognizes that the actual No Net Impact contribution rate for summer subyearling Chinook is unknown, as survival studies for this species have not yet been conducted. With this in mind, decoupling applies solely to the calculation of annual NNI contributions for summer subyearling Chinook and does not alter performance standards or Covered Species obligations under the Settlement Agreement.

- The PRCC agrees that the current estimated baseline survival for summer subyearling Chinook (83.43%, ± 2.5 SE) will be used to calculate the annual NNI contributions for the 5-year duration of this SOA (2027-2032).
- Methodologies for NNI calculations, as described in Section 15.7 of the Priest Rapids Salmon and Steelhead Settlement Agreement (SSSA), will remain unchanged.

In accordance with Section 15.6 (New Survival Estimates) of the SSSA, updated survival estimates for summer subyearling Chinook will be based on the arithmetic three-year average annual estimates, once survival studies are completed.

- Over the term of this five-year SOA, approved pilot studies will be conducted to address critical uncertainties which may include but not limited to fish source, travel time, tag effects, fish size, and emigration behaviors (e.g. residualism, active migrant, etc.), to support the development of a summer subyearling Chinook survival study plan.
- The parties agree in principle that No-Net-Impact (NNI) funds may be used to partially or completely fund PRCC approved pilot or laboratory studies directly supporting development of a subyearling Chinook survival study plan. All proposed expenditures require PRCC consensus approval of scope, budget, and protocols prior to obligation, consistent with the NNI Fund; Guidance Document and Spec Sheet.

- At the end of this SOA, the most current and best available scientific information and analysis collected over the five-year SOA timeframe (2025-2032) will be the standard of care for implementation as further described in Section 4.2 of the SSSA (Standard of Care).
- Any extension of this SOA requires consensus which may be based on documented study progress and agreed upon next steps. Absent consensus on an SOA extension (or some other consensus solution), by December 31, 2032, this SOA shall terminate and subyearling Chinook will be recoupled with steelhead (steelhead – 3.6%) for NNI calculations as described in Section 15.6 and Table 3 of the SSSA until which time approved subyearling Chinook survival estimates are established under Section 15.6¹.
- ~~At the conclusion of this SOA, the PRCC may elect to: (1) extend the SOA; (2) terminate the SOA and recouple subyearling Chinook with steelhead; and/or (3) proceed with subyearling Chinook survival studies. If the PRCC is unable to reach agreement at the conclusion of this SOA, subyearling Chinook will be recoupled with steelhead until such time as the PRCC develops a consensus solution.~~

Background:

In 2006, the Parties to the SSSA acknowledged that study methodologies to measure project passage survival rates had not been sufficiently established to conclusively measure summer subyearling Chinook survival. As a result, the Parties agreed that baseline survival for summer subyearling Chinook would be based on 2003 Project operating conditions for spring Chinook minus 3.6% (SSSA, Tables 1 & 3), transitioning to steelhead minus 3.6% in 2009 following the anticipated first three years of steelhead survival studies (SSSA, Table 3), and consistent with the surrogate relationship reaffirmed in PRCC SOA 2017-2. This relationship (Steelhead -3.6%) remains the default standard until project-specific subyearling data are available.

Because site-specific studies had not been completed at the time of signing, inferences about Covered Species' survival (and NNI contributions) were initially based on surrogate data from off-site studies. Those data supported the assumption that spring Chinook survival was an adequate surrogate for steelhead survival. Accordingly, the baseline estimate for steelhead survival, until studies were conducted, was assumed to be equal to spring Chinook. Off-site data also supported the assumption that sockeye and summer subyearling Chinook survivals were likely to be lower than those for spring Chinook and juvenile steelhead (SSSA, Table 3). Therefore, the baseline survival values for both

¹ This does not preclude any Party to the Priest Rapids Salmon and Steelhead Settlement Agreement from utilizing the dispute resolution process (Part VI. Sections 6.1-6.6).

sockeye and subyearling summer Chinook were established at 2.7-3.6% lower than spring Chinook and juvenile steelhead (SSSA, Table 3)

To date, performance standard evaluations for summer subyearling Chinook have not been conducted, as study methodologies have not been sufficiently established to conclusively measure survival. Nor has the Parties determined the best path forward to conduct survival evaluations. It is the PRCC's expectation that data will be collected to inform the development of a survival study plan by 2032.

Literature Cited:

Public Utility District No. 2 of Grant County, Washington (Grant PUD). 2024. Priest Rapids Project Annual Progress and Implementation Report to Federal Energy Regulatory Commission (FERC). Grant PUD, Priest Rapids Project No. 2141. Ephrata Washington 98823.

Public Utility District No. 2 of Grant County, Washington (Grant PUD). 2006. Priest Rapids Salmon and Steelhead Salmon and Steelhead Settlement Agreement. Grant PUD, Priest Rapids Project No. 2141. Ephrata Washington 98823.

Juvenile Steelhead Survival Synthesis Priest Rapids Project (2008-2017)

By: Public Utility District No. 2
of Grant County, Washington

January 2026

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1 Background

The *Juvenile Steelhead Survival Synthesis* was developed to provide the National Marine Fisheries Service (NMFS), Public Utility District No. 2 of Grant County, Washington (Grant PUD), members of the Priest Rapids Coordinating Committee (PRCC), and other interested stakeholders with a technical summary of past juvenile steelhead survival evaluations conducted through the Priest Rapids Hydroelectric Project by Grant PUD. This synthesis integrates results from more than a decade of telemetry-based survival and behavioral studies (2008–2017) to document trends, evaluate compliance with established performance standards under the NMFS Biological Opinions and 2006 Salmon and Steelhead Settlement Agreement, and identify factors influencing interannual variation in survival and migratory behavior. The intent of this document is to consolidate existing knowledge into a single reference that both contextualizes historical results and supports the design, implementation, and interpretation of the upcoming 2026–2028 evaluation cycle.

The Priest Rapids Hydroelectric Project (hereafter Project) is owned and operated by Grant PUD, and spans the mid-Columbia River in central Washington, including two major developments—Wanapum and Priest Rapids dams and their associated reservoirs. Since 2003, Grant PUD has implemented a comprehensive fish telemetry program to evaluate the downstream survival and migratory behavior of juvenile salmonids as they navigate this system. These studies were designed to fulfill regulatory obligations defined under the National Marine Fisheries Service (NMFS) Biological Opinions and the 2006 Salmon and Steelhead Settlement Agreement (SSSA), both of which establish performance standards and adaptive management requirements for ESA-listed species.

The primary objective of the Grant PUD telemetry program was to estimate juvenile salmonid survival for three focal species—yearling Chinook Salmon (*Oncorhynchus tshawytscha*), Sockeye Salmon (*O. nerka*), and steelhead (sea run *O. mykiss*)—through the full extent of the Project, from 1,000 ft below Rock Island Dam to 1,000 ft below Priest Rapids Dam. Ancillary objectives included estimating survival at multiple spatial scales (i.e., dam and development), analyzing behavioral metrics such as residence time and passage route selection, identifying behavioral indicators of avian predation, and evaluating the influence of environmental and operational covariates on survival outcomes. The performance standards, established under the Salmon and Steelhead Settlement Agreement (SSSA) and NMFS Biological Opinions, require that each development (reservoir and dam combined) achieve a minimum survival of 0.93 with a standard error ≤ 0.025 , and that the Project as a whole (both developments combined) achieve a minimum survival of 0.8649 with a standard error ≤ 0.025 .

To demonstrate compliance, survival performance is evaluated using a rolling three-year arithmetic mean for each focal species. A species is deemed to have met the standard if the mean survival meets or exceeds the applicable threshold over three consecutive years. Once a species achieves compliance, the standard requires periodic re-evaluation—originally every five years but extended to a ten-year cycle in 2018—to ensure continued performance under representative environmental and operational conditions.

For the purposes of this synthesis, the Grant PUD telemetry program is divided into four distinct phases: the PIT phase (2003–2005), the HTI phase (2006–2010), the JSATS phase (2011–2017) and the upcoming phase (2026–2028). During the initial PIT phase, Grant PUD evaluated and met the Project survival performance standard for yearling Chinook Salmon (*Oncorhynchus tshawytscha*) as outlined in NMFS (2004) using Passive Integrated Transponder (PIT) technology with a three-year arithmetic mean of 0.866 (Anglea et al. 2003, 2004, 2005).

During the HTI phase (2006–2010), the telemetry program transitioned to using Hydroacoustic Technology, Inc. (HTI) acoustic telemetry to evaluate survival and behavior for the three focal species. The 2006 and 2007 survival results were invalidated by the Priest Rapids Coordinating Committee (PRCC) due to study design issues that was likely significantly underestimating survival (Timko et al. 2007 and 2008).

In 2008, behavioral evaluations for all three focal species continued, incorporating 3D tracking methods. This year also included survival estimation for steelhead and the first pilot studies on a fourth focal group—subyearling

Chinook salmon—focusing on behavioral testing at Priest Rapids Dam (Sullivan et al. 2009). A key focus during this period was evaluating fish behavior before and after the installation of major bypass structures: the Wanapum Fish Bypass (WFB), completed in 2008, and the Priest Rapids prototype Top-Spill, installed in 2006.

In 2009 and 2010, steelhead and Sockeye salmon survival studies and 3D behavioral tracking continued at both developments (Timko et al. 2010 and 2011). During this time, Sockeye salmon met the performance standard of >0.93 ($SE \leq 0.025$) for each development, with Project survival estimates of 0.921 (SE 0.0142) in 2009 and 0.9114 (SE 0.0187) in 2010. Because these results achieved the standard in two consecutive years, the PRCC approved Sockeye salmon for compliance without requiring a third year of testing. During this phase, 2008-2010, juvenile steelhead did not meet the Project survival performance standard with a three-year arithmetic mean of 0.810 (SE 0.0146).

During the JSATS phase (2011–2017), the Project’s acoustic telemetry equipment was upgraded, replacing the HTI system with tags and receivers based on the Juvenile Salmon Acoustic Telemetry System (JSATS) technology. The first JSATS-based study in 2011 focused on identifying juvenile steelhead mortality “hot spots” within the Priest Rapids Development and tagging three predatory fish species—Northern pikeminnow (*Ptychocheilus oregonensis*), walleye (*Sander vitreus*), and smallmouth bass (*Micropterus dolomieu*)—to evaluate predator-prey interactions (Thompson et al. 2012). This was conducted as a single-release survival study, and therefore the results were not applicable for consideration as a point-estimate survival through the Priest Rapids development.

From 2014 to 2017, Project survival evaluations were reinstated to assess steelhead survival, which had not yet met the Project standard and therefore required at least three consecutive years of study (Hatch et al. 2015, 2016, 2017, 2018). In addition to steelhead, yearling Chinook Salmon were re-evaluated in 2014, and Sockeye Salmon were re-evaluated in 2015. This phase of studies also incorporated a 3D tracking array positioned in front of the newly operational Priest Rapids Fish Bypass (PRFB) to provide fine-scale behavioral data in the forebay and passage routes.

In 2014, a fracture was discovered at Wanapum Dam, prompting a significant reservoir drawdown to allow for structural repairs. As a result, the 2014 steelhead survival estimate was invalidated by the Priest Rapids Coordinating Committee (PRCC), while the yearling Chinook Salmon check-in was accepted with a Project survival of 0.9082 (SE 0.0145). In 2015, steelhead survival estimation continued using JSATS, and Sockeye Salmon were re-evaluated (five years after meeting the standard in 2010), once again passing with a Project survival of 0.9179 (SE 0.0120).

In 2016 and 2017, Project survival evaluations continued with juvenile steelhead as the sole study species. During these years, the study design shifted from previous iterations by discontinuing the development-by-development survival estimation approach. Instead, survival was estimated directly for the entire Project, rather than calculating individual development estimates and multiplying them to derive Project survival. Using the 2015–2017 studies, juvenile steelhead met the Project survival standard, with a three-year arithmetic mean survival of 0.870 (SE = 0.0204).

Beginning in 2026, Grant PUD will launch a new cycle of Project survival evaluations to re-assess juvenile steelhead, yearling Chinook Salmon, and Sockeye Salmon. This upcoming phase will mark the ten-year re-evaluation following the most recent JSATS-based survival studies conducted from 2011 to 2017.

Since its inception in 2003, Grant PUD’s telemetry program has generated an extensive dataset describing project- and reach-scale survival, migration timing, travel rates, passage route selection at both dams, and inferred avian predation rates from double-tagged fish recoveries. While the program’s methodological framework has remained largely consistent, each study cycle incorporated technical refinements in telemetry infrastructure, statistical design, and data collection methods. Collectively, these efforts have advanced Grant PUD’s adaptive management objectives, providing a robust foundation for understanding both interannual variability and long-term patterns in juvenile salmonid survival and behavior within the Priest Rapids Project.

2 Objective and Approach

While the Grant PUD telemetry program has included multiple species and age groups across the years, this report focuses exclusively on juvenile steelhead. Steelhead are of particular regulatory and biological interest due to their complex freshwater life histories, variable migratory behaviors, and inconsistent survival results through the Project.

Since 2006, Grant PUD conducted a series of telemetry-based studies to assess juvenile steelhead survival and behavior during downstream passage through the Project. These efforts produced a rich, decade-long dataset encompassing diverse river conditions, dam operations, and environmental scenarios, together forming the empirical foundation for this synthesis. This synthesis aims to consolidate past findings, highlight persistent trends and knowledge gaps, and provide a technical foundation for the design and execution of the upcoming 2026–2028 evaluation cycle.

This report curates, synthesizes, and interprets results from the 2006–2017 steelhead evaluations. Its objectives are to summarize survival outcomes and precision metrics, identify reach-specific mortality hotspots, characterize behavioral metrics such as migration rates, forebay residence times, and route passage selection, and examine the behavioral patterns of avian-predated fish. It also evaluates consistency, comparability, and methodological evolution across years. Through this process, the report distills a set of well-supported conclusions and key lessons learned to inform future study planning and performance assessments.

The analytical approach draws from annual reports and, where available, raw telemetry and environmental data. Emphasis is placed on comparability across years and spatial zones, identification of anomalies or deviations, and the contextualization of trends relative to project operations and environmental variability. As such this synthesis focuses on the steelhead studies that produced PRCC accepted Project survival estimations (i.e., 2008, 2009, 2010, 2015, 2016, and 2017). The synthesis is intended to be both retrospective and forward-looking, providing a cohesive summary of past results while establishing a framework for interpreting and guiding the next phase of research and monitoring.

This memorandum is structured to follow the logical progression of technical evaluation and synthesis. The Methods section describes the telemetry infrastructure, fish handling and tagging procedures, survival estimation models, behavioral metrics, and integration of environmental and operational data used across study years. It also identifies methodological changes that could influence data comparability.

The Results section synthesizes findings from each study year and across key analytical domains, including fish-specific characteristics, hydro system and environmental conditions, migration timing and rates, forebay residence durations, route-specific passage behavior, and survival metrics by passage route, reach, developments and through the Project. Where applicable, patterns in avian predation are examined. Interannual comparisons and spatial analyses are used to identify persistent trends and system-level variability.

The Discussion interprets the results of the meta-analysis, within both ecological and regulatory frameworks. It considers the implications of observed behavioral and survival patterns for future project operations and performance evaluations. This section distills high-confidence conclusions, highlights unresolved questions, and outlines key considerations for the upcoming 2026–2028 evaluation cycle.

By consolidating a decade of focused telemetry research into an integrated technical narrative, this report supports Grant PUD's ongoing commitment to science-based adaptive management, regulatory compliance, and the protection of ESA-listed salmonid populations within the mid-Columbia River.

