Priest Rapids Fish Forum

Conference Call

Wednesday, 2 July 2025
9:00 a.m. – 11:00 a.m.

FINAL MINUTES

PRFF Members

Michael Lucid, Emily Orling, USFWS
Ralph Lampman, Keely Murdoch, YN
Nathan and Clayton Buck, Wanapum
Jason McLellan, Bret Nine, CTCR
Mike Clement, Chris Mott, Grant PUD
Tracy Hillman, Chair
Patrick Verhey, Laura Heironimus, WDFW
Melissa Peterson, Chad Brown, WDOE
Aaron Jackson, Carl Merkle, CTUIR
Steve Lewis, BIA
Pete McHugh, CRITFC

Meeting Attendees

Mike Clement, Grant PUD
Melissa Peterson, WDOE
Patrick Verhey, WDFW
Chris Mott, Grant PUD
Tygh Schuster, YN
Laura Heironimus, WDFW
Tracy Hillman, Chair
Ralph Lampman, YN
Tim Taylor, Grant PUD
Michael Lucid, USFWS
Joseph LeMoine, Grant PUD
Nate Patterson, YN
Robbie O'Donnell, WDOE

Action Items:

- Laura Heironimus will update the White Sturgeon Spontaneous Autopolyploidy Guidance document based on recently published literature.
- Laura Heironimus and Tracy Hillman will identify the objectives for the White Sturgeon modeling effort and share those with Grant PUD, WSP, and LGL/Blue Leaf.
- Laura Heironimus will reach out to Lance Keller at Chelan PUD about the White Sturgeon life cycle model and who they used to populate that model.

- Tracy Hillman and Laura Heironimus will provide the PRFF with an updated draft agenda for the White Sturgeon Subgroup meeting.
- Tracy Hillman and Ralph Lampman will provide the PRFF with an updated draft agenda for the Pacific Lamprey Subgroup meeting.
- Tracy Hillman will send the Pacific Lamprey questions to PNNL after the ASWG reviews the questions.

I. Welcome and Introductions

Tracy Hillman welcomed everyone to the meeting and identified all attendees.

II. Agenda Review

The PRFF reviewed and approved the July agenda with no additions.

III. Approve June Meeting Notes

The PRFF reviewed and approved the 4 June 2025 meeting minutes.

IV. Review Action Items

The PRFF reviewed the following action items from the June meeting:

- Mike Clement will ask Corey Wright to share Grant PUD's sturgeon catch data with Laura Heironimus. **Complete.**
- Laura Heironimus will conduct a literature search to determine whether there is more recent information on White Sturgeon spontaneous autopolyploidy. **Complete. Laura said she found two recent papers that could be used to update the Spontaneous Autopolyploidy Guidance document. She said the Fiske et al. (2019)[1] paper looked at the nuclear volumes for 8N, 10N, and 12N fish samples that were run through a coulter counter analysis and could be used to improve definitions of ploidy status in sturgeon. The Schreier et al. (2021)[2] paper includes an overview of various methods for evaluating ploidy status in sturgeon and importantly includes updates for Best Hatchery Practices for minimizing spontaneous autopolyploidy. The guidance document should be updated based on these papers and could be used to standardize the coulter counter methodology across the basin. Laura shared the papers with the group and said she will work on updating the guidance document based on the two recent papers.**
- Tracy Hillman will coordinate with Laura Heironimus on topics to discuss during the White Sturgeon Subgroup meeting in September. **Complete. See Section VI.**
- Tracy Hillman will send the PRFF a placeholder for the White Sturgeon Subgroup meeting that will be held on Wednesday, 3 September 2025. **Complete.**

[1] Fiske, A. J., J. P. Van Eenennaam, A. E. Todgham, S. P. Young, C. E. Holem-Bell, A. M. Goodbla, and A. D. Schreier. 2019. A comparison of methods for determining ploidy in White Sturgeon (*Acipenser transmontanus*). Version of Record: https://www.sciencedirect.com/science/article/pii/S0044848618321616 Manuscript_dbca6545f4b9f1ddd40551ed52d19b42

[2] Schreier, A. D., J. P. Van Eenennaam, P. Anders, S. Young, and J. Crossman. 2021. Spontaneous autopolyploidy in the Acipenseriformes, with recommendations for management. Rev. Fish Biol. Fisheries 31:159-180. https://doi.org/10.1007/s11160-021-09637-z

- All members will review the strategy and provide comments to Ralph Lampman by Friday, 6 June 2025. **Complete. See Section VII.**
- Ralph Lampman will confirm the start date for adult lamprey tagging at Bonneville, and Mike Clement will coordinate the activation of new HDX readers accordingly. **Complete. Ralph shared the information with the PRFF following the June meeting. Mike indicated that the HDX PIT-tag interrogation systems were activated last week. The interrogation systems are located in the entrances and exits of all fishways at Priest Rapids and Wanapum dams.**

V. Water Quality

Columbia River Water Temperature TMDL – Tim Taylor and Melissa Peterson gave a presentation titled, "Columbia River Water Temperature – Priest Rapids Project Background" (see Attachment 1). Tim began by describing why water temperature is being discussed in the PRFF. The 401 Certification states, "If measurements reveal values don't meet the numeric criteria, Grant PUD shall develop a plan, in consultation with the PRFF and PRCC, to determine the impact on aquatic habitat and associated biota and the Project's contribution. If monitoring shows that the Project causes negative impacts to aquatic life, Grant PUD shall, in consultation with the PRFF, identify any actions that are reasonable and feasible to protect aquatic life that may be adversely affected from such Project effects, and develop and implement an appropriate action plan, subject to review and approval by Ecology" (underlines added). Thus, the water quality attainment plan will be developed in consultation with the PRFF. Tim added that the PRFF needs to familiarize themselves with water quality issues, understand how the Priest Rapids Project affects water temperature, and understand how model results and scenarios inform future temperature reduction strategies (e.g., the Water Quality Attainment Plan development).

