



**Priest Rapids Coordinating Committee
Final Meeting Minutes
Grant PUD HOB-107/Zoom
Tuesday, September 27, 2022
1 PM**

PRCC Representatives

Scott Carlon, Justin Yeager (Alt), NMFS	Jim Craig, USFWS
Keely Murdoch, Brandon Rogers (Alt), YN	Kirk Truscott, Casey Baldwin (alt), CCT
Chad Jackson, A. Murdoch (Alt) WDFW	Tom Skiles, CTUIR
Curt Dotson, Tom Dresser (Alt), GPUD	Rod O'Connor (Alt), GPUD

PRCC Meeting Attendees

Curt Dotson, GPUD	Keely Murdoch, YN
Scott Carlon, NMFS (Via Zoom – partial)	Jim Craig, USFWS (Via Zoom - partial)
Chad Jackson, WDFW (Via Zoom - partial)	Tim Taylor, GPUD
Tom Skiles, CTUIR (Via Zoom)	Erin Harris, GPUD
Kirk Truscott, CCT - Absent	Andrew Murdoch, WDFW (Via Zoom - partial)
Bryan Nordlund, FPE - Facilitator	Tom Dresser, GPUD (Via Zoom -partial)
Rod O'Connor (Via Zoom – partial)	

Meeting Minutes

Decisions and Approvals Made During September 27, 2022, Meeting

1. **APPROVAL:** July and August 2022 Meeting Minutes are approved as final.
2. **ACTION: Survival Study Talking Points:** Curt Dotson will continue to update the survival study talking points for PRCC review and comment. PRCC members should pass any comments, questions, or suggestions to Curt.
3. **ACTION: Fish Counts 2022:** Curt Dotson will ask Dave Duvall, Grant PUD Lead Biologist for steelhead discrepancy clarification to report to the committee during the October 2022 meeting.

4. **ACTION: PRCC Operations Protocol (working document):** Bryan Nordlund will add the Excel spreadsheet as an attachment to the PRCC Operations Protocols Word document (attached).
5. **ACTION: Fish Survival Studies:** Curt Dotson will draft an example document (i.e. draft study proposal) describing how Grant PUD could conduct a fish survival study.

Agenda

- I. **Welcome, Announcements and Introductions** – Bryan Nordlund welcomed everyone to the meeting and Curt Dotson supplied a safety briefing.
- II. **Agenda Review** – Bryan Nordlund reviewed the agenda. Curt Dotson added a walk-on agenda item: Extending the Lower Range of Fish Mode at Wanapum Dam.
- III. **Meeting Minutes Approval**
 - A. August 16, 2022, PRCC meeting minutes – meeting minutes were distributed by Bryan Nordlund by email on August 25, with comments due by the next PRCC meeting on September 27, 2022 (today). July 26, 2022, meeting minutes have been approved by the PRCC and are ready for posting. Meeting minutes are approved, Bryan Nordlund will send out final approved July and August meeting minutes to Erin Harris for posting to GrantPUD.org
- IV. **Status of Actions Items from August 16, 2022, Meeting**
 1. Action: Curt Dotson will continue updates to his Survival Study discussion document built from the bullet list below and distribute for continuing this discussion at future PRCC meetings. He will also reach out to Chelan PUD to discuss feasibility of using their facilities as a source for study fish. -*Ongoing*
 2. ACTION: Fish ladder inspections: Bryan Nordlund will reach out to Tom Skiles for a current report on fishway operations. *Completed – Per Tom Skiles, he did not inspect the ladders in July.*
 3. ACTION: Bryan Nordlund will supply an updated Operations Protocols document for distribution at the next PRCC meeting. Bryan Nordlund will make updates to his Excel spreadsheet for the PRCC operations protocols to match the committee’s recommendations and change the format from Excel to Word. – *Completed and distributed via email on Sept 12, 2022.*
- V. **2021 Fish Passage Operations Report**
 1. **Update on investigations for fish count discrepancy:**

Curt Dotson reported there are ongoing quality controls in place. Based on the results of three (3) days of fish counts reviewed by Grant’s 3rd party reviewer (consultant), it was found that one fish-counter in particular had a large number of “over-counts”, which, if expanded out, accounts for a lot of the discrepancies seen in the WAN fish counts compared to those of Priest Rapids and Rock Island

(i.e. sockeye). It was also mentioned that Grant PUD dismissed a particular fish counter employee due to inaccurate fish counts. Curt also informed the committee that Grant was having trouble finding/hiring qualified (i.e. fish identification) fish counters to finish out this season – thus there may be some delays in when counts get posted due to this labor shortage.