3 Methods

3.1 Study Area

The Priest Rapids Hydroelectric Project spans a section of the mid-Columbia River in central Washington and served as the study area for these evaluations (Figure 1). The project consists of two hydroelectric developments—Wanapum Dam and Priest Rapids Dam—and their associated reservoirs. Survival and behavior of juvenile steelhead were evaluated across a river reach extending from Rock Island Dam at river mile (RM) 453 to various downstream detection locations, including Hanford Reach near RM 339. This 114-mile segment of the Columbia River includes both mainstem dam structures and open river habitats.

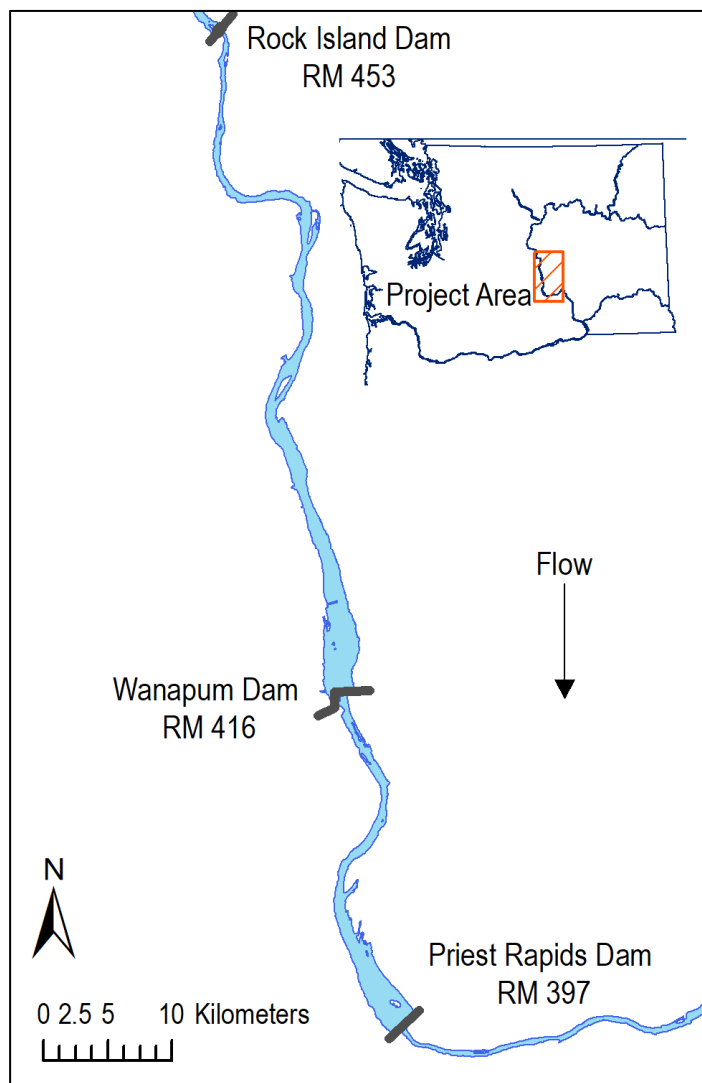


Figure 1. Study area for the Priest Rapids Project.

Steelhead Project survival evaluations were conducted over multiple years, beginning in the HTI phase (2006–2010) and continuing with a reassessment during the JSATS phase (2014–2017). Due to study design limitations in 2006 and 2007, the HTI phase analysis focuses on results from 2008–2010. Together, these periods encompass a broad range of operational conditions, hydrological regimes, and biological responses, providing a robust basis for retrospective analysis of fish passage and survival dynamics through the Priest Rapids Project.

3.2 Statistical Design

All survival evaluations employed a Paired Release Recapture study design, a statistically rigorous approach developed by Skalski et al. (1998) to estimate survival through defined river reaches. This design involves the surgical implantation of acoustic tags in juvenile steelhead and their subsequent release in two spatially distinct groups. The first group, a treatment group, is released at the upstream boundary of the reach of interest. A second group, the control group, is released at the downstream end of the reach of interest; and the timing of their release is meant to coincide with the passage of the treatment group through the downstream end of the reach of interest. The result is that both groups mix and travel together through the shared reach (i.e., from the downstream end of the reach of interest toward the detection arrays at the downstream end of the study area). Telemetry arrays deployed in the shared reach detect tagged fish and allow for estimation of survival by comparing the detection proportions of the control vs treatment groups. Specifically, the difference between control and treatment groups in the proportions detected in the downstream detection arrays can be explained wholly by the fact that one group travelled through the reach of interest, while the other did not – and as result, the ratio of their detection proportions is mathematically equivalent to the survival rate through the reach of interest (for details, see Skalski et al. 1998). This design is well-suited for hydropower systems like the Priest Rapids Project, where fish must navigate complex reservoir and dam environments. This approach inherently controls for detection efficiency, tag shedding, handling and tagging effects, and emigration outside the study area, although it is desirable to minimize each of the factors since they can impact the precision of the resulting survival estimates (thus requiring more study fish to achieve the same precision). In years when tag failure was suspected or documented (e.g., 2016), survival estimation models were adjusted accordingly to account for premature tag loss.

The Paired Release Recapture survival model carries particular assumptions that were independently validated by Columbia Basin Research for each survival study (Skalski et al. 2011 and 2017). These assumptions include:

1. Fish from both release groups mix randomly with each other before encountering downstream detection arrays.
2. The probability of detection is equal for treatment and control groups at all downstream arrays.
3. Tag failure and shedding are minimal and occur equally across control and treatment groups, or are otherwise accounted for.
4. No residualization occurs—fish are assumed to continue migrating downstream during the study period.
5. Environmental and operational conditions do not differentially affect survival of the control and treatment groups within the shared reach.
6. Fish do not re-ascend or bypass detection arrays without being recorded.

3.3 Acoustic Telemetry

Juvenile steelhead survival estimations through the Project were evaluated using acoustic telemetry technology for all study years summarized herein. Telemetry evaluations at hydroelectric projects on the Columbia River shifted toward the use of acoustic technology beginning in the early 2000's. Relative to radio telemetry, acoustics had the benefits of an increased detection range, since acoustic signals are not attenuated to the same degree when traveling through water (i.e., depth of tag has no effect on its recorded signal strength), and the tags have no need for external antennas that likely altered fish behaviors. Compared to PIT technologies, acoustic tags have much higher detectability, thereby reducing the number of tags and study animals required for desired precision. Acoustics also allow positioning of tags in three dimensions near dams or other areas of interest, allowing for discernment of fine scale behavior.

Hydrophones and receivers, whether cabled to shore or autonomously deployed underwater, detect the acoustic signals from the tags and record them (Figure 2). Groups of hydrophones are positioned around dams and at in-river arrays producing gates that record movement of study fish past a certain location in the river.

During the HTI phase (2006–2010), Hydroacoustic Technology, Inc. (HTI) acoustic telemetry systems—including receivers and coded transmitters—were used to evaluate Project survival, passage route selection, and migration behavior. In the subsequent JSATS phase (2014–2017), the program transitioned to Juvenile Salmon Acoustic Telemetry System (JSATS) technology to achieve these same study objectives. The change in technology was driven by advancements that allowed for smaller transmitters, reducing tag burden on study fish; autonomous, battery-powered receivers, which improved deployment and recovery logistics; and streamlined data processing, which significantly reduced both labor and study costs.

During both phases, 3D tracking was performed at Wanapum and Priest Rapids dams to support testing and evaluation of surface-spill fish bypass structures designed to improve juvenile fish passage. Although JSATS offered notable improvements in tag size, receiver autonomy, and cost efficiency, its 3D positioning accuracy—particularly in calculating the z-axis (fish depth)—was less refined than that of the HTI system. This limitation was not a major concern, as the highest need for precise 3D tracking occurred during bypass testing and development prior to 2014. The 3D tracking data collected during these studies are not summarized in the results of this synthesis.

Across the PRCC-accepted Project survival study years (2008–2010 and 2015–2017), telemetry arrays were configured within the immediate forebays of both Wanapum and Priest Rapids dams to determine the passage routes of all tagged study fish. These near-dam arrays enabled detailed classification of passage behavior across available routes, including fish bypass, spillway, and powerhouse pathways. This configuration was consistent across all accepted study years except 2017, when receiver deployments at both dams were limited to the Boat-Restricted Zone (BRZ). As a result, the 2017 array configuration did not permit determination of specific passage routes for that evaluation year.

Array locations varied over the study years, with a total of 14 different detection arrays deployed across the Project area (Figure 3 and Table 1). Notable expansions during the JSATS phase included the addition of downstream arrays at White Bluffs (RM 370) Lower Ringold (RM 351), as well as two arrays at Hanford (RM 337-339) and one at Pasco (RM 328) tested in 2016. These downstream arrays improved the ability to assess delayed handling effects in Priest Rapids Dam fish releases.

An analysis by Columbia Basin Research (referenced in Skalski et al. 2017) determined that the Vernita Bridge array was positioned too close to the Priest Rapids Dam release site, limiting the time available for handling effects to manifest in the control release group. This proximity violated a key assumption of the survival model. Following PRCC approval, the 2015–2017 steelhead survival analyses instead incorporated more distant downstream arrays at White Bluffs, Lower Ringold, and Hanford to produce more reliable survival estimates.



Figure 2. Acoustic technologies used in previous studies: a) HTI 290 receivers with cabled hydrophones and 307 kHz tags; and b) JSATS autonomous acoustic receivers and JSATS and 416 kHz tags.

Table 1. Acoustic detection array locations by study year, green indicates an active site.

Location	RM	Study Year								
		2006	2007	2008	2009	2010	2014	2015	2016	2017
Crescent Bar	442									
Sunland Estates	430									
Wanapum Dam [BRZ]	416									
Wanapum Dam [Forebay]	416									
Mattawa	408									
Priest Rapids Dam [BRZ]	397									
Priest Rapids Dam [Forebay]	397									
Vernita Bridge	388									
White Bluffs	370									
Ringold	361									
Lower Ringold	351									
Hanford 1	339									
Hanford 2	337									
Pasco	328									

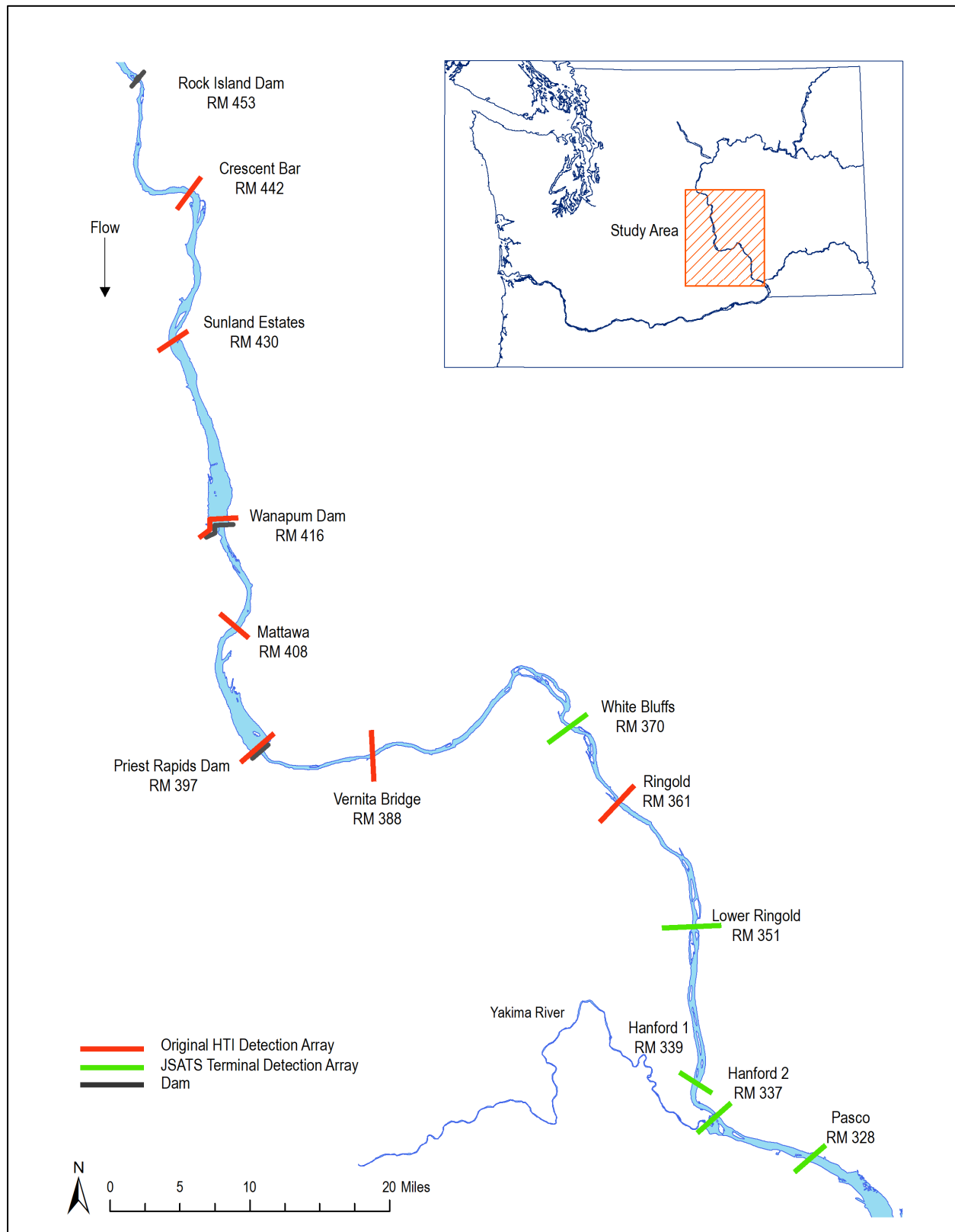


Figure 3. Locations of detection arrays in the study area over 2006-2017 acoustic survival studies.

3.4 Juvenile Steelhead Study Fish

Juvenile steelhead used as study fish during both the HTI and JSATS evaluation phases were collected using a method known as gateway dip-netting. *Gateways* are vertical slots adjacent to turbine intakes at hydroelectric dams, and as run-of-river juvenile fish migrate downstream, some become entrained in these gateway structures at Wanapum and Priest Rapids dams.

To collect gateway entrained fish, a crane-operated dip net is lowered into the gateway, opened to capture the fish, and then lifted back to the dam deck. Captured juveniles are transferred into a Grant PUD fish transport tank supplied with continuous river water flow to maintain fish health. Once the transport tank is full, the fish are trucked to the Wanapum right-bank fish tagging facility (hereafter referred to as *fish town*) for processing and tagging prior to release.

At *fish town*, gateway-dipped fish are unloaded into a holding tank and then conveyed into the tagging facility via an Archimedes screw (commonly referred to as a *pescalator*). Once inside, fish are sorted by species, size, and condition to ensure that only suitable candidates proceed to the tagging process. Following sorting, all candidate study fish were held for 24 hours prior to surgery. Steelhead were accepted for tagging based on a number of pre-determined acceptance/exclusion criteria detailed below:

Fish accepted if it:

- Is a juvenile steelhead;
- Has either an intact or clipped adipose fin;
- Is not previously tagged with a coded wire, elastomer, PIT, or acoustic tag; and
- It weighs enough that its tag burden will not exceed the maximum threshold percentage (3%).
-

Fish excluded if it:

- Is a non-target species;
- Is moribund or emaciated;
- Shows signs of prior tagging (e.g., radio, acoustic, PIT-tags);
- Indicates a positive reading when read with a PIT-tag reader;
- Has malformations such as spinal deformities;
- Exhibits descaling >20% on any side of body;
- Exhibits any sign of gas bubble trauma (GBT) or bacterial kidney disease (BKD);
- Has physical injuries severe enough to impede performance, such as: opercula damage, exophthalmia, eye hemorrhages (>10% of eye), head or body injuries, or missing fins and/or extreme erosion; or
- Shows evidence of infections; symptoms include fungal infections on body surface, gill necrosis, open lesions on body or fins, swollen body, ulcers, or copepod parasites on the eyes or gills.