Tim then described the timeline from development of the license application to present. He said before 2007, Grant PUD was busy developing their final license application. In 2007, the 401 Water Quality Certification was issued and the FERC license renewal occurred in 2008. As a result, a lot of work, including modeling, was conducted to evaluate the effects of the Priest Rapids Project on water quality and temperature. In 2016, the temperature modeling report was submitted as part of Grant PUD's 401WQC requirements. In 2021, EPA released their temperature TMDL. Presently, Ecology is implementing the temperature TMDL.

Tim described the work that occurred before 2007, specifically the evaluation of the Priest Rapids Project on water temperature. He said Grant PUD contracted with Battelle to model project effects on water temperature. Battelle used the Modular Aquatic Simulation System 1-Dimension (MASS1) model to evaluate project effects on temperature. Battelle compared the MASS1 model with several other temperature models and concluded that the MASS1 model was the most appropriate for the project area. Modeling evaluated three scenarios: (1) current conditions, (2) Priest Rapids Project effects removed, and (3) baseline (resembling "natural conditions"). The latter assumes no impoundments downstream of the U.S./Canada border. They analyzed the time period 1973-2000 and evaluated monthly mean temperatures, water quality standard exceedances, seasonal temperature changes, and temperature change within the project area. This work was conducted in consultation with the USFWS, WDFW, and Ecology.

Battelle found that water temperatures in the "natural condition" (no middle-Columbia River dams) still exceeded temperature criteria. When comparing the "current" condition to the "natural condition," the fall cooling cycle shifted forward by 2-4 weeks because of upstream storage projects. They found that the Priest Rapids Project did not contribute to this shift. They also found that the average daily maximum July to August temperatures would be slightly warmer under "natural conditions" compared

to “current” and “no Priest Rapids Project” scenarios. Finally, they found no significant difference between “no Priest Rapids Project” and “current” condition scenarios in the number of days temperatures exceeded 16-20˚C. With removal of the Priest Rapids Project, maximum water temperatures would increase 0.2˚C in July and August. From March to August, “Current conditions” water temperatures would be 0.1˚C cooler than with “no Priest Rapids Project,” and compared to the “baseline” temperatures, “current conditions” would be 0.3˚C warmer than “natural conditions.” Based on these results, Battelle concluded that the Wanapum and Priest Rapids reservoirs produce very little of the season shift in temperatures, their effects on exceedances of water temperature standards are small, and there is little to no difference between Columbia River temperatures with the Priest Rapids Project and without it. Battelle recommended further analysis with 2D modeling to account for vertical temperature variation.

Melissa indicated that Ecology performed a separate analysis to substantiate the results by Battelle. Those results were published in a Technical Memo and are referenced in the 401 Certification. Since then (2004), EPA and Ecology have gathered more information and performed additional analysis and modeling. This work will be discussed later in the presentation.

Tim said the work by Battelle informed the certification process in 2007 as well as FERC licensing in 2008. Melissa said the 401 Certification provided clear language on what was expected from Grant PUD regarding water temperature. The 401 Water Quality Certification Issuance and Conditions requires Grant PUD to provide a temperature monitoring program and use modeling to evaluate project compliance after year 6. Ecology will use basin-wide analyses to determine whether the Priest Rapids Project is making improvements in water temperature. Melissa indicated that EPA issued a temperature TMDL in 2021. She said the results of the TMDL supersede conditions of the 401 Certification because the provisions in the TMDL are more protective.

Tim said the first modeling effort informed the 401 Certification and FERC license renewal processes. Additional temperature modeling was conducted in 2016 as a condition in the 401 Certification. Grant PUD contracted with Northwest Hydraulic Consultants (NHC) to conduct the modeling work. NHC used the CE-QUAL-W2 (W2) model, which, unlike the MASS1 model, is a 2D hydrodynamic water quality model. NHC found that the W2 model matched observed data very well. The W2 model evaluated two scenarios: (1) current conditions and (2) Priest Rapids Project effects removed (i.e., Wanapum and Priest Rapids dams removed). As directed in the 401 Certification, the goal was to evaluate project-specific effects and therefore did not require a basin-wide approach. The analysis included the time period 2003-2012 (as required in the 401 Certification) and evaluated 7-day average daily maximum (7-DADmax) temperature threshold upstream from the project, maximum 7-DADmax temperature increase upstream of the project, daily maximum temperature threshold downstream of the project, and maximum temperature increase downstream of the project. Grant PUD submitted the draft report to Ecology in 2015 and the final to Ecology in 2016.