2. Fish ladder inspections:

Tom Skiles performs monthly fish ladder inspections at the GPUD dams for the fisheries agencies and tribes. Tom Skiles shared he had a ladder inspection scheduled for today that was cancelled. Tom reported that Mike Clement sent him photos of the ladder for his review. Tom Skiles reported that he performs monthly inspection and briefly discussed his findings. The ladders were performing with criteria.

3. Fish spill updates:

Spill season is complete for juvenile passage. Curt Dotson reported that adult fallback spill is currently taking place through November 15, 2022, at both Wanapum and Priest Rapids dams.

4. Fish counts for 2022 (April 15 – September 4)

(note: corrected dates - agenda had incorrect time span)

Project	Spring Chinook (final)	Summer Chinook (final)	Sockeye	Fall Chinook	Steelhead	Coho
Priest Rapids	21091	61927	654323	6668	2304	382
Wanapum	21165	59778	724509	2711	2285	57
Rock Island	22487	64497	659871	1862	3803	7

Curt Dotson shared a document titled “Comparison of Actual Fish Counts for Priest, Wanapum and Rock Island (April 15 - Sept 12, 2022)”. He shared that the higher counts were most likely associated with human error (see above section on Updates on Investigations for fish count discrepancies). Chad Jackson inquired on Steelhead count discrepancies and Curt Dotson stated he would need to speak with Dave Duvall (GPUD) regarding the steelhead counts and that he would get back with Chad and the PRCC.

VI. Continuing discussion - Develop PRCC operations protocols (e.g., SOA development, timing, agenda items, presentations)

Bryan Nordlund reviewed the PRCC Meeting Operations Protocol document with PRCC members and minor edits were made. With agreement from the committee, the summary spreadsheet/matrix used to develop the Word document be added to the draft (Word) document It was agreed that the working (protocols) document is complete.

See working document attached to these minutes, derived from today’s discussion from original draft document sent by email on September 12, 2022, from Bryan Nordlund.

VII. Fish Mode at Wanapum Dam

Curt Dotson referenced the Fish Mode memo that was sent out to the PRCC the week prior to this meeting and presented a PowerPoint that demonstrated how Fish-Mode was developed for the GPUD dams. Fish Mode was developed to optimize fish survival through the turbines, while keeping turbine efficiency up. In 1996, a balloon-tag study was conducted to show survival of fish released directly into the turbine flow path at 10 feet and 30 feet depths below the turbine's intake ceiling, over a range of turbine flows and constant head. As such, he pointed out that the data used to develop Fish-Mode was based on the old/original Wanapum turbines, not the (new) Advanced turbine units now installed at Wanapum. PowerPoint slides from 1996 showed (average between the two release depths) survival was best (above 95%) between 11.8 and 15.7 kcfs (i.e. "Fish Mode") and peaked around 15 kcfs with the old turbine units, with mortality increasing outside of that flow band. In 2005, the balloon-tag study was repeated to compare fish passage survival between the new design turbine and the original turbines. With the new survival data collected in 2005, the fish survival rates at the higher turbine flows thru the new turbine produced similar fish passage survival rates as seen in the original (old) turbines, (similar results as seen in the 1996 balloon-tag study). Since there wasn't a much difference between the new turbine and the old turbines at the higher (>15 kcfs), the original Fish-Mode range (11.8 – 15.7 kcfs) was kept for use in the new turbines. What was shown by the 2005 study results, was that fish survival exceeded 95% for the new turbines for flows down to 9.5 kcfs.