Surgical implantation of acoustic transmitters and PIT tags followed established methods (Adams et al. 1998; Liedtke et al. 2012a,b) and remained consistent across study years. Juvenile steelhead were anesthetized with MS-222, measured, weighed, and scanned for existing tags before a small ventral incision was made to implant both tags. Incisions were closed with a double absorbable suture, and surgical tools were disinfected between fish.

Following surgery, fish recovered in oxygenated buckets with continuous river water flow and were monitored for equilibrium and normal swimming behavior. After ~24 hours, fish were transferred to fly tanks supplied with ambient river water and supplemental oxygen as needed. Releases occurred via helicopter to designated release locations in the Rock Island Dam tailrace, Wanapum Dam tailrace, and Priest Rapids Dam tailrace (Figure 4). All helicopter fish releases were overseen by an on-shore ‘spotter’ that actively communicated with the helicopter pilot to ensure a consistent release height and recorded the release time.

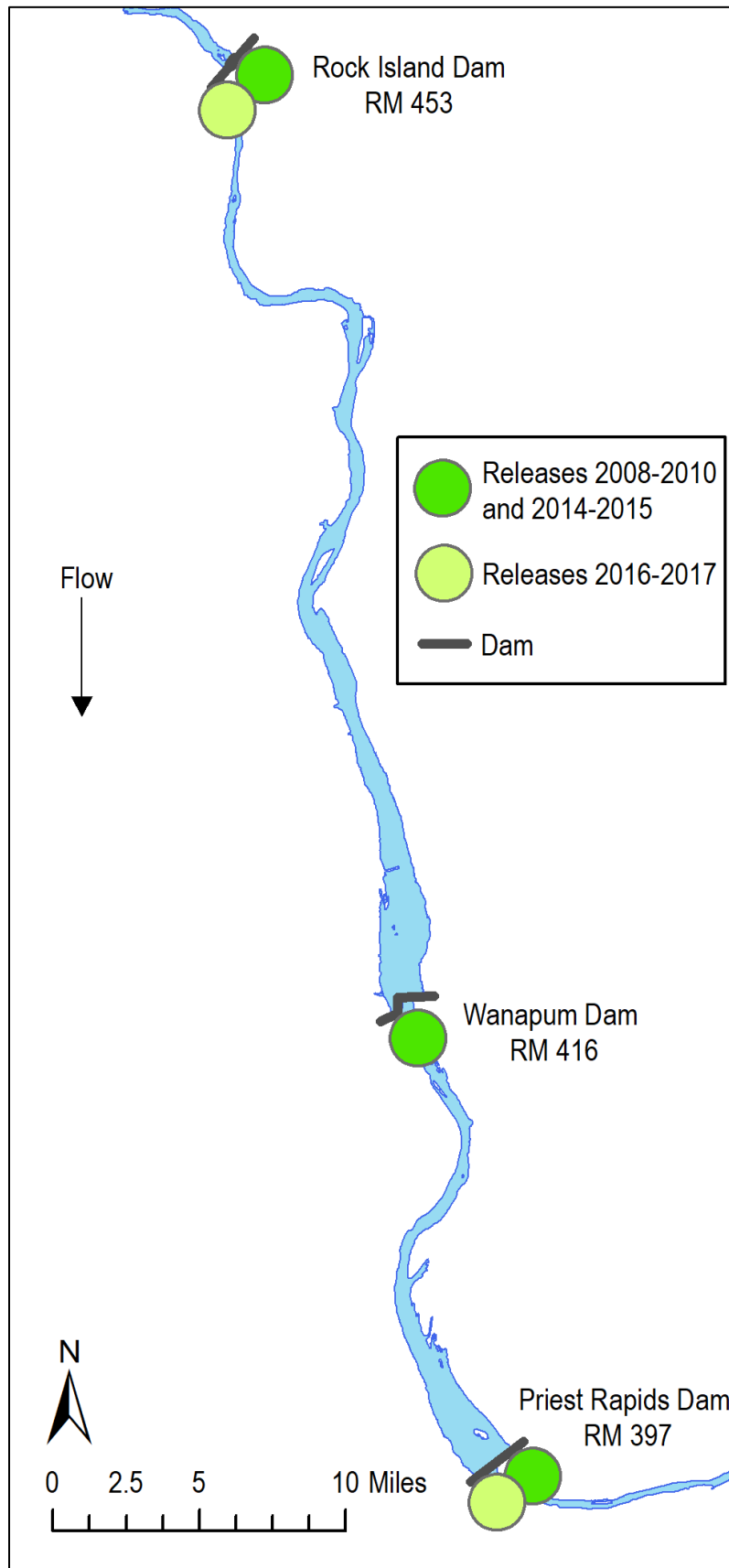


Figure 4. Locations of steelhead releases during acoustic studies.

4 Results

4.1 Fish Characteristics

4.1.1 Length and Weight

Across the six years of juvenile steelhead Project survival evaluations summarized herein (2008–2010 and 2015–2017), a total of 12,985 juvenile steelhead were collected, surgically implanted with acoustic tags, and released to estimate survival. Fish lengths ranged from 124.0 mm to 229.0 mm, with a mean length of 187.9 mm. Corresponding weights ranged from 17.5 g to 98.0 g, with a mean weight of 60.8 g.

The distribution of juvenile steelhead sizes—both in terms of length and weight—were generally consistent across all six study years. Figure 5 illustrates the overall length distribution of tagged fish, while Figure 6 presents the distribution of steelhead weights by year. These figures demonstrate that interannual variation in size was minimal.

Because fish were collected *run-of-river* and not selectively sampled, the study groups are considered representative of the juvenile steelhead population passing through the mid-Columbia River during each study year. As such, the model assumption of representative size distributions was met in all six evaluations.

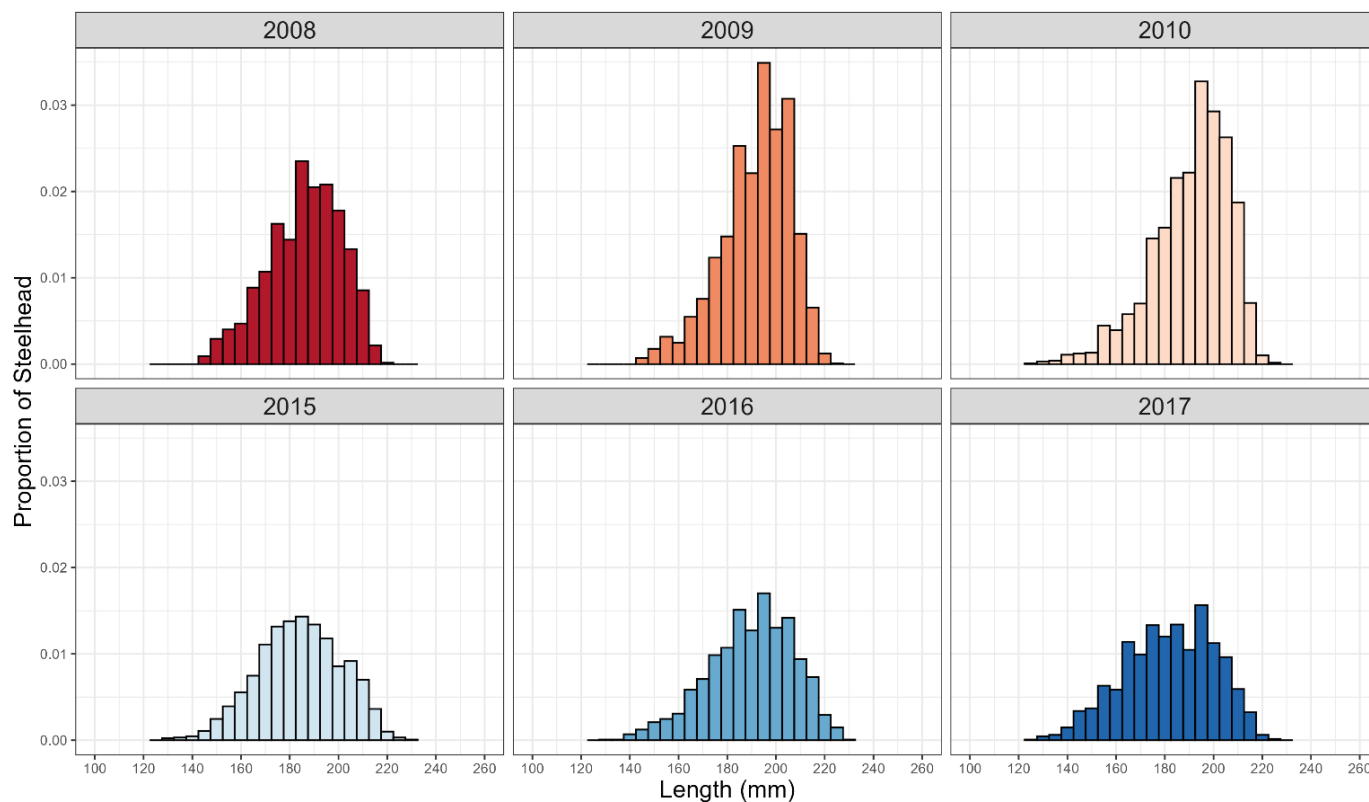


Figure 5. Histograms showing the distribution of juvenile steelhead fork lengths (in mm) used in survival evaluations, separated by study year (2008–2010 and 2015–2017).

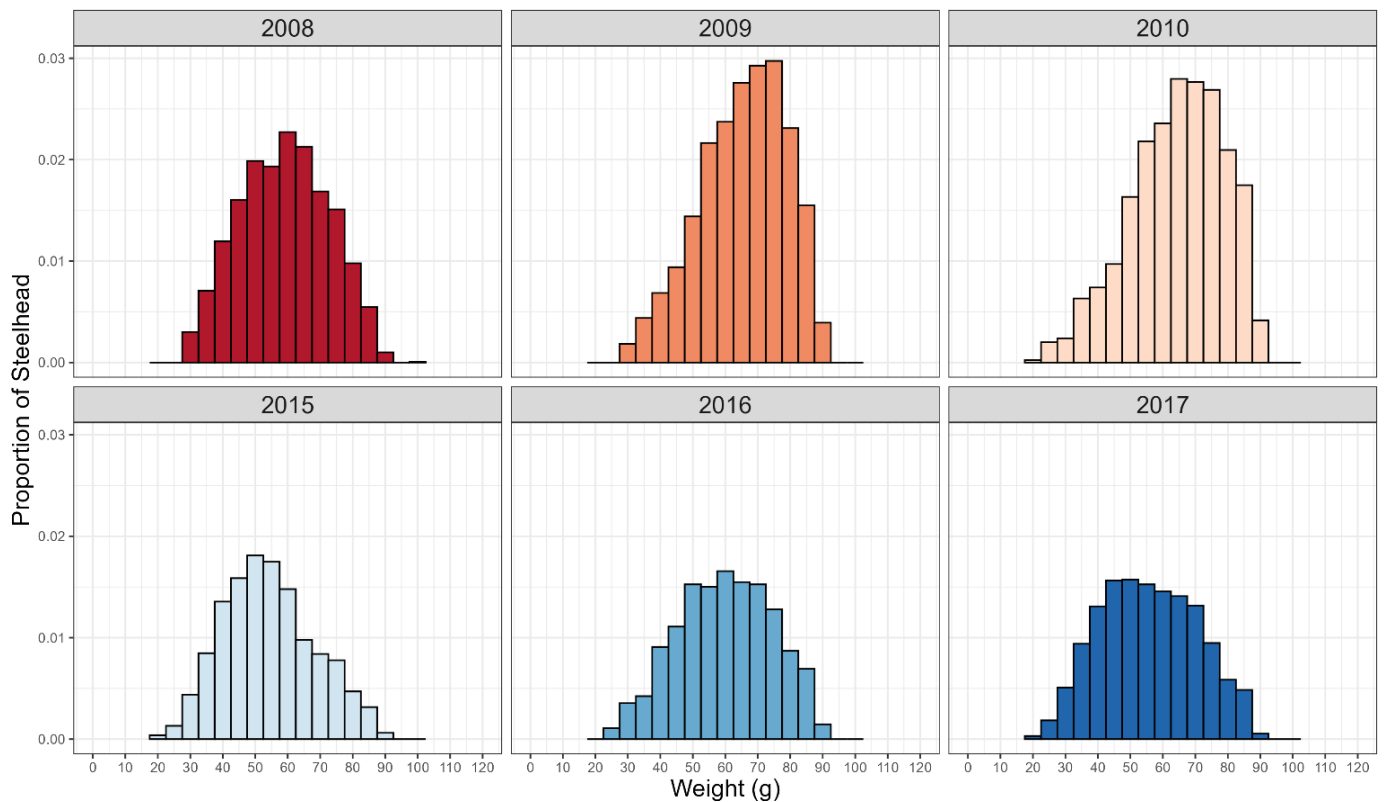


Figure 6. Histograms showing the distribution of juvenile steelhead weights (in grams) for each study year (2008–2010 and 2015–2017).

4.1.2 Release Timing and Smolt Index

Tagged juvenile steelhead were released with the explicit objective of aligning with the ongoing juvenile steelhead migration. The intent was for the release window to capture the majority of the steelhead run, ensuring that survival estimates would be representative of typical passage conditions.

To evaluate how well this objective was achieved, the release period for each study year was compared against the Rock Island Dam steelhead passage index, as compiled by Columbia DART. This comparison is visualized in Figure 7, which shows the Rock Island steelhead index (gray columns) for each study year, overlaid with the tagged fish release window (blue dotted lines). The long-term average Rock Island index (2000–2025) is also plotted (red line with shaded ribbon) to contextualize each year’s passage pattern against a 25-year trend.

Figure 8 presents an aggregated view, averaging the Rock Island steelhead index and release windows across all study years. This figure highlights how well the study periods captured the peak of the run and demonstrates that the average smolt index pattern across study years closely mirrored the 25-year index average, indicating that the conditions during each study were typical of long-term index trends.

When examining the release periods and corresponding steelhead index data averaged across the six study years, the cumulative study windows captured the majority of the total juvenile steelhead runs. On average, the study windows started when 9.1% of the run had passed, and ended when 82.8% of the total juvenile steelhead run had moved through the study area. The extent of coverage varied by year (Figure 7). The release start dates coincided with 2.6% to 18.8% of the run having already passed Rock Island Dam, while the release end dates extended to when 68.5% to 93.7% of the run had occurred. These values illustrate that while full-run coverage was not always achieved in each year, the releases consistently spanned a substantial portion of the migration and included peak passage periods in most cases.