The results from this modeling exercise indicated that there was little vertical stratification (i.e., little temperature change with depth). Tim said the temperature of the first 3 m of water changed the most throughout the project area, while temperatures at greater depths changed little throughout the project area. He added that average daily maximum temperatures measured upstream and downstream of the project were generally exceeded largely because water flowing from Rock Island Dam into the project area commonly exceeded criteria. The model indicated that water is generally cooler “with project” than “without project” upstream of the Priest Rapids forebay. Temperatures are occasionally warmer lower in the project “with project.” The maximum temperature increase measured upstream and downstream of the project was not exceeded at the Wanapum forebay or at Beverly Bridge. However, it was exceeded 14 time at the Priest Rapids forebay and 5 times at the project boundary (exceeded <0.5% of

the time; in compliance 99.5% of the time). Exceedances were less than 0.3˚C. Finally, the maximum temperature increase downstream of the project was not exceeded.

Based on the modeling results, NHC concluded that there were some annual differences in "with Project" and "without Project" comparisons, but in general, the water flowing through the project boundaries had slightly lower temperatures in the "with Project" simulations (0.1°C) compared to the "without Project" simulations. In addition, simulated project temperatures at most project sites did not show an increase of more than the 0.3˚C threshold and the project was found to have a relatively small impact on water temperatures as a whole. Finally, it was demonstrated by a sensitivity test that lowering upstream inflow temperatures outright would result in a comparable temperature decrease at the downstream end of the Project. Tim said that sensitivity analysis indicated that if cooler temperatures enter the project area, those cooler temperatures are maintained throughout the project.

Melissa provided more information on the EPA Temperature TMDL. She said EPA issued a temperature TMDL in 2021 for the Snake and Columbia rivers. The TMDL assigned daily maximum temperature targets at each dam tailrace. These are more restrictive than 7-DADmax. The TMDL also assigned a cumulative load allocation (0.1˚C) across all dams. While the TMDL does not stipulate unique, dam-specific load allocations, cumulative load allocation exceedances are estimated at each dam tailrace in daily average temperature, which represents the amount of heat that must be reduced for all dams to meet the cumulative load allocation. Melissa noted that Ecology will evaluate progress at dams in daily average and daily maximum temperatures. Melissa stated that there will be more information provided on the EPA Temperature TMDL during a future PRFF meeting.

Tracy Hillman noted that water temperatures entering the project area are already elevated. He asked whether there has been an evaluation of the sources of the warmer water. He suggested Grand Coulee (Lake Roosevelt) and perhaps the Okanogan River as possible sources. Robbie O'Donnell responded that the tributaries, such as the Okanogan, Methow, and Wenatchee rivers, were identified as heat sources and contributors to the TMDL; however, their total load allocation is similar to the dam allocations (0.1˚C). In contrast, Lake Roosevelt does contribute a lot of heating to the river system. He said they are going through a similar water quality attainment plan process on Lake Roosevelt.

The PRFF thanked Tim and Melissa for the presentation and background information.

Other Water Quality Items – No additional items were discussed.

VI. White Sturgeon

White Sturgeon Hatching and Rearing – Nate Patterson said the eggs have hatched and the fish are rearing in troughs rather than the circular tanks. He reminded the Forum that they successfully spawned the fish on 3 June. The fish were put on feed on 20 June. There is some mortality, which is normal for this life stage. He said, overall, everything is going well.

Monitoring White Sturgeon Spawning – Mike Clement stated that WSP will monitor the success of White Sturgeon spawning in the project area during 7 through 12 July. This monitoring occurs every five years in the tailrace of Rock Island Dam. They will evaluate spawning success using egg mats and D-ring plankton nets. Egg mats are designed with a rough surface to which sturgeon eggs, which are sticky after contact with water, can adhere. D-ring nets are placed downstream from spawning locations and collect drifting sturgeon eggs and larvae. They are especially effective at capturing larvae as they drift downstream after hatching. Mike noted that they have always collected eggs with the egg mats, which indicates natural spawning in the project area.

White Sturgeon Subgroup Meeting – Tracy Hillman reminded the PRFF that they recently agreed to extend the 2016 White Sturgeon Stocking Program Statement of Agreement (SOA) another year. During the review of the SOA, Laura Heironimus suggested that the PRFF convene the White Sturgeon Subgroup to consider developing a new SOA—potentially with a multi-year duration—to avoid the need for annual re-approval. Last month, the PRFF agreed to hold the White Sturgeon Subgroup meeting on 3 September 2025. During the meeting last month, Tracy was asked to coordinate with Laura on the topics to be discussed during the Subgroup meeting. Tracy reported that he and Laura identified topics to be discussed, and based on their coordination, Tracy provided a draft agenda for the Subgroup meeting. The PRFF reviewed the agenda and identified the following items for discussion during the Subgroup meeting.

- Welcome and Introductions (9:00-9:05)
- Agenda Review (9:05-9:10)
- Review 2016 White Sturgeon SOA (Hillman) (9:10-9:30)
- Review White Sturgeon Monitoring Results (WSP) (9:30-11:00)
    - Evidence of Density Dependence
- Modeling (LGL/Blue Leaf) (9:30-11:00)
    - Adult Abundance Goals
    - Harvest Goals
- Recommendations to PRFF (All) (11:00-12:00)
    - Stocking Level
    - Broodstock or Larvae and Where to Collect Them
- Adjourn (12:00)

Laura said it will be important to have WSP talk about results from their monitoring efforts in the project area, including any evidence of density dependence. She also indicated that it would be important to identify adult target goals and harvest goals for the project area. The life-cycle model that was used by Chelan PUD to model sturgeon in the Rocky Reach project area can be used to model sturgeon in the Priest Rapids project area. Mike Clement said LGL/Blue Leaf helped populate the model for Chelan PUD and they would need to help the PRFF populate the model with Priest Rapids data. Laura added that we can use the model to estimate how long it will take to reach a target abundance based on survival rates, growth rates, and stocking levels. The model can be updated as more information becomes available over time.