With the requirements of the 2004 Fall Chinook Protection Plan (i.e. Hanford Reach) GPUD is experiencing a high frequency of turbine "on/off" events at Wanapum turbines as Grant follows electrical power load, since PRD is very limited in flow output due to flow requirements on Hanford Reach. These frequent on/off events for a turbine are "hard" on turbines and increases maintenance on the new units, and outages affect power operations and could affect fish passage. As such, GPUD is requesting that the PRCC consider a revised Fish Mode flow range for the Wanapum turbines from the present 11.8 – 15.7 kcfs to 9.5 – 15.7 kcfs. This would decrease the number of turbine "on/off" events (nearly a 50% reduction in number) Curt Dotson presented a slide (PPT) showing the survival rates from the 2005 balloon-tag study thru the new WAN turbine and survival for both release depths (10 ft. and 30 ft.) were above 95% down to a flow of 9.5 kcfs.

Tom Skiles asked technical questions regarding better clarity on the 1996 slides vs the 2005 slides, and when fish friendly turbines were installed at Wanapum Dam. Keely Murdoch suggested that juvenile fish survival rates could possibly change with the revised Fish Mode. She also pointed out that all previous survival studies were conducted with the current operation protocols and questioned whether we should test the proposed modified 'fish mode' in the 2025 & 2026 survival studies prior to full implementation or go ahead and implement and then conduct the upcoming survival studies with the modified 'fish mode'.

The PRCC will study the document for discussion and potentially a vote at the October meeting.

See attachment: Extending the Lower Range of Fish Mode at Wanapum Dam).

VIII. Continuing preliminary discussion - Survival study talking points.

- timing, species, life stage(s)
- future workshops needed?
- tag type
- standard to measure (combine projects? combine adult + juvenile?)
- accuracy/precision of data analysis
- fish source
- release points
- assessing tag and tagger effects detection points
- dealing with adverse river flow conditions
- plant operations
- achieving standard or not – path forward
- factoring in avian predation
- others, per PRCC discussion?

Curt Dotson has added text to the above list's bullet items for increased clarity and understanding based on previous survival study experience. He then reviewed the changes and updates he had made since the August meeting. Curt informed the committee that he has heard back from the data logger/receiver vender and parts/upgrades to the receivers would need about an 18-month lead time (supply chain issue) to ensure that parts would be received in time for the study. The PRCC discussed priorities in these talking points and decided that fish source and tagging location were the most items to address first, since they would dictate other aspects of the study. The PRCC also discussed what standard will be measured, and it was agreed that the check-in studies were intended to measure juvenile survival within the Priest Rapids Project. The PRCC also agreed that further discussion is underway regarding achievement of the performance standard, and this needs to be completed prior to determining how or if the standard is achieved for each species.

Curt Dotson requested that PRCC members send him feedback on the material he had presented, and several members agreed to do so. To help facilitate this process moving forward, Curt will provide the PRCC a draft survival study proposal for the PRCC to review and evaluate and this may help narrow down those particular items within a study that the committee needs to discuss. Tom Skiles asked for an update from the August PRCC meeting, which he couldn't attend. In response, Curt described the difficulties in resurrecting the gateway dipping program, which was the primary fish source for earlier survival studies. After collection from gateways, fish were routed to Wanapum "Fish Town", which was a facility where tags were surgically implanted in study fish, then held in temporary ponds before use in the study. Curt also mentioned that deciding on some options will dictate the selection of other options. An example of this: if gateway dipping is selected as the source of

study fish, the fish handling would be done at Wanapum Fish Town. Curt mentioned that he also revised text in the aviation predation section of the document.

Potential options for fish source for future studies included the Rocky Reach Evaluation Facility, the Rock Island Sampler and possibly some type of in-river collection (i.e. gatewell dipping). Curt stated that for study fish to be collected, tagged, and held would require development of facilities (or agreement to use existing Chelan PUD facilities) similar to the Wanapum Fish Town. Depending on logistics, it may be possible to resurrect and use the Wanapum Fish Town.

See attached document regarding recent modifications to Survival Study Talking Points memo.

ACTION: Fish Survival Study Talking Points - Curt Dotson will continue to update the survival study talking points for PRCC review and comment. PRCC members should pass any comments, questions, or suggestions to Curt.

ACTION: Fish Survival Studies - Curt Dotson will draft an example document describing how Grant PUD could conduct a fish survival study.