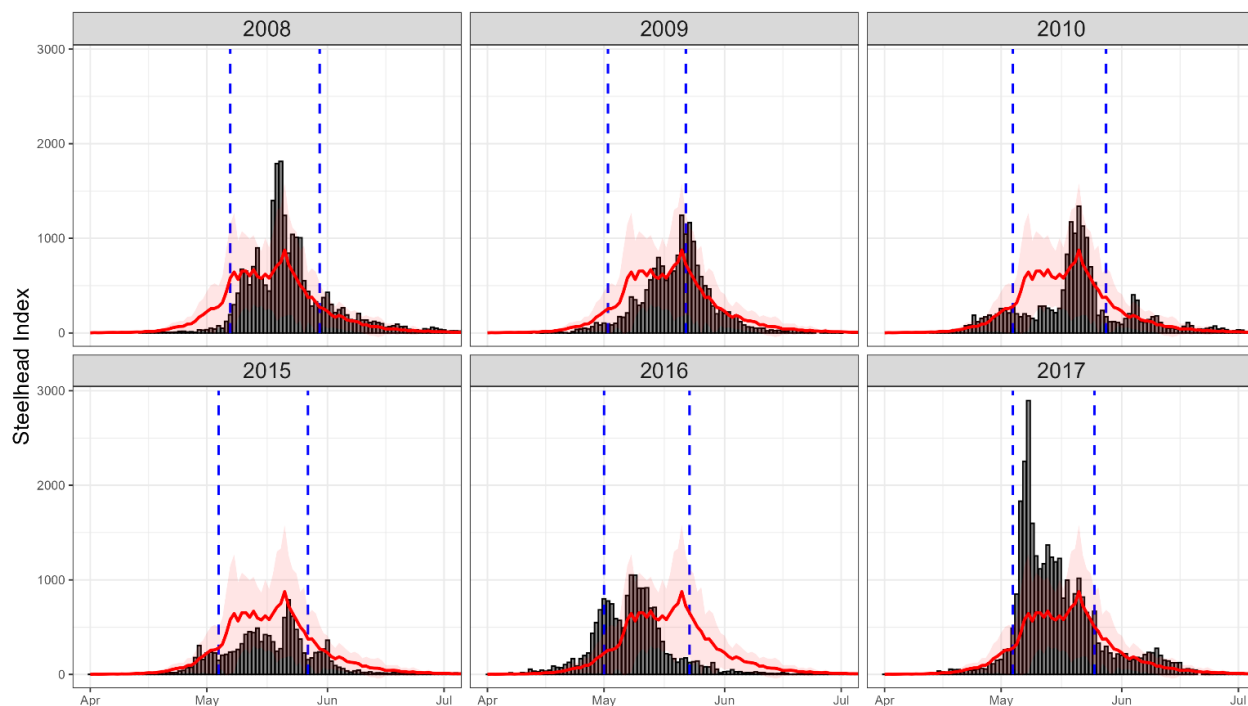


Figure 7. Daily juvenile steelhead index counts (gray columns) at Rock Island Dam for each study year (2008–2010 and 2015–2017). Blue dashed lines indicate the release window for tagged steelhead in each respective year. The red line represents the 25-year average (2000–2025) of the Rock Island steelhead smolt index, with the light red shaded ribbon denoting ± 1 standard deviation. Data source: Columbia DART.

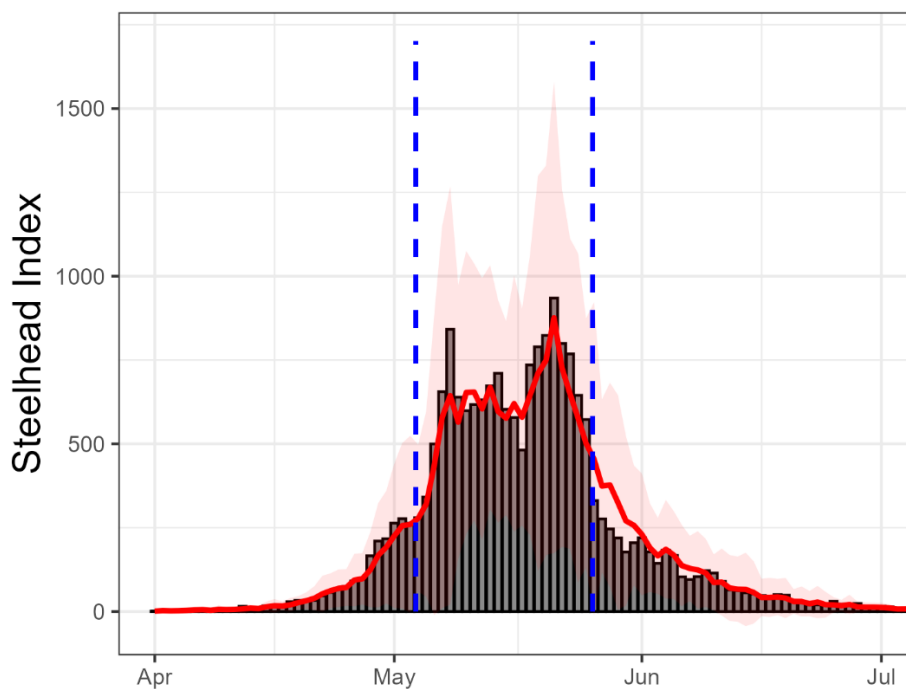


Figure 8. Mean daily juvenile steelhead index counts at Rock Island Dam during study years (2008–2010 and 2015–2017). The blue dotted lines represent the average release window for tagged steelhead across all study years. The red line shows the 25-year historical average (2000–2025) of the Rock Island steelhead index, and the red shaded ribbon indicates ± 1 standard deviation around that average. Data source: Columbia DART.

4.2 Environmental Conditions

Water temperatures during each study year were calculated by averaging daily values from Wanapum Dam and Priest Rapids Dam, providing a representative temperature profile for the entire project area. During the juvenile steelhead release periods, the minimum and maximum temperatures varied by study year, ranging on the low end from 7.1°C to 11.3°C, and from 11.4°C to 14.9°C at the high end (Figure 9). The mean temperature across all study years and release periods was 11.0°C. For comparison, the 25-year average (2000–2025) over the same juvenile steelhead release periods showed temperatures ranging from 9.2°C to 13.2°C, with a mean of 10.9°C (Figure 10).

Temperatures varied somewhat among years: 2008 and 2009 experienced below-average conditions, while 2015 and 2016 were warmer than average. Despite this variability, the overall average temperature during the six study years closely aligned with the 25-year average, indicating that the thermal conditions experienced by study fish were typical of long-term seasonal patterns.

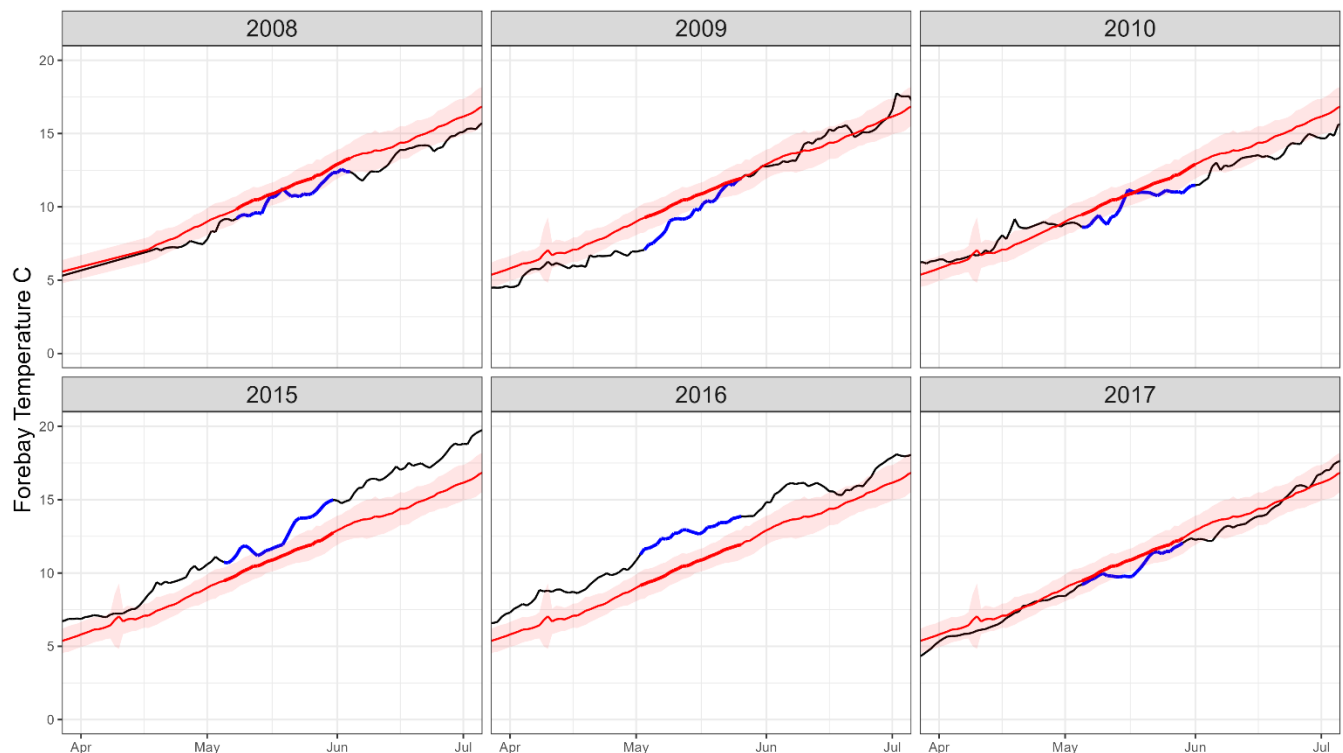


Figure 9. Averaged forebay water temperatures from Wanapum and Priest Rapids Dams during each study year (2008–2010, 2015–2017). The line is colored blue during the temporal extent of the study period for each year. The red line represents the 25-year historical average temperature (2000–2025), and the red shaded ribbon shows ± 1 standard deviation from the historical mean.

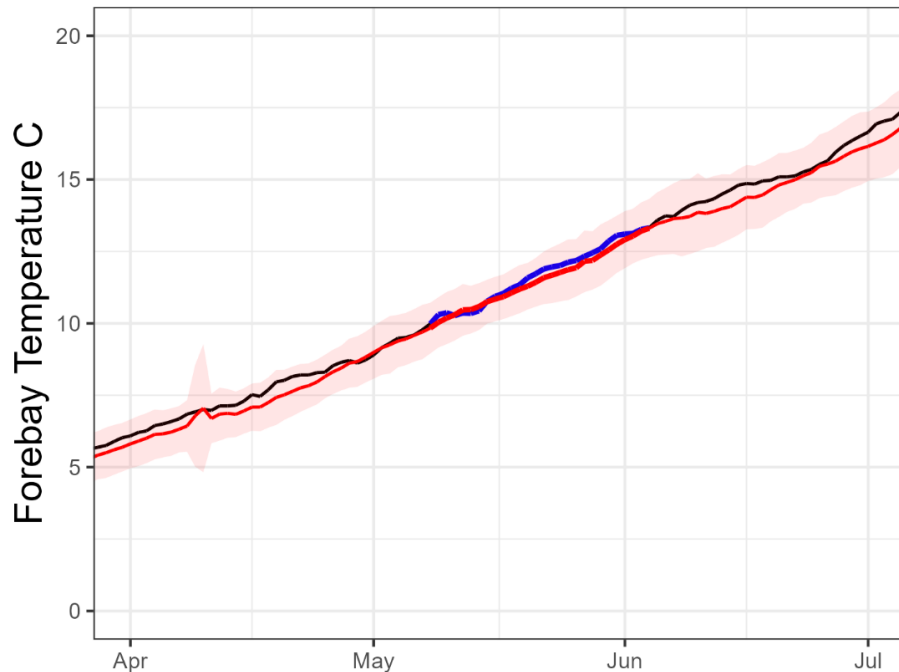


Figure 10. Average daily water temperature across all six study years (2008–2010 and 2015–2017) in the Priest Rapids Project area, based on mean forebay temperatures from Wanapum and Priest Rapids Dams. The line is colored blue to indicate the temporal extent of the average study period. The red line represents the 25-year historical average temperature (2000–2025), and the red shaded ribbon denotes ± 1 standard deviation from the long-term mean.

Like temperature, daily river outflows were averaged between Wanapum and Priest Rapids Dams to characterize discharge conditions through the project reach. Outflow was more variable among study years than temperature, with a broader range of flow regimes observed (Figure 11). Some years, such as 2008 and 2016, showed transitional flow conditions—portions of the study period were below the 25-year average, while other portions were above. By contrast, flows during 2009, 2010, and 2015 were consistently below average, while 2017 exhibited markedly above-average flows throughout the study period.

During the six study periods, daily outflows ranged from 67.4 to 298.2 kcfs, with a mean flow of 163.5 kcfs. The 25-year average outflows over the same timeframes ranged from 153.5 to 179.3 kcfs, with a mean of 167.0 kcfs. These data are summarized in Figure 12, which shows that, despite interannual variation, the average outflow across study years was closely aligned with the long-term mean, supporting the conclusion that fish experienced flow conditions representative of typical hydrologic patterns through the project reach.

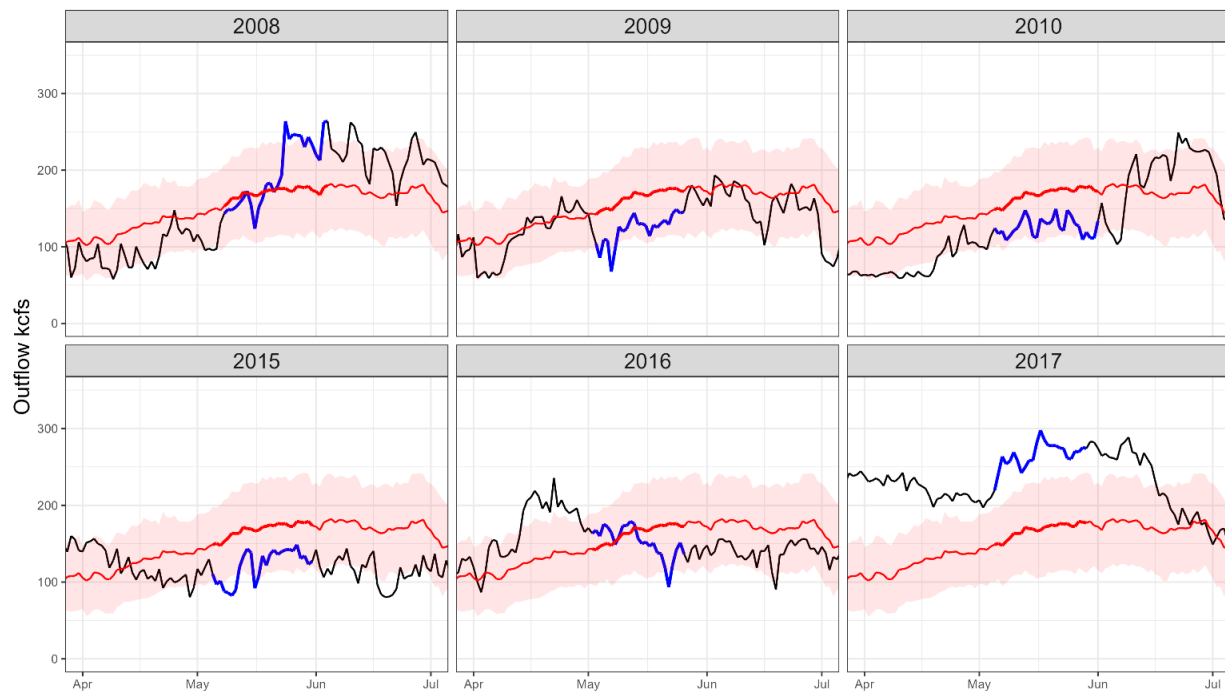


Figure 11. Daily river outflows during each study year (2008–2010 and 2015–2017) in the Priest Rapids Project area, averaged between Wanapum and Priest Rapids Dams. The line is colored blue during the temporal extent of the study period for each year. The red line shows the 25-year historical average outflow (2000–2025), with the red shaded ribbon indicating ± 1 standard deviation from the historical mean

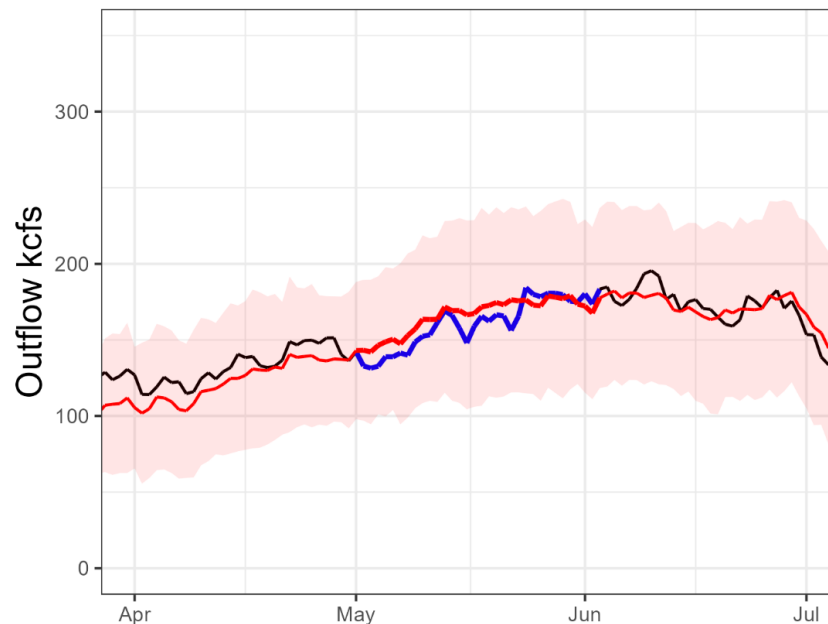


Figure 12. Average daily river outflow across all six study years (2008–2010 and 2015–2017) in the Priest Rapids Project area, based on mean outflows from Wanapum and Priest Rapids Dams. The line is colored blue to indicate the temporal extent of the average study period. The red line shows the 25-year historical average outflow (2000–2025), and the red shaded ribbon represents ± 1 standard deviation from the long-term average.