Mike asked that Laura and Tracy develop objectives for the modeling effort and share those with Grant PUD, WSP, and LGL/Blue Leaf. Laura said she will also reach out to Lance Keller at Chelan PUD about the model and who they used to populate that model. Chris Mott noted that the “new” model is an outgrowth of the Beamesderfer model that was used in 2016. It will be important to populate the model with more recent information from the Priest Rapids project area.

Following the meeting, Mike reached out to WSP, and WSP indicated that they will not be able to attend the Subgroup meeting in September. WSP will be conducting index monitoring in the project area in September. WSP recommended that the Subgroup meeting occur on 1 October. This will also give the PRFF additional time to populate the life cycle model and run different scenarios.

Other White Sturgeon Items – No additional items were discussed.

VII. Pacific Lamprey

Comments on the Juvenile Lamprey Survival Study Document – Ralph Lampman reported that he received comments from the USFWS, CTCR, CRITFC, and PUDs. He is working on addressing comments and will have those addressed before the Pacific Lamprey Subgroup meeting in August.

Grant PUD Adult Trapping Efforts in 2025 – Mike Clement reported that Grant PUD began collecting adult Pacific Lamprey at Priest Rapids Dam on 23 June. The early start was to accommodate Chelan PUD's studies at Rock Island Dam. He said that since starting on the 23rd, they have collected 48 adult lamprey. Chelan PUD only needed 20 fish during the first two weeks of their study; therefore, the extra fish were released upstream of Priest Rapids Dam. Mike said trapping will continue through early October.

Pacific Lamprey Subgroup Meeting – Tracy Hillman reported that the PRFF, in coordination with the RRFF and ASWG, is convening the Pacific Lamprey Subgroup to discuss the efficacy of juvenile Pacific Lamprey studies. The Subgroup meeting will be on 6 August 2025. In preparation for the meeting, Tracy provided a draft agenda for the Subgroup meeting. The PRFF reviewed the agenda and identified the following items for discussion during the Subgroup meeting.

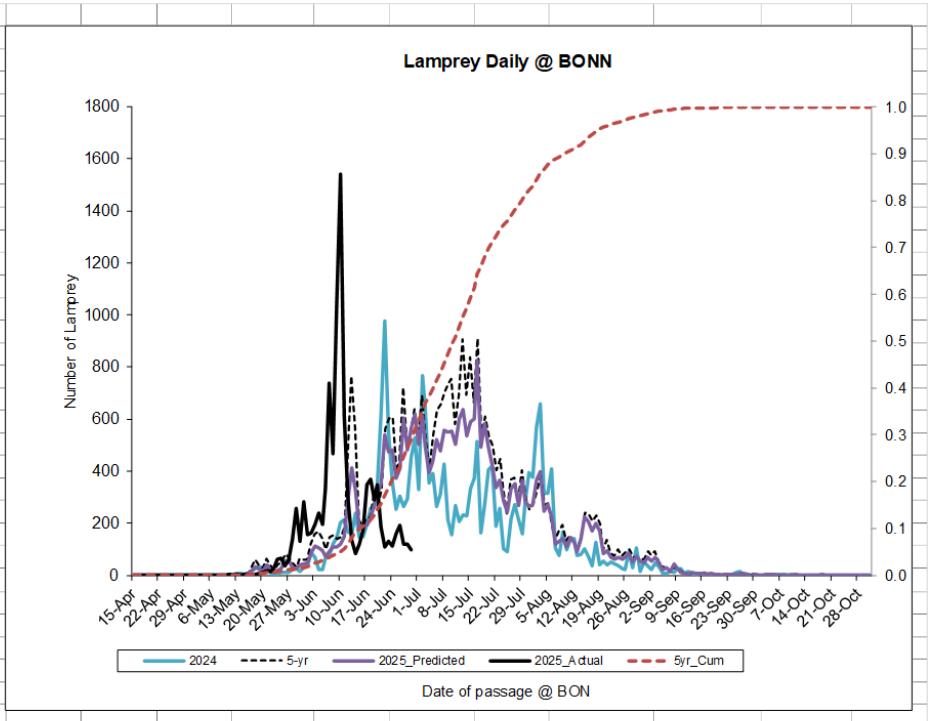
- Welcome and Introductions (9:00-9:05)
- Agenda Review (9:05-9:10)
- PNNL Responses to Questions and Summary of Research Results (9:10-12:00)
- Pacific Lamprey Survival Strategy and Key Questions (1:00-3:00)
    - Spatial Scale and Scope
    - Survival Model
    - Acceptable Precision Level
    - Source of Lamprey
    - Tag Performance
- Recommendations (3:00-4:00)
    - Responses to Key Questions
- Adjourn (4:00)

Ralph Lampman asked whether the "Recommendations" would be for PRFF only, or if they would be for all three groups. Tracy responded that the recommendations would likely go to all groups, but it would be up to each group to review and discuss the recommendations. Ralph recommended that the draft agenda and questions be shared with PNNL next week after the ASWG reviews the questions. Tracy agreed and will send the draft agenda and questions to PNNL and the groups after he hears from the ASWG. Ralph also recommended that PNNL provide a summary of findings from the last four years of their survival studies. Tracy will work with Ralph to put the final touches on the draft agenda.