4.3 Behavioral Synthesis

4.3.1 Forebay Residence Times

Forebay residence time was defined as the duration between a fish's first detection in the forebay of a dam and its final detection prior to passage, serving as a proxy for how long juvenile steelhead remained in the immediate vicinity of a dam before passing. These metrics provide insight into behavioral responses to forebay environments and potential delays in downstream migration.

Figure 13 presents box and whisker plots summarizing forebay residence times at Wanapum Dam and Priest Rapids Dam across all six study years (2008–2010 and 2015–2017). Two analytical methods are shown: In one method, the forebay residence times were calculated using only receivers located in the immediate forebay near the dam face; in the other method, data from the Boat Restricted Zone (BRZ) were also included, thus residence times were measured starting with the first detections on receivers suspended along the BRZ buoy line (~250 m upstream of each dam). BRZ data were only available during 2015–2017 due to array limitations in earlier years.

At Wanapum Dam, forebay residence times were generally consistent across most years. In 2009, 2010, 2015, and 2016, residence times shared a similar pattern, with interquartile ranges (IQRs) between 0 and 13 hours and medians near 3 hours. By contrast, 2008 and 2017 displayed shorter residence times, with lower medians and tighter IQRs, indicating faster forebay transit in those years.

At Priest Rapids Dam, forebay residence times could not be calculated for 2017 due to the absence of receivers in the forebay. Among the remaining years, 2008 and 2016 exhibited relatively fast passage, with residence durations skewed toward the lower end. Conversely, 2009, 2010, and 2015 showed longer residence times, with IQRs extending up to 10 hours and medians around 1.5 hours. Notably, 2010 appeared to have the longest residence times at PRD, with a slightly elevated median and broader distribution compared to the other years.

Together, these results highlight clear interannual variability in forebay residence behavior, with some years exhibiting consistently faster passage and others showing more protracted durations. Residence times were generally more stable at Wanapum Dam, whereas greater variation was observed at Priest Rapids Dam, likely reflecting differences in site-specific hydrodynamics, fish behavior, or facility operations.

Importantly, forebay residence times appeared to be associated with environmental conditions—such as river outflow and water temperature—and with hydropower operations, including bypass operations and timing. For example, 2017 was a high-flow year, and residence times at both dams were shorter, likely reflecting increased hydraulic cues and improved passage conditions. While 2008 was not characterized by consistently high flows, late-season increases in flow likely contributed to the reduced residence times observed that year.

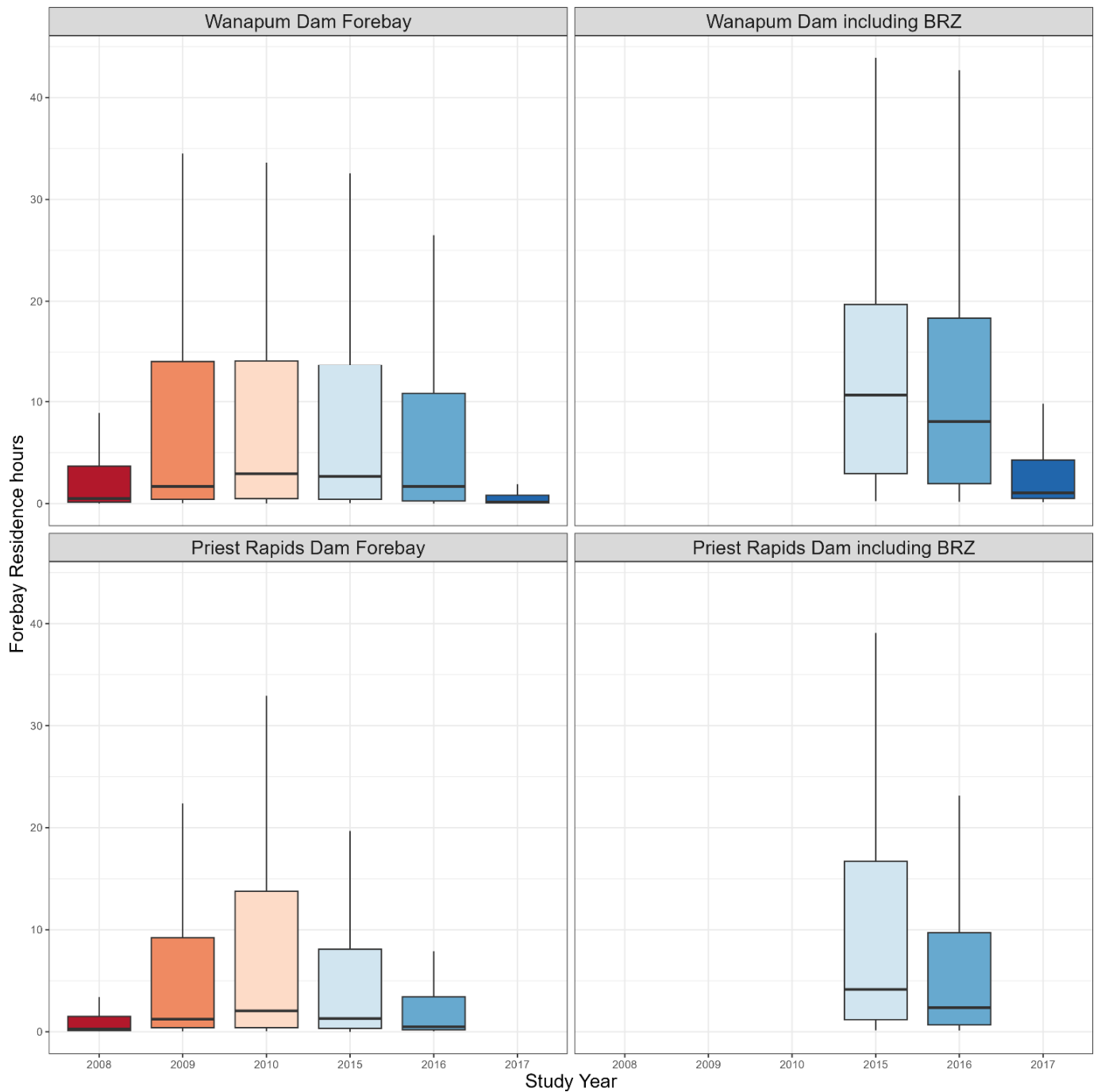


Figure 13. Box and whisker plots of juvenile steelhead forebay residence times at Wanapum Dam and Priest Rapids Dam across all six study years (2008–2010 and 2015–2017). Residence times were calculated using detection data from receivers located in the immediate forebay (left panels), as well as from combined Boat Restricted Zone (BRZ) and forebay receivers where available (right panels, 2015–2017 only). Note that no forebay receivers were deployed at Priest Rapids Dam in 2017. Outliers were excluded for clarity. Each box displays the interquartile range (25th–75th percentile), the line indicates the median, and whiskers extend to the largest and smallest values within 1.5× the IQR.

4.3.2 Study Area Travel Durations

Study area travel durations were measured as the total time (in hours) it took a tagged juvenile steelhead to travel from release at Rock Island Dam to detection at Priest Rapids Dam, effectively capturing migration through the entire Priest Rapids Project corridor.

Study area travel durations varied notably across study years (Figure 14) and showed strong correspondence with forebay residence times and river discharge patterns. Tagged steelhead migrated fastest in 2017, a year characterized by exceptionally high flows, with a median travel time of 49.2 hours. By contrast, fish migrated slowest in 2009, 2010, and 2015, all of which were lower-flow years, with median travel times near 115 hours. Migration rates in 2008 and 2016 fell between these extremes, reflecting moderate conditions and passage durations.

When evaluating travel through each development separately (Wanapum and Priest Rapids Reservoirs), similar trends were observed across study years (Figure 15). However, migration through Wanapum Reservoir was consistently slower than through Priest Rapids Reservoir, which is expected given the longer reservoir length and greater travel distance in the Wanapum segment (approximately 37 river kilometers compared to 19 river kilometers at Priest Rapids). When migration rates were standardized by distance traveled (rkm per hour), however, travel durations were comparable between the two reservoirs, with a median rate of 1.70 km/hr (interquartile range: 1.25–2.35 km/hr) through Wanapum Reservoir and a median rate of 1.61 km/hr (interquartile range: 1.04–2.63 km/hr) through the Priest Rapids Reservoir.

Some additional interannual differences were evident: in 2016, steelhead appeared to migrate slightly more slowly through Wanapum Reservoir, whereas in 2010, fish experienced slower transit through the Priest Rapids Reservoir, relative to other years. These patterns likely reflected a combination of hydrologic conditions, forebay delays, and reservoir-scale hydraulics that influenced fish movement behavior within each reach.

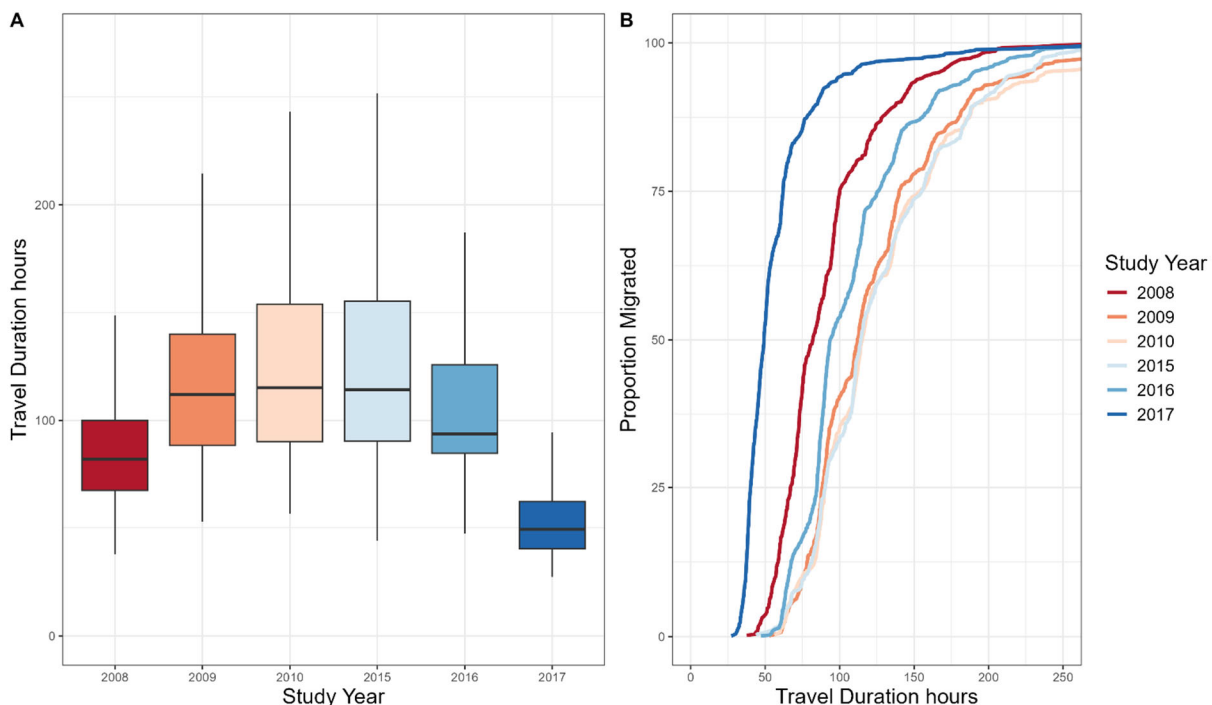


Figure 14. Distribution of travel durations (in hours) from release at Rock Island Dam to detection at Priest Rapids Dam. Shown as box whisker (Panel A) and cumulative curves (Panel B). In Panel A, boxes represent the interquartile range (25th–75th percentile), lines show the median, and whiskers extend to $\pm 1.5 \times$ the IQR; outliers are not shown. In Panel B, line colors correspond to study years, illustrating interannual variability in the speed at which tagged steelhead moved through the project reach.

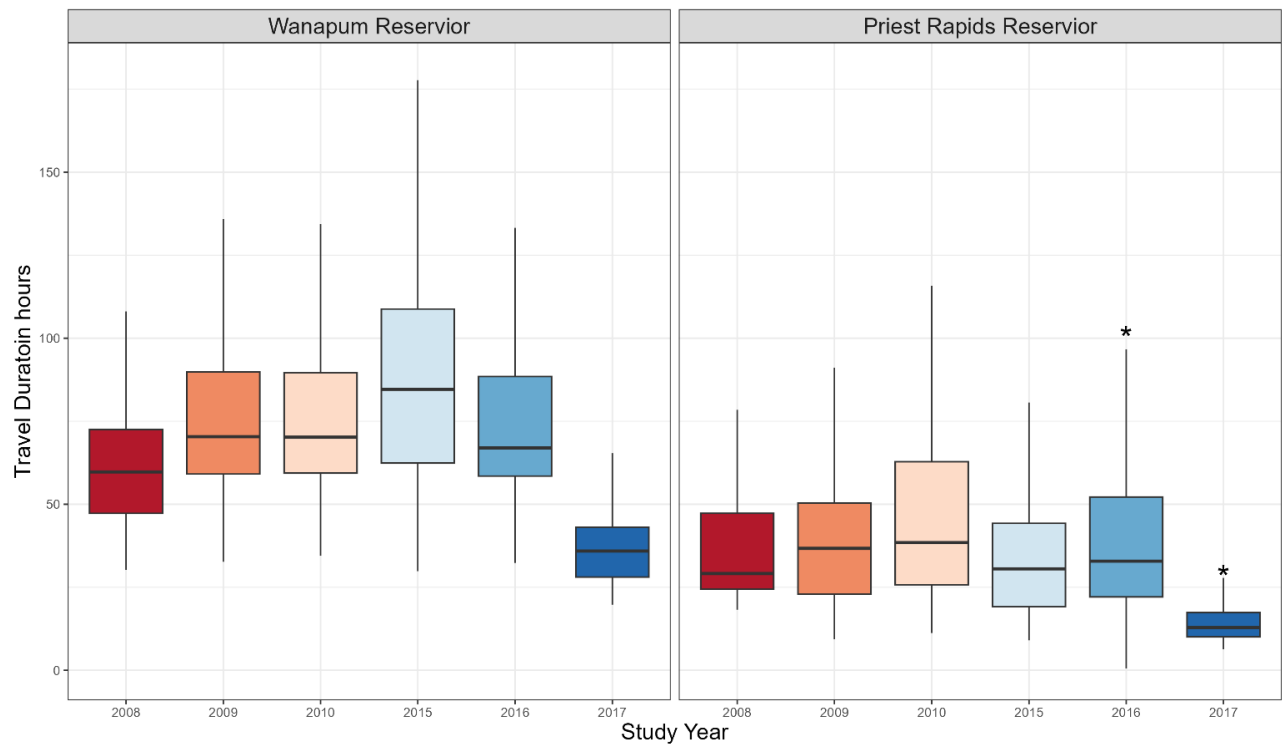


Figure 15. Box and whisker plots showing the distribution of travel durations (in hours) of juvenile steelhead through the Wanapum Reservoir and the Priest Rapids Reservoir across six study years (2008–2010 and 2015–2017). Each box represents the interquartile range (25th–75th percentile), with the line indicating the median and whiskers extending to 1.5× the IQR. Outliers are not shown. These data illustrate differences in transit times through each reservoir segment of the Priest Rapids Project corridor. For the Priest Rapids Reservoir, data from 2008–2010 and 2015 were calculated from fish released at Wanapum Dam, while data from 2016 and 2017 (denoted with an asterisk) were derived from fish released at Rock Island Dam, as no Wanapum Dam releases occurred during those study years.

4.3.3 Passage Route Selection

Passage route proportion was defined as the percentage of study fish that selected each available downstream passage option at both Wanapum and Priest Rapids dams, evaluated across all PRCC-accepted study years except 2017. Routes were categorized into four types: Fish Bypass, Spillway, Powerhouse (turbine), and Top-spill. The Top-spill refers to a prototype surface overflow weir installed in the spill gates adjacent to the powerhouse at Priest Rapids Dam during 2008–2010, prior to construction of the permanent fish bypass. The permanent bypass at Priest Rapids was completed and became operational in 2014. Passage route data were not available for 2017 because receiver deployments that year were limited to the Boat-Restricted Zone (BRZ) at both dams, which did not provide the spatial resolution necessary to assign passage routes.

Figure 16 illustrates the interannual variability in route choice, although a consistent pattern emerges: the Fish Bypass was the preferred route at both dams. Averaged across all applicable study years, 59.8% of tagged juveniles selected the bypass at Wanapum Dam, and 56.1% did so at Priest Rapids (Figure 17). Notably, after the prototype top-s-pill at Priest Rapids Dam was replaced by the permanent bypass in 2014, the permanent facility appeared to offer improved passage effectiveness, with higher bypass usage rates compared to the temporary solution.

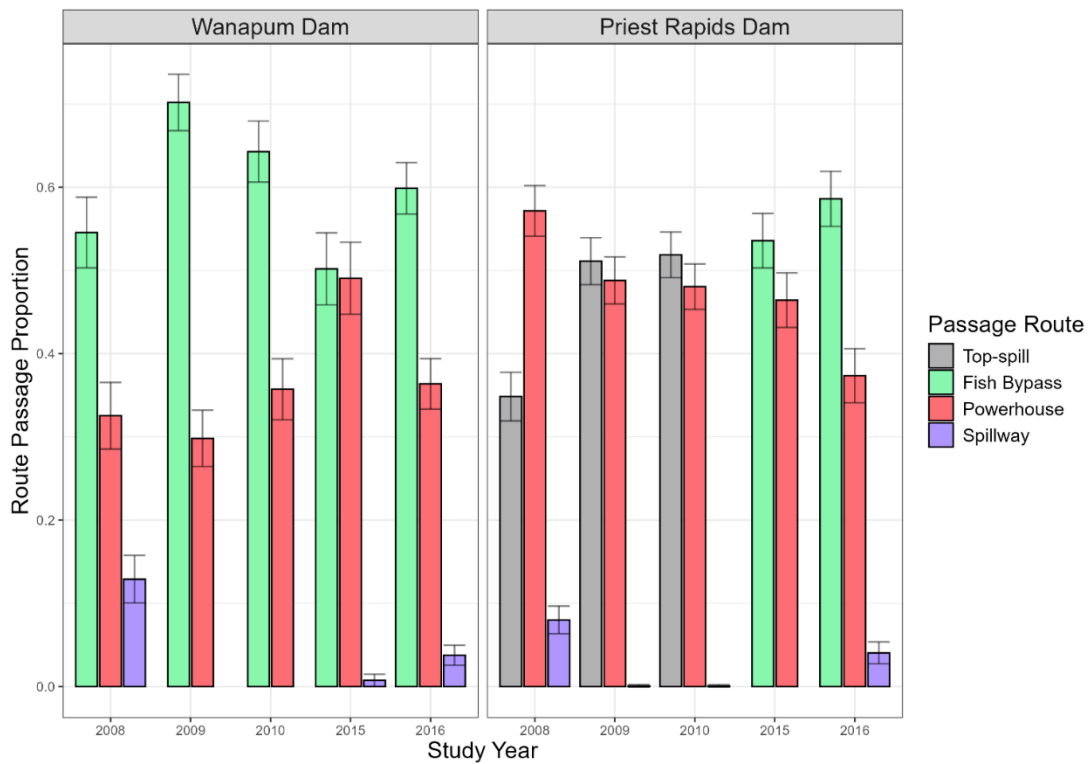


Figure 16. Juvenile steelhead passage route proportions at Wanapum and Priest Rapids Dams across individual study years (2008–2010 and 2015–2016; passage routes were not analyzed in 2017). Routes are categorized as Fish Bypass, Spillway, Powerhouse, or Top-Spill (temporary test fishway at Priest Rapids used from 2008–2010). Error bars represent ± 2 standard errors, highlighting variability in route selection among study years.

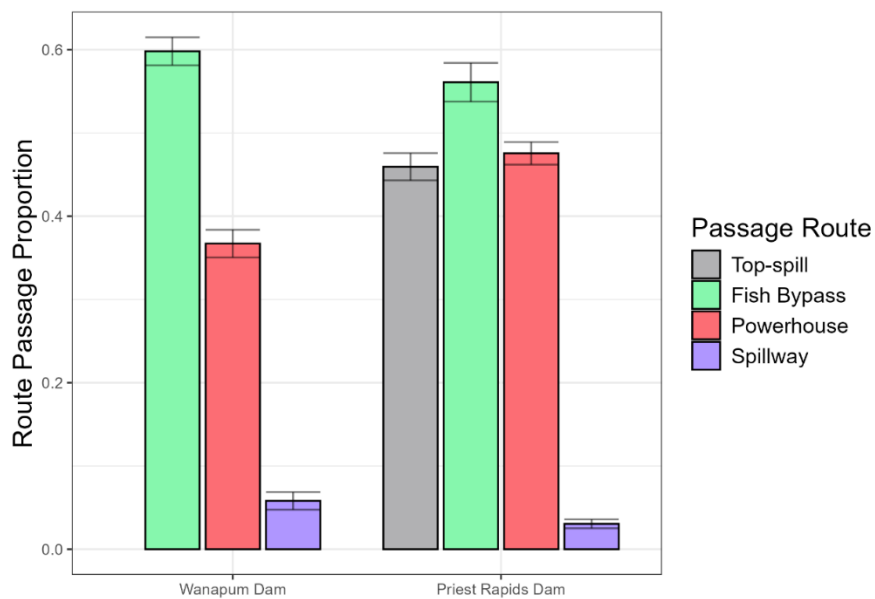


Figure 17. Mean passage route proportions for juvenile steelhead at Wanapum and Priest Rapids Dams, averaged across all available study years (2008–2010 and 2015–2016; passage route was not analyzed in 2017). Route options include Fish Bypass, Spillway, Powerhouse, and Top-Spill. Error bars represent ± 2 standard errors, reflecting interannual variation in passage behavior.

4.4 Project Survival

4.4.1 Route-Specific Survival

Route-specific survival estimates were calculated by determining the proportion of juvenile steelhead that passed through a given route at each dam and were subsequently detected at the nearest downstream detection array—the Mattawa array for Wanapum Dam and the Vernita Bridge array for Priest Rapids Dam. These estimates reflect not only the immediate survival associated with passage through each route but also include post-passage survival during migration to the first downstream array. Therefore, they represent route-associated survival, rather than absolute survival during the passage event alone.

Across all study years (except 2017) and at both Wanapum and Priest Rapids Dams, passage through the Fish Bypass consistently resulted in the highest survival, indicating it was the safest route for migrating juvenile steelhead (Figure 18). By contrast, passage through the Powerhouse (turbines) was associated with the lowest survival, reflecting elevated mortality risk likely due to turbine-related injury or disorientation.

Survival associated with Spillway passage varied considerably among years (Figure 19). Averaged downstream survival rates of juvenile steelhead by passage route at Wanapum and Priest Rapids dams for study years 2008-2010 and 2015-2016. Passage routes were not analyzed in the 2017 survival evaluation.

), largely due to the relatively small number of fish using this route. This is reflected in the large standard errors and variability in survival estimates across study years, making year-to-year comparisons less reliable.

A comparison between bypass designs at Priest Rapids Dam further highlights route performance improvements. During the 2008–2010 studies, when the prototype Top-spill structure was in use, average survival for bypass-passage fish was 0.969 (SE = 0.005). By contrast, following the installation of the permanent Fish Bypass, average survival increased to 0.993 (SE = 0.003) in 2015 and 2016. This improvement underscores the benefits of dedicated bypass design in enhancing safe downstream passage.

Across both dams and all years, Powerhouse passage survival averaged approximately 0.93 (Figure 18), with some interannual variation (Figure 19). Averaged downstream survival rates of juvenile steelhead by passage route at Wanapum and Priest Rapids dams for study years 2008-2010 and 2015-2016. Passage routes were not analyzed in the 2017 survival evaluation.

). Spillway passage survival estimates were more inconsistent, ranging broadly depending on flow conditions, structural configurations, and sample size in a given year.

Collectively, these results reinforce the importance of bypass systems in reducing mortality during dam passage and support their continued use and refinement as a critical component of effective fish passage management at hydroelectric facilities.

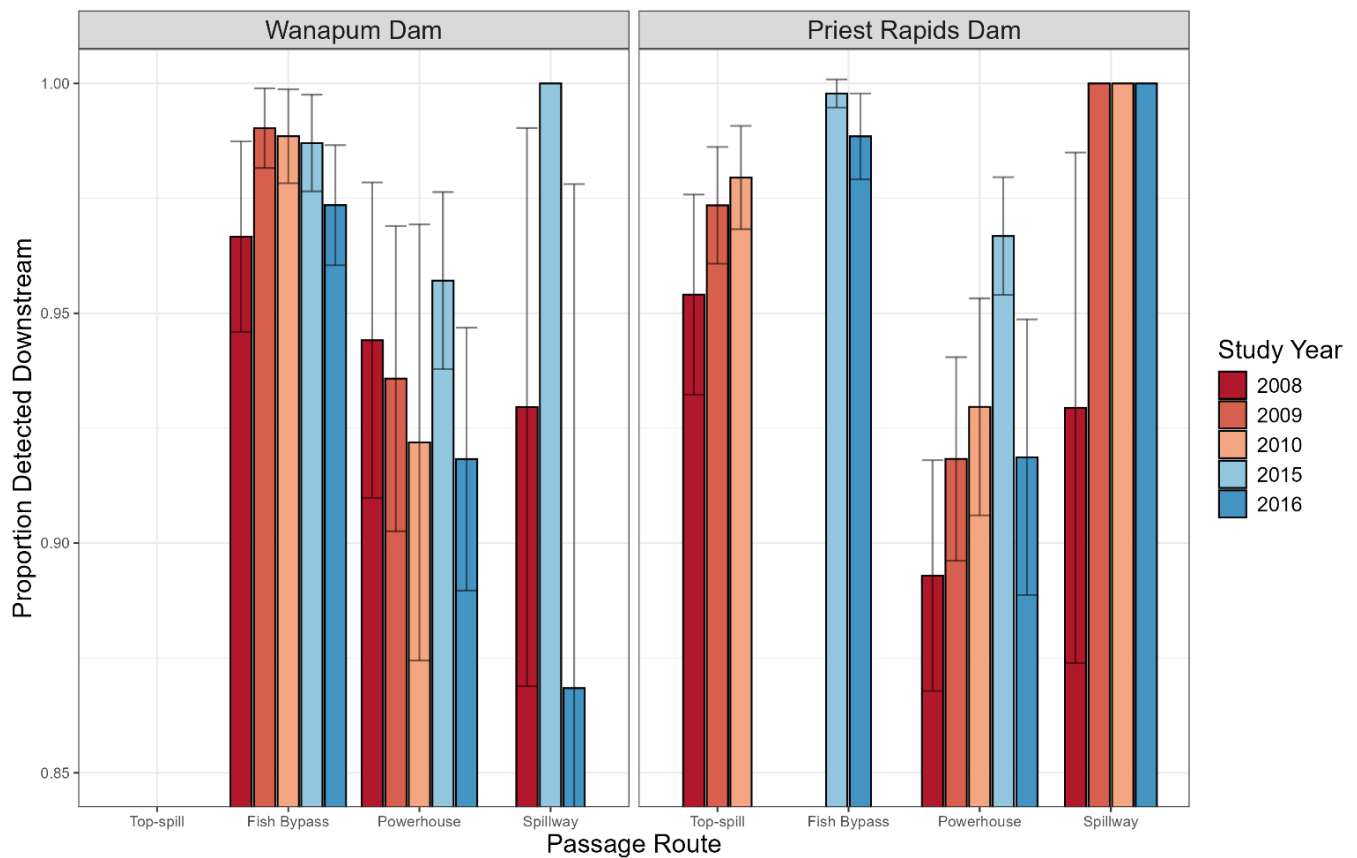


Figure 18. Downstream survival rates of juvenile steelhead by passage route at Wanapum and Priest Rapids dams across study years.