Other Pacific Lamprey Items – The following Pacific Lamprey updates were shared during the meeting:

- Ralph shared the following figure with the PRFF (the figure was generated by Jon Hess, CRITFC). The figure shows the count of adult lamprey at Bonneville Dam. Ralph indicated

that the numbers continue to stay low and noted that the run was early this year. The early spike in numbers was not sustained over time.



PREDICTED 2025 RUN BASED ON 5YR AVG RUN TIMING:					**35,048**	or 12days earl	**19,980**	Year	BON count
As of June 29, 2025					**Largest run in past 10 years**			2017	82681
					82,681	**12.3%**		2023	63937
Preseason forecast: 28,405								2016	52324
								2022	48936
	The cumulative run at BON			**10,174**	**29.0%**	**complete (5yr avg)**		2018	43419
	As of:	**6/29/2025**			**Exp. Date of 50% complete: Jul. 11**			2015	38716
								2014	31953
								2024	22088
								2021	21102
								2019	19374
								2020	11889

- Ralph reported that the acoustic tag for juvenile lamprey (ELAT, or Eel and Lamprey Acoustic Tag) will be produced commercially in a few months. Advanced Telemetry Systems (ATS) will supply the tags at a cost of about $200-$300 per tag.
- Ralph reported that they were unable to conduct the field study on the Bonneville Hatchery Floating Adult Collector. The purpose of the study was to finetune the floating adult lamprey collector, following modifications based on lab testing. They will continue to study the collector in the lab at the Bonneville Hatchery. They intend to evaluate it in the river next year.
- Ralph indicated that the deadline for abstracts for the 2025 Lamprey Information Exchange has been extended one month. The new deadline for abstracts is Friday, 25 July 2025.
- Ralph reported that the Willamette Falls Lamprey Translocation and Celebration occurred last week. He said it was a great success, and they translocated over 250 adult lamprey above Army Corps of Engineers dams in the Willamette Basin. The actual release was less than the goal of translocating 500 adults.

VIII. Administration

Tracy Hillman reported that he received a letter from the USFWS indicating that Michael Lucid will serve as their representative on the PRFF. Emil Orling will serve as their alternate on the PRFF. Everyone welcomed Michael to the PRFF.

IX. Adjourn

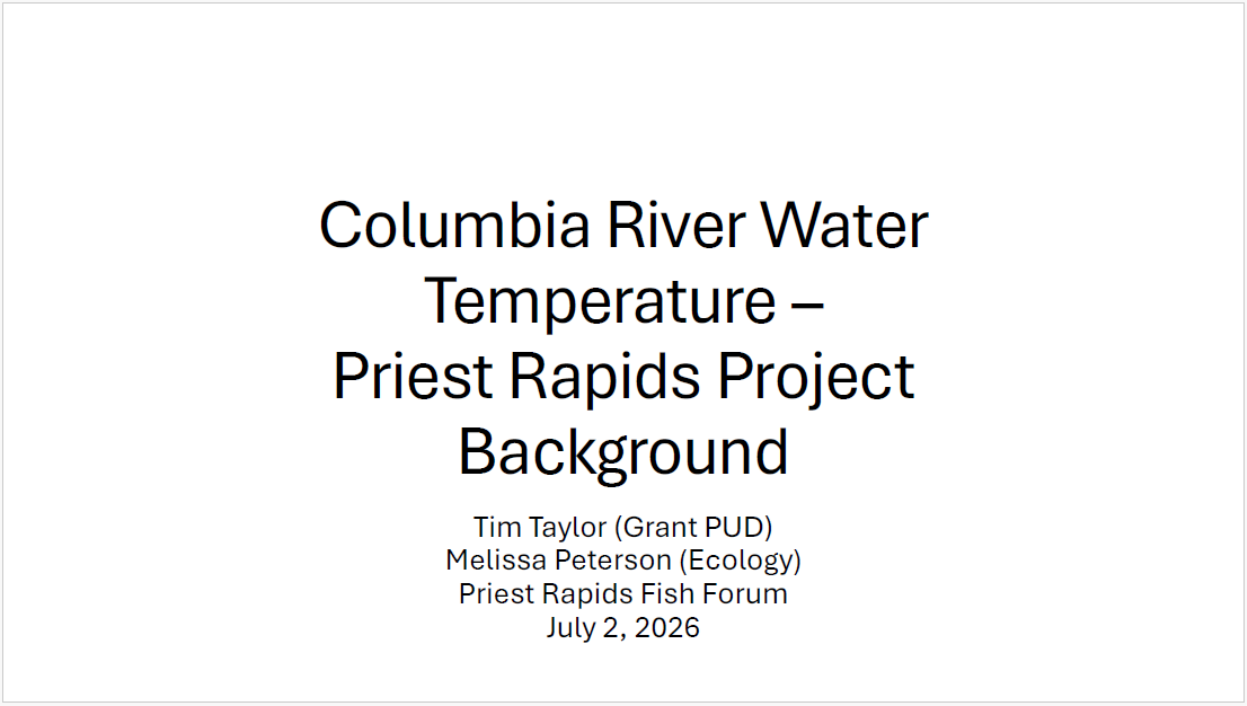
With no additional business to discuss, Tracy Hillman adjourned the meeting at 11:00 am.