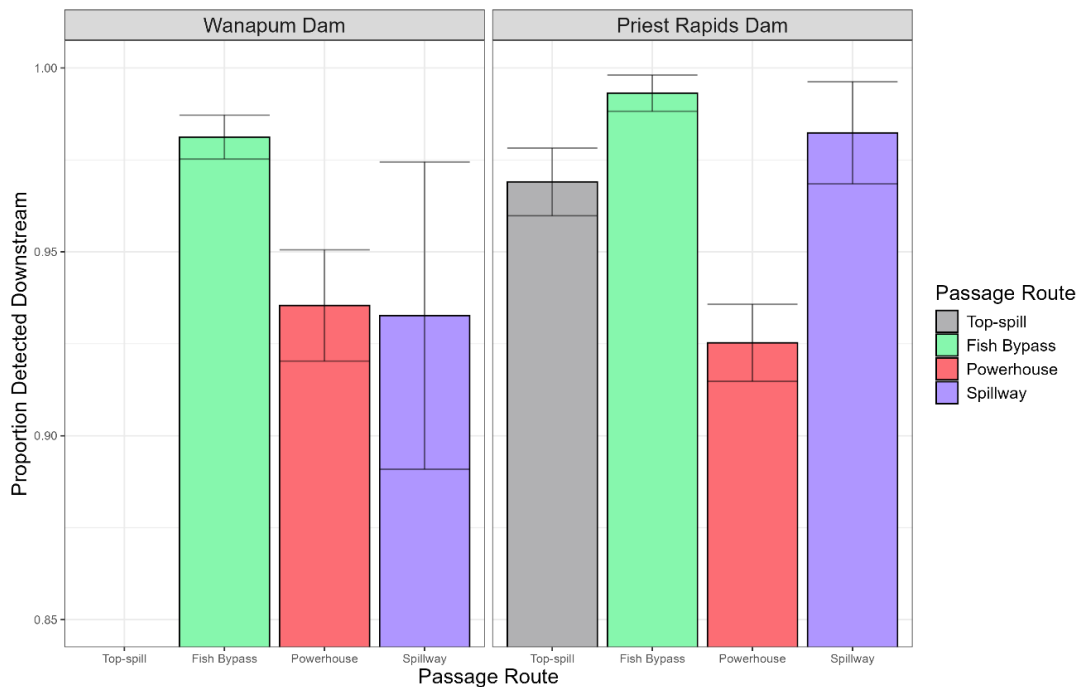


Figure 19. Averaged downstream survival rates of juvenile steelhead by passage route at Wanapum and Priest Rapids dams for study years 2008-2010 and 2015-2016. Passage routes were not analyzed in the 2017 survival evaluation.

4.4.2 *Reach-Specific Survival*

Reach-specific survival was estimated as the proportion of tagged juvenile steelhead detected at a downstream array relative to those detected at the upstream array, within discrete segments of the Priest Rapids Project. These estimates provide insight into survival patterns as fish move between detection locations. The study corridor was divided into the following reaches, depending on data availability across study years:

- Rock Island Dam to Sunland Estates array
- Sunland Estates to Wanapum Dam
- Wanapum Dam to Mattawa array
- Mattawa array to Priest Rapids Dam
- Priest Rapids Dam to Vernita Bridge array

As with route-specific survival, these reach-based estimates are not absolute survival rates, as they incorporate additional variables beyond the reach itself. These include handling effects—particularly relevant in the Rock Island to Sunland reach—and passage effects, especially in reaches downstream of Wanapum and Priest Rapids Dams where survival includes dam passage events.

Despite these limitations, the analysis was conducted to evaluate whether any spatial trends or consistent patterns emerged among reaches. As shown in Figure 20, survival varied across study years and reaches. However, slightly lower survival was consistently observed in the Sunland to Wanapum Dam and Mattawa to Priest Rapids Dam reaches. These segments represent the forebay approach zones, where fish experience slowed velocities and longer exposure to potential predators as the river transitions into the reservoir environment upstream of each dam.

Survival also appeared lower in the Priest Rapids Dam to Vernita Bridge reach, which includes the Priest Rapids Dam passage event. This was particularly evident in 2008, when survival in this reach was substantially reduced. This trend aligns with low route-specific survival estimates for powerhouse passage at Priest Rapids Dam in 2008 and may also reflect elevated avian predation pressure, which was a known issue during that period.

Outside of these observations, no single reach emerged as a consistent mortality hotspot. Survival rates across reaches and years suggested that mortality was distributed relatively uniformly throughout the Project. Observed losses may have been more closely associated with dam passage events and the behavioral delay or disorientation that occurs in reservoir forebays, rather than with distinct environmental bottlenecks within specific reaches.

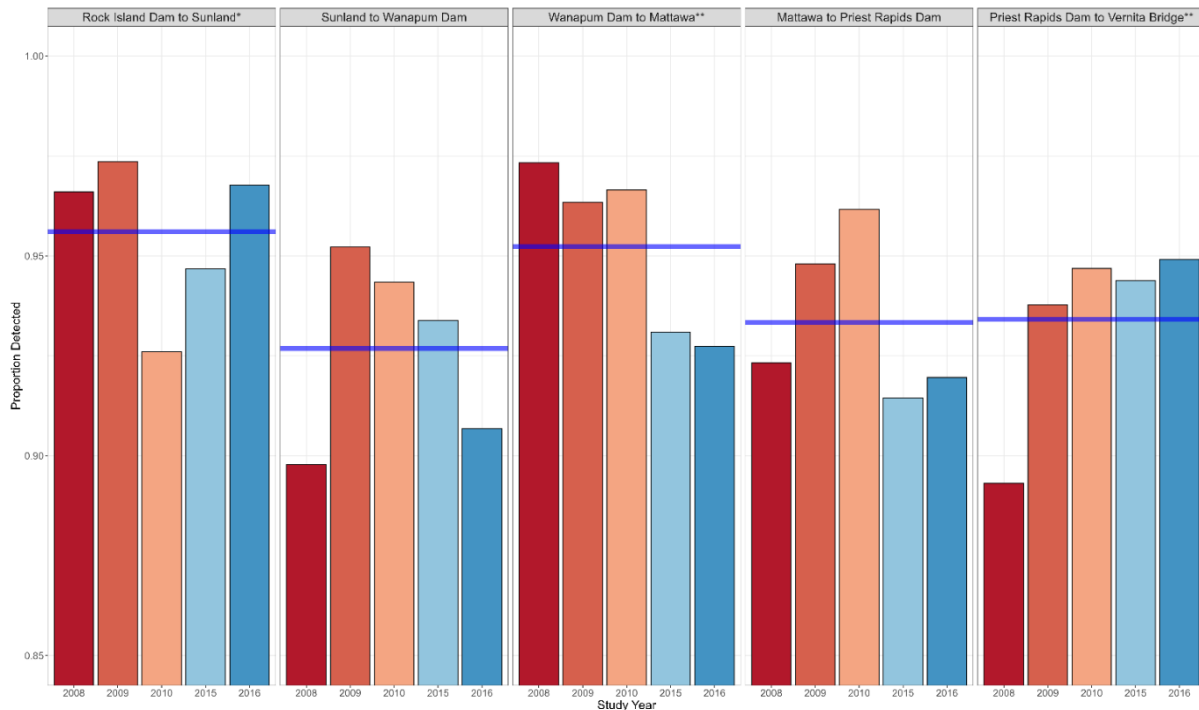


Figure 20. Reach-specific survival rates of juvenile steelhead by study year, paneled by river reach. Survival is based on detection histories between upstream and downstream arrays. The blue horizontal line represents the mean reach survival rate across all study years. *Reaches containing a release event may include additional handling effects that are not controlled for. **Reaches containing a passage event have that event included in the survival rate.

4.4.3 Avian Predation

To assess the influence of avian predation on juvenile steelhead survival, PIT tags were monitored across all study years by Real Time Research (RTR) at known avian colony sites located near the Priest Rapids Project. When a PIT tag was detected on one of these colonies, it provided conclusive evidence of mortality due to avian predation for that individual fish.

Figure 21 presents the proportion of total reach-specific mortality attributed to confirmed avian predation, allowing for a spatial understanding of where and when bird-related losses occurred. As with the reach-specific survival estimates, these values should be interpreted cautiously due to several limitations. Most notably, the predation values represent raw detections and do not incorporate correction factors for PIT tag detection efficiency at colonies—efficiencies which can vary by site, year, and bird behavior (see RTR annual reports for methodology and caveats).

Despite these limitations, the data revealed clear spatial and temporal patterns. Avian predation was generally elevated in river reaches leading up to the dams—specifically the Sunland Estates to Wanapum Dam and Mattawa to Priest Rapids Dam segments. These results align with findings from the reach-specific survival analysis, where mortality increased as fish entered slower-moving forebay areas, potentially increasing their exposure time to aerial predators.

Temporally, avian predation was more prevalent during the initial phase of studies (2008–2010) than in the reassessment phase (2015–2017). This trend may reflect the impact of expanded avian deterrence programs implemented in the later years of the study. These efforts, which included enhanced hazing techniques, colony management, and structural deterrents, appear to have been at least partially effective in reducing bird-related predation on juvenile steelhead in the Priest Rapids Project area.

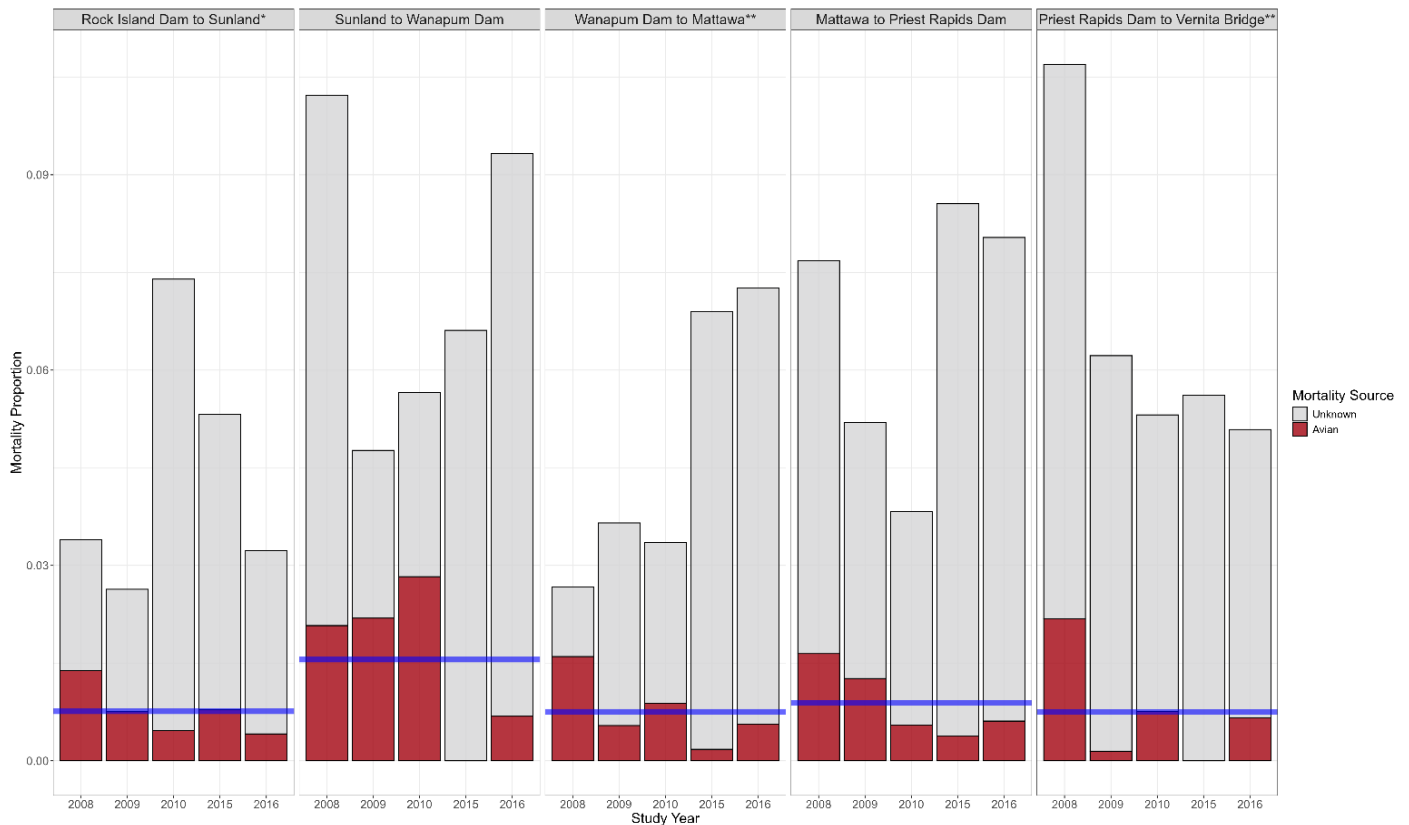


Figure 21. Mortality rates (1 – survival) for each river reach by study year, shown as vertical columns. Red shading indicates the proportion of total mortality attributable to confirmed avian predation events. The blue horizontal line represents the mean proportion of mortality from avian predation across all study years for each reach.

4.4.4 Annual Project Survival Estimates

The primary objective of the steelhead survival evaluations conducted in 2008–2010 and 2015–2017 was to quantify juvenile steelhead survival through the Priest Rapids Project. The study goal was to meet a Project Survival target of 0.865, with SE below 0.025. For survival estimates within each development—Wanapum and Priest Rapids—the performance thresholds were 0.93 survival with SE below 0.025.

Figure 22 summarizes the annual Project Survival estimates across all study years. A survival rate above the 0.865 threshold was achieved in 2014, 2016, and 2017. However, the 2014 evaluation was disqualified due to the emergency drawdown of the Wanapum Reservoir, which was necessary to repair a crack in the dam structure and rendered the survival estimate non-representative of standard operational conditions. In all remaining study years, project survival estimates fell below the 0.865 threshold.

During the HTI phase of studies (2008-2010), both project-level and development-level survival estimates were calculated. The average (arithmetic mean) Project Survival across these three years was 0.810, with a pooled SE of 0.015. At the Wanapum Development, survival exceeded 0.93 in both 2008 and 2009, but fell below the threshold in 2010. By contrast, survival through the Priest Rapids Development was below 0.93 in all three years, failing to meet the development-specific standard.

The JSATS phase of evaluations began in 2015, initially with separate development-level estimates, followed by project-level-only evaluations in 2016 and 2017. The 3-year Project survival standard was met during this phase with an average survival of 0.870 (SE 0.0204). In 2015, the Priest Rapids Development achieved above-threshold survival for the first time. However, overall Project survival that year was below the 0.865 standard at 0.837, and the standard

error exceeded the 0.025 threshold at 0.027. The reduced survival coincided with low-flow conditions, which are known to negatively influence passage efficiency and survival. The elevated standard error was largely driven by a mass acoustic tag failure from the manufacturer (Lotek), which required the removal of numerous potential study fish due to premature tag failure. This event also necessitated a more aggressive tag-life correction than in other study years, thereby increasing the underlying standard error estimate in 2015.

In 2016, survival reached the project threshold, while in 2017, survival was well above the threshold, coinciding with exceptionally high flows. These findings are consistent with well-documented trends showing that river outflow is the most significant driver of project-wide survival, influencing both passage route availability and fish movement behavior.

While 2017's high-flow year contributed substantially to the improved survival, other operational and ecological changes also likely played important roles in the observed improvements during the reassessment phase. One key factor was the implementation of the permanent Fish Bypass at Priest Rapids Dam, which replaced the prototype top-spill used in the initial phase, and consistently attracted more fish, leading to better route-specific survival outcomes.

In addition, avian predation was identified as a major source of mortality during the initial phase. In response, targeted avian deterrent efforts were implemented during the reassessment phase, likely reducing losses and contributing to the upward trend in survival. These findings suggest that while flow remains the dominant factor, bypass improvements and predator management were also instrumental in achieving higher survival rates in later years.