X. Next Meeting

The Pacific Lamprey Subgroup will meet on Wednesday, 6 August 2025. The next meeting of the PRFF will be on 3 September 2025.

Attachment 1

Presentation by Tim Taylor and Melissa Peterson on Columbia River Water Temperature – Priest Rapids Project Background



Water Temperature in the PRFF: Why?

6.6 LOCALIZED PROJECT EFFECTS

Grant PUD shall monitor and study the following parameters, *in accordance with the plan development and procedures of Section 6.7.*

1) **DO, pH and Temperature**

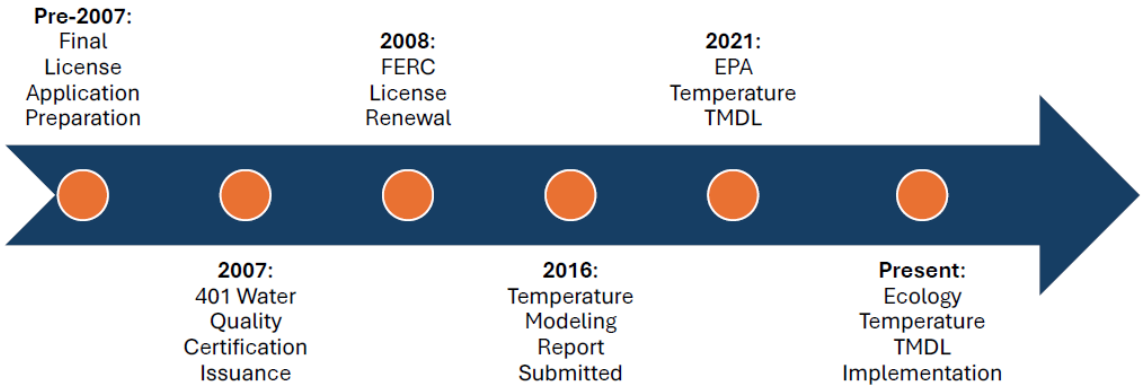
a) Long-Term Monitoring. Grant PUD shall continue to monitor pH and DO in the Project for the term of the New License. Monitoring shall be done on a periodic basis, as specified in the Ecology-approved Quality Assurance Project Plan (QAPP), per Section 6.7.

b) Short-Term Monitoring. Within one year of license issuance, Grant PUD also shall develop and implement a short-term monitoring study for DO, pH and temperature in shallow water habitats, including macrophyte beds, in the reservoirs. Grant PUD shall monitor to determine if the values in the numeric criteria for DO, temperature and/or pH are met in these areas. If measurements reveal values to don't meet the numeric criteria, Grant PUD shall develop a plan, in consultation with the PRFF and PRCC, to determine the impact on aquatic habitat and associated biota and the Project's contribution. If monitoring shows that the Project causes negative impacts to aquatic life, Grant PUD shall, in consultation with the PRFF, identify any actions that are reasonable and feasible to protect aquatic life that may be adversely affected from such Project effects, and develop and implement an appropriate action plan, subject to review and approval by Ecology. Grant PUD shall implement such plan in a timely manner.

Why should I care about this background information?

- Baseline information
  - to familiarize the PRFF (generally fish folks) to water quality issues
  - to understand how the PRP impacts water temperature
  - to review how model results and scenarios may inform future temperature reduction strategies (*e.g., Water Quality Attainment Plan development*)

Timeline



Pre-2007:
Final License Application Preparation

Final License Application (Pre-2007) – PRP Effects on Water Temperature

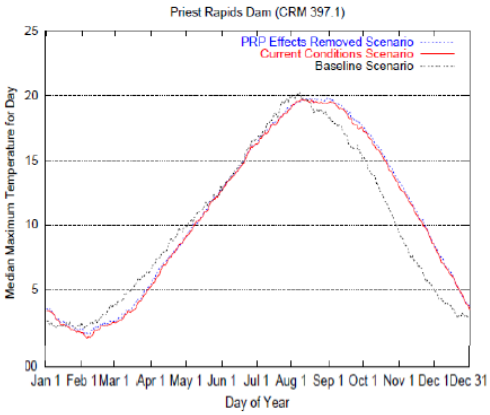
- Final License Application: Grant PUD contracted with Battelle (PNNL) to model project effects on water temperature
  - Used the Modular Aquatic Simulation System 1-Dimension (MASS1) model (Perkins et al. 2002)
    - Demonstrated appropriateness of model to evaluate water quality standards, equivalent results to competing models
  - Primarily evaluated three scenarios
    - Current conditions - all dams operated at seasonal pool levels
    - PRP effects removed - Wanapum and Priest Rapids were removed from the system
    - Baseline – most closely resembles 'natural conditions'; no Mid-Columbia impoundments below the below the Canadian border
      - MCN: modeled so Hanford Reach and Pasco water quality site not impacted by MCN

Perkins et al. (2002) – 222 page report

- Time period analyzed: 1973–2000
- Summary statistics compared
  - Monthly mean temperature
  - Water quality standard exceedances
  - Seasonal temperature changes
  - Temperature change within the PRP
- Developed in consultation with USFWS, WDFW, Ecology

Perkins et al. (2002) - Results

- Water temperatures in the 'natural condition' (no mid-C dams) still exceeded temperature criteria
- 'Current conditions' versus 'natural conditions': fall cooling cycle shifted forward by two to four weeks (due to upstream storage projects)
  - PRP did not contribute to this seasonal shift
- Average daily maximum July to August temperatures would be **slightly higher** under 'natural conditions' compared to 'current' and 'No PRP' scenarios.



Perkins et al. (2002) – Results Cont…

- No significant difference between 'No PRP' and 'Current' condition scenarios in the number of days temperatures exceeded 16 to 20°C; in July and August, max water temp **would increase 0.2°C with PRP removed**.
  - From March to August, 0.1°C cooler than 'No PRP'
  - 'Current' conditions 0.3°C warmer than 'natural conditions', but 0.5°C warmer with 'PRP removed'
    - Higher temperature influenced by conditions upstream of the Project

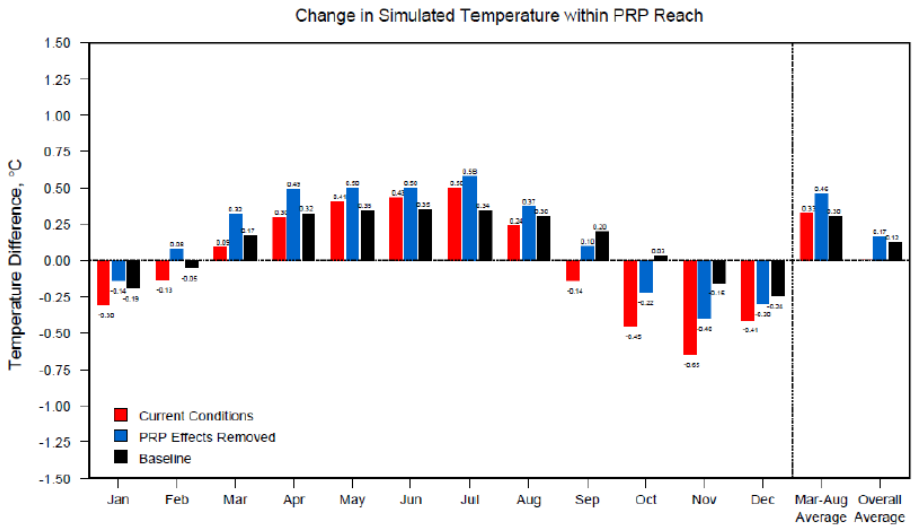


Figure 3.9: Differences in simulated temperature over the Priest Rapids Project (PRP) Reach.

Perkins et al. (2002) - Conclusions

- "The WAN and PR pools produce very little [of the seasonal shift observed in the model]...".
- "The effects of the [PRP] on exceedances of numeric water temperature standards is small."
- "...the results show little or no difference between Columbia River temperatures with the PRP impoundments and without."

The authors recommended further analyses looking into 2D modeling to account for vertical temperature variations.

Whiley (2004)

- Ecology performed a separate analysis to substantiate these results (Whiley 2004).
  - *Ecology and EPA have gathered more current information and performed additional analyses and modeling over the past two decades (more information forthcoming).*

2007: 401 Water Quality Certification Issuance

and

2008: FERC License

401 WQC Issuance and Conditions

Water Temperature:

- Monitoring – GPUD will provide a temperature monitoring program
- Temperature modeling – GPUD evaluated PRP compliance after year 6 (~2014)
- Evaluation – Ecology will evaluate if PRP is making improvements in water temperature using a basin-wide analysis.
- Temperature TMDL – EPA issued a temperature TMDL in 2021. The results of the TMDL supersede conditions of the 401 certification because the provisions are more protective.

2016:
Temperature Modeling Report Submitted

2016: Additional Temperature Modeling

- 401WQC Condition: Grant PUD contracted with Northwest Hydraulic Consultants (NHC) to model project effects on water temperature
  - Used the CE-QUAL-W2 (W2) model, which is a **2D** hydrodynamic water quality model
    - The calibrated model matched observed data well
  - Primarily evaluated two scenarios
    - Current conditions – existing dams and conditions in place
    - PRP effects removed - Wanapum and Priest Rapids were removed from the system

NHC (2016) – 121 pages

- Time period analyzed: 2003–2012
  - Requirement of 401WQC (10 years)
- Five metrics (WAC criteria) to compare simulation results
  - 7-day Average Daily Maximum (7-DADMax) Temperature Threshold upstream of PRD
  - Maximum 7-DADmax Temperature Increase Upstream of PRD
  - Daily Maximum Temperature Threshold Downstream of PRD
  - Maximum Temperature Increase Downstream of PRD (two total metrics)
    - WAC did not specify how to calculate average temperatures from a 2D model
      - Flow weighted temperature average used
- Submitted for comments/review by Ecology in 2015, 2016