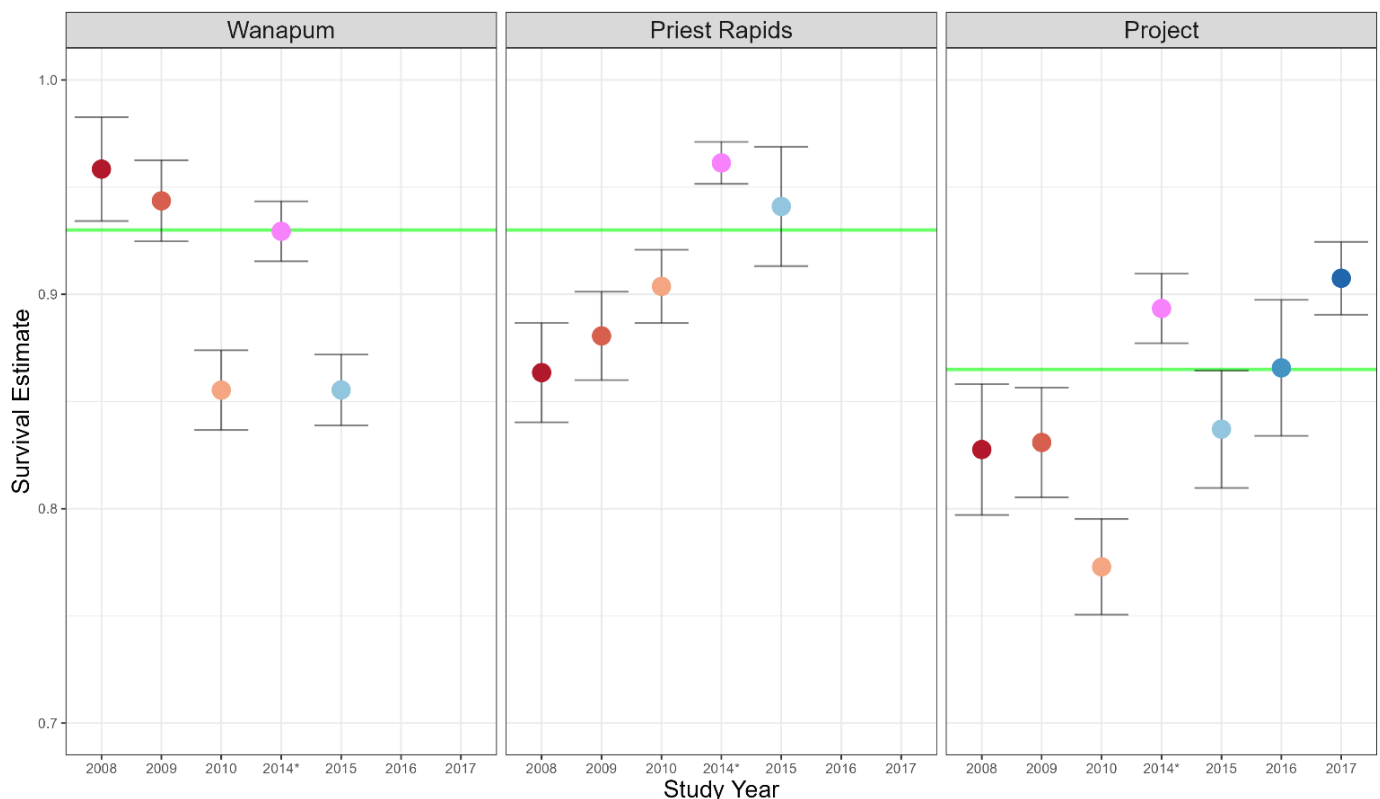


Figure 22. Steelhead survival estimates and associated standard errors for each development (Wanapum and Priest Rapids) and for the entire Priest Rapids Project by study year. The green horizontal line represents the Development and Project survival standards (0.93 and 0.865, respectively). * In 2014, the Wanapum Dam reservoir was drawn down for structural repairs, and survival estimates from that year were not approved by the PRCC.

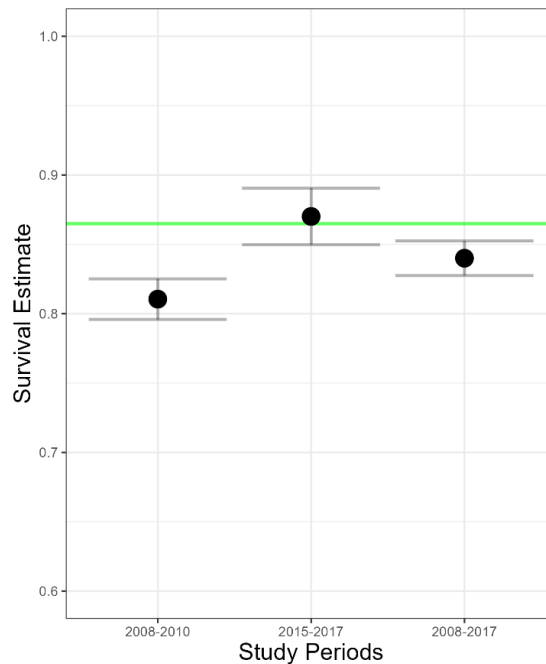


Figure 23. Steelhead Project survival estimates averaged for the HTI phase (2008–2010), the JSATS phase (2015–2017), and for both periods combined. Error bars represent aggregated standard error estimates for each grouping. The green horizontal line represents the Project survival standard (0.865).

5 Discussion

This synthesis of juvenile steelhead survival evaluations conducted at the Priest Rapids Project between 2008 and 2017 reveals several critical insights into downstream migration behavior, survival dynamics, and the influences of environmental and operational conditions. These insights not only evaluate past performance relative to regulatory standards, but also inform future adaptive management strategies for ESA-listed populations in the mid-Columbia River.

Across all reviewed study years, the biological characteristics of tagged fish (length and weight) and the timing of release relative to the broader smolt migration window were highly representative of the run-at-large. The six-year dataset captured a broad spectrum of hydrological conditions, including low-flow years (2009, 2010, 2015) and a high-flow year (2017), allowing for robust interannual comparisons. Both water temperature and outflow generally aligned with long-term 25-year averages, reinforcing the environmental representativeness of the conditions under which these survival estimates were made.

This representativeness is particularly important because a covariate analysis of steelhead survival, using the 2008–2010 and 2014–2015 datasets, identified river flow, smolt outmigration index, and avian predation rates as significant predictors of steelhead survival through the Project (Payton et al. 2016). That analysis also demonstrated that higher flows were generally associated with improved survival, while increased avian predation and lower smolt outmigration indices correlated with decreased survival. Although the covariate study did not include 2016 and 2017 data, the observed relationships provide a strong mechanistic framework for interpreting trends in the full dataset.

The behavioral analyses presented in this report—including forebay residence times, migration rates, and passage route selection—revealed patterns tightly coupled with environmental drivers and dam operations. Years with higher flows (e.g., 2017) consistently showed reduced residence times and shorter project-wide travel times, likely due to enhanced hydraulic cues and improved passage conditions. By contrast, lower-flow years

(2009, 2010, 2015) were associated with prolonged delays in forebays and overall longer travel times through the project corridor.

Juvenile steelhead consistently preferred the fish bypass routes at both Wanapum and Priest Rapids Dams. Notably, the implementation of the permanent fish bypass at Priest Rapids in 2014 resulted in both higher usage and improved survival compared to the prototype Top-spill configuration used during earlier years. These findings strongly support the positive results from the implementation of non-turbine passage structures, especially those that minimize delay and injury risk.

Survival through the Project varied by year but generally reflected the influence of flow and operational context. The project survival standard (0.865) was met only in 2016 and 2017, with the 2014 estimate excluded due to abnormal reservoir conditions. The HTI study phase (2008–2010) yielded an average project survival of 0.810, while the JSATS phase (2015–2017) showed improvements with an average Project survival of 0.870 (SE 0.0204). This was particularly true in 2017, when high flows, favorable passage conditions, and avian deterrents likely combined to drive higher survival.

Importantly, the survival data show that Wanapum Dam more consistently met development-level targets (0.93 survival with SE below 0.025), whereas Priest Rapids Dam lagged during the initial phase, only achieving the benchmark in 2015. This difference may reflect varying forebay hydrodynamics, passage route availability, or site-specific predator pressures.

The reach-specific survival analysis did not identify a single mortality hotspot but suggested slightly elevated losses in reaches immediately upstream of the dams—consistent with increased forebay residence times, slower velocities, and heightened avian predation risk. These findings were further supported by PIT tag detections at avian colonies, which confirmed a higher incidence of predation in these forebay approach zones.

Temporal patterns in avian predation were also clear: rates were higher during 2008–2010 and declined in later years, likely due to enhanced deterrent efforts beginning in the reassessment phase. While raw PIT detections were used in this analysis without correction for detection efficiency, the decline in confirmed avian mortalities remains consistent with broader management trends.

As Grant PUD prepares for the next cycle of survival evaluations scheduled for 2026–2028, the findings of this retrospective analysis provide a strong foundation for continued progress. The synthesis demonstrates that river flow is the most influential and inherently variable driver of juvenile steelhead survival and behavior, indicating that outcomes from singular survival evaluations are largely governed by the hydrologic conditions of that year rather than by operational or structural factors alone.

Regardless of this variability, the synthesis found that route-specific passage remains an important factor influencing overall survival, with consistent evidence that use of bypass structures has benefited project performance. Analyses of forebay residence times and migration durations showed that these behavioral metrics provide valuable insight into fish passage dynamics beyond survival outcomes alone. The synthesis also identified avian predation as a significant source of mortality, with indications that management and deterrence efforts have contributed to reduced losses in recent years.

Collectively, this synthesis provides a comprehensive foundation for understanding the relationships among flow, passage behavior, and survival, establishing a framework for assessing and interpreting results from the upcoming 2026–2028 evaluation cycle.

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**PRCC NNI Funds
Project Specification Sheet
Northern Pikeminnow Fishing Derby 2026**

Date submitted: January 19, 2026
Project Sponsor: Quincy Valley Chamber of Commerce - Quincy Valley Tourism Association
Project Liaison: PRCC Representative – Tom Dresser ~ TDresser@gcpud.org
Project Title: 2026 Northern Pikeminnow Fishing Derby – Wanapum Reservoir
Project Type: Predator Removal (Northern Pikeminnow)

Location: The Northern Pikeminnow Fishing Derby (derby) is located on the mainstem of the Columbia River in Washington State and extends from the forebay of Wanapum Dam (above the boat restricted zone) to the tailrace of Rock Island Dam (below the boat restricted zone).

Requested Funding Amount: \$25,000.00

Project description: The Quincy Valley Chamber of Commerce (QVCC) will host a northern pikeminnow fishing derby (in 2026) at Crescent Bar, Washington or another location located on the Wanapum Reservoir. The overall goal of the derby is to remove as many predators (northern pikeminnow) from the Wanapum Reservoir (above the Wanapum Dam boat restricted zone to below the Rock Island Restricted zone) as possible during the three (3)-day event.

The participants will catch northern pikeminnow by rod and reel during the time periods specified in the derby rules. Northern pikeminnow will be removed from the reservoir waters for inspection by QVCC derby officials and Grant biological staff as appropriate. Northern Pikeminnow shall be turned into the QVCC derby officials at locations specified for inspection and subject to the following restrictions: Derby participants and the QVCC shall comply with all applicable Washington State Fish and Wildlife Laws.

Project Justification: This proposal provides NNI funds to remove northern pikeminnow from the Priest Rapids Project, which is consistent with the primary purpose and use of NNI Funds, which is to implement measures or activities to improve near term survival for juvenile salmon and steelhead.

Project Cost: Quincy Valley Chamber of Commerce - Quincy Valley Tourism Association is requesting \$25,000 to fund the 2026 northern pikeminnow fishing derby.

NNI will be used to conduct activities associated with the northern pikeminnow derby and includes advertising, banquet, cash awards, etc. The proposed cash prize system will include a youth and adult division, which will consist of the following cash awards.

Youth Division.

- | | |
|--|---------------------|
| (1) Largest Fish = | 1 designated prize. |
| (2) Smallest Fish= | 1 designated prize. |
| (3) Weight Total 1 st Place = | 1 designated prize |
| (4) Weight Total 2nd Place = | 1 designated prize |
| (5) Weight Total 3rd Place = | 1 designated prize |
| (6) Weight Total 4th Place = | 1 designated prize |
| (7) Weight Total 5th Place = | 1 designated prize |
| (8) Weight Total 6th Place = | 1 designated prize |
| (9) Weight Total 7th Place = | 1 designated prize |
| (10) Weight Total 8th Place = | 1 designated prize |
| (11) Weight Total 9th Place = | 1 designated prize |

(12) Weight Total 10th Place = 1 designated prize

Adult Division.

(1) Largest Fish =	1 designated prize
(2) Smallest Fish =	1 designated prize
(3) Weight Total 1 st Place =	1 st pick of prize pool
(4) Weight Total 2nd Place =	2 nd pick of prize pool
(5) Weight Total 3rd Place =	3 rd pick of prize pool
(6) Weight Total 4th Place =	4 th pick of prize pool
(7) Weight Total 5th Place =	5 th pick of prize pool
(8) Weight Total 6th Place =	6 th pick of prize pool
(9) Weight Total 7th Place =	7 th pick of prize pool
(10) Weight Total 8th Place =	8 th pick of prize pool
(11) Weight Total 9th Place =	9 th pick of prize pool
(12) Weight Total 10th Place =	10 th pick of prize pool

The estimated \$10,000 prize budget will be used to purchase prizes for all awards listed above. After all prizes have been awarded, for Youth and Adult divisions, the remaining prize pool will be raffled off with tickets earned by catching Northern Pikeminnow.

The remaining funds (after covering prize pool, advertising, banquet costs, etc.), which is estimated to be \$10,000, will be used to purchase the Grand Prize of an ATV Side x Side. The Grand Prize will be raffled off with tickets earned by catching Northern Pikeminnow.

Raffle tickets will be awarded as follows to encourage fishing efforts on pikeminnow >9”.

- (1) 2 tickets will be awarded for each Northern pikeminnow >9” total length, and
- (2) 1 ticket will be awarded for each Northern pikeminnow between 6-9” in length (total length).

No raffle tickets will be awarded for fish under 6 inches long. Fish under 6 inches long will be eligible for the Smallest Fish awards.

All prizes and winner of the Grand Prize ATV Side x Side will be awarded at the banquet immediately following the final weigh-in.

QVCC shall be responsible for all services related to the planning and organization of the derby which includes but is not limited to; marketing/advertisement (newspaper, radio, TV, website, Facebook and Twitter), registration (website, local stores, and mail-in), banners and posters, fishing seminar, associated prizes and/or awards, food, labor, equipment (measuring boards, scales, sound system, wrist bands, vests, paper products) and fish disposal.

Estimated Timeline: 2026 Northern Pikeminnow Derby will occur over a three (3) day period during May 15th, 16th and 17th, 2026.

Additional Requirements:

If **Northern Pike** are caught, anglers are required **to retain and immediately present the fish to QVCC derby officials** with details on where the fish was collected. QVCC derby officials are required to preserve all northern pike caught (by freezing) and notify the Grant PUD Representative (Tom Dresser - Tdresse@gcpud.org) immediately.

If **adult steelhead** are caught, anglers are required to release them immediately without removing them from the water and report the encounter to QVCC derby officials during weight in. QVCC derby officials will notify the Grant PUD Representative (Tom Dresser - Tdresse@gcpud.org) immediately.

QVCC shall provide the Grant PUD Representative, Tom Dresser (Tdresse@gcpud.org) a written summary by June 30, 2026, with the following information.

1. Total funds expended,
2. Total number of anglers participating,
3. Number of boats participating,
4. Residency (zip code) for all participants,
5. The total number of northern pikeminnow removed during the 3-day event.
6. Total weight for all northern pikeminnow removed during 3-day event.
7. Average weight of northern pikeminnow removed during 3-day event.
8. Total number (by species) of non-native predators caught and retained.
9. Overall cost per fish removed.
10. Report on the number of non-native predatory fish retained (e.g. walleye, bass, & channel catfish).
11. Comparison or prior spring versus fall derby events (total and average weight, total number, total number of anglers participating); and
12. Prizes awarded.