NHC (2016) – Results

Little vertical stratification

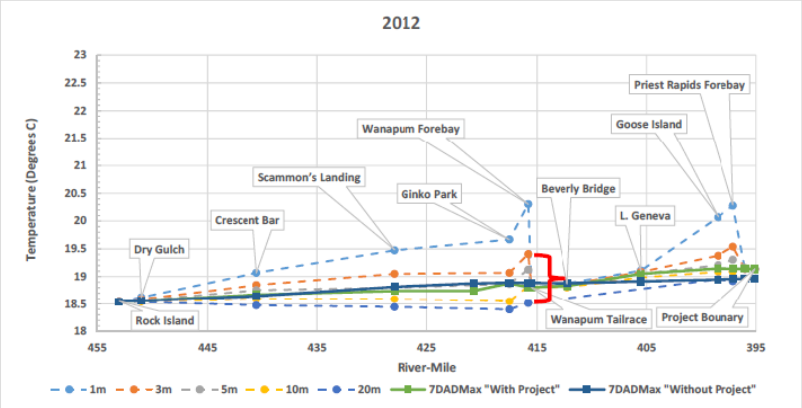
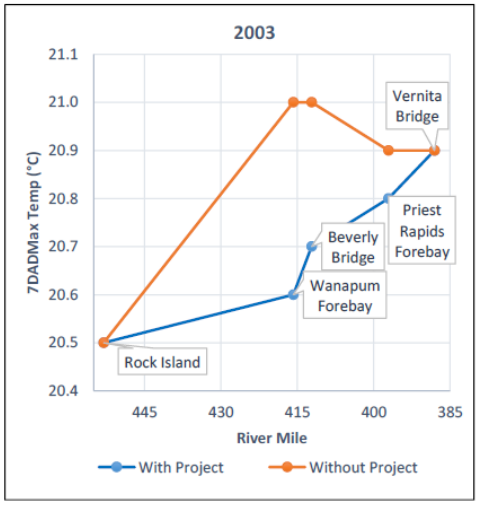


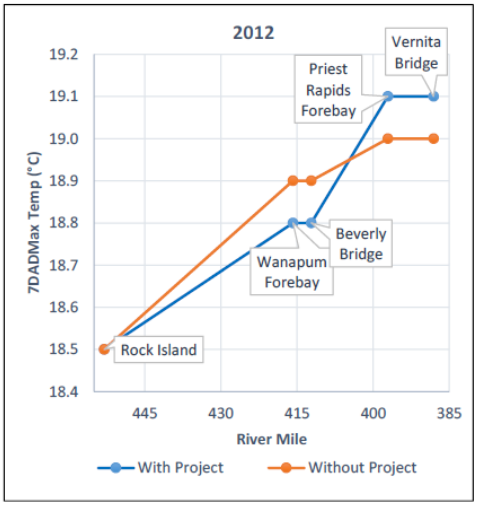
Figure 45: Maximum Annual 7-DADMax Queried at Depths by River-Mile, 2012

NHC (2016) – Results Cont.

- Metric 1 & 3 (average daily max temp upstream/downstream of PRD)
  - Generally exceeded; water flowing from RID commonly exceeded criteria
  - Generally cooler water "with project" than "without project" upstream of PR forebay
  - "With project" is occasionally warmer lower in the project
- Metric 2 & 4 (max temp increase upstream/downstream of PRD)
  - Not exceeded at WAN forebay or at Beverly Bridge
  - Only exceeded 14 times at PR Forebay and 5 times at project boundary
    - <0.5% of time (14 days and 5 days out of 3652 simulation days)
- Metric 5 (max temp increase downstream of PRD, equation)
  - Not exceeded

NHC (2016) – Results Cont.





NHC (2016) – Results Cont.

Year	Analysis Location			
	Metric 2 Upstream of Priest Rapids dam, 7-DADMax Temperature Criterion (# of days Difference > 0.3 °C)			Metric 4 Downstream of Priest Rapids dam, Daily Maximum Temperature Criterion, (# of days Difference > 0.3 °C)
	Wanapum Forebay	Beverly Bridge	Priest Rapids Forebay	Project Boundary
2003	-0.02 (0)	0.00 (0)	0.29 (0)	0.16 (0)
2004	0.15 (0)	0.19 (0)	0.32 (1)	0.33 (5)
2005	0.05 (0)	0.11 (0)	0.17 (0)	0.13 (0)
2006	0.05 (0)	0.08 (0)	0.33 (1)	-0.02 (0)
2007	0.11 (0)	0.13 (0)	0.31 (0)	0.12 (0)
2008	-0.10 (0)	-0.02 (0)	0.17 (0)	0.11 (0)
2009	-0.02 (0)	0.09 (0)	0.27 (0)	0.05 (0)
2010	0.16 (0)	0.23 (0)	0.33 (3)	0.12 (0)
2011	0.04 (0)	0.09 (0)	0.26 (0)	NA
2012	0.21 (0)	0.27 (0)	0.38 (9)	NA
Average	0.06 (0)	0.12 (0)	0.28 (14)	0.12 (5)

NHC (2016) - Conclusions

- *The authors identified that there was some annual differences in 'with Project' and 'without Project' comparisons, but in general, the water flowing through the project boundaries had **slightly lower temperatures in the 'with Project'** simulations (0.1°C) compared to the 'without Project' simulations.*
- "Simulated project temperatures at most Project sites **did not show an increase** of more than the 0.3 degree threshold."
- "…the Project was found to have **a relatively small impact** on water temperatures as a whole."
- "It was demonstrated by a sensitivity test that **lowering upstream inflow temperatures outright** would result in a comparable temperature decrease at the downstream end of the Project."

2021:
EPA Temperature TMDL

EPA's temperature TMDL assigns:

- Target temperatures at each dam tailrace as daily maximum temperature are more restrictive than 7-DADmax.
- A cumulative load allocation (0.1) across all dams. While the TMDL doesn't stipulate unique, dam-specific load allocations, cumulative load allocation exceedances are estimated at each dam tailrace in daily average temperature (Tables 6-6 through 6-10), which represents the amount of heat that must be reduced for all dams to meet the cumulative load allocation.
- Ecology will evaluate progress at dams in daily average and daily maximum temperature.

Questions?

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