IX. New discussion – Path forward from check-in survival study results.

The PRCC discussed this in general terms, suggesting possible alternatives if the check-in survival studies show a failure to achieve survival standards. Alternatives suggested included developing a SOA to spell out how the new measurement will be considered in combination with or separate from existing survival test results. Project operation modifications may be possible. Factors such as predation, operations, river conditions and others should be considered in determining a path forward when developing the SOA. Bryan Nordlund stated that Scott Carlon needs to be present to provide his views on how to proceed if the survival rate specified by RPA from the Project's Biological Opinion is not achieved

- X. Revived discussion – PRCC definition of survival standards** - Curt Dotson discussed the survival standards and confirmed that the 2025 Check-in Study was intended to measure Project juvenile fish survival by either combining Priest Rapids and Wanapum into a single study or by measuring survival at each Project individually but combined for one total survival estimate for the Priest Rapids Project. He mentioned that another forum is currently discussing the issue surrounding combined survival standards (adult plus juvenile) or separate adult and juvenile survival. Keely Murdoch confirmed this. Curt Dotson would like the PRCC to start discussing a draft study proposal to be developed and have a SOA that addressing path forward if the results from the 2025 check-in survival study come in below the performance standards required for the PRP completed before February 2025.

UPDATES

XI. Review of Outstanding NNI Funded Projects

- A. Lower Wenatchee Instream Flow Enhancement Project Phase II.
Status: No update

- B. Avian Predation on ESA-listed Juvenile Salmonids on the Mid-Columbia River, 2022.
Status: Per Curt Dotson, field work is completed for 2022 and a report writing is underway and hopefully be present by RTR at the November 2022 meeting.

- C. Northern Pike Removal (2022-2024).
Status: The Colville Tribes are expected to provide an update at the end of the year with a presentation to the committee.

XII. Sub-Committee Updates

Bryan Nordlund has forwarded the latest subcommittee distributions he has received to date via email.

- A. Priest Rapids Fish Forum – PRFF conference call occurred on September 7.

- B. Habitat Subcommittee –HabSC meeting held September 8.

- C. Fall Chinook Work Group – no update.

- D. Hatchery Subcommittee – Next meetings are scheduled for September 21, October 19, and November 16.

XIII. SOA discussed in 2022

SOA number	Key words	Last Discussed	Status
2021-06	Facilitator Selection	January 25, 2022	completed

XIV. Next Meetings

The next PRCC meetings are scheduled for October 25 at the Douglas PUD Auditorium at 9:00 AM, a virtual meeting on November 15 at 1:00 PM, and a virtual meeting December 16 at 1:00 PM.

Attachment 1 - Survival Study – Talking Points (C. Dotson)

I. Discussion - Survival study preliminary discussions.

Let's focus on fleshing out list from last meeting and prioritize discussions. Potential discussion points include:

- **timing, species, life stage(s)** – PRCC SOA 2018-01 states that “check-in” survival studies for the PRP will be every 10 years (an expansion from the original SSSA schedule of every 5 years), with the first studies (yearling Chinook, steelhead, sockeye) taking place in 2025/2026.
 - HCP allows for a “surrogate” species to be used in survival study check-ins for all species.
 - WAN Fish Town is presently only capable of keeping two species of fish on-site at a time when a study is being conducted and fish source is gate well dipping. Infrastructure not capable to handle the number of smolts on station with three species at a time.
- **future workshops needed?**
- **tag type** – Tag types that have been used in the past have been PIT-tags, radio tags, and acoustic tags (both JSAT and HTI) – each type of tag with its own set of pros/cons. Due to a variety of reasons, the region has been predominately using acoustic tags for looking at survival estimates within short sections of the river (i.e., a PUD's Project).
 - **PIT-tags:** Small tag. Low tag/body weight ratio. No battery life issues, but must be within a couple of feet of a PIT receiver to be read. Nearest PIT receiver for PRP study is McNary Dam, which has a tag detection efficiency of less than 2%. Due to very low tag detection efficiency, to get a survival estimate that has any merit, your sample size (i.e. number of smolts needed for the study) must be in excess of 100,000 smolts tagged.
 - **Radio tags:** Do have a battery-life to them, Tag is surgically inserted into the smolt, but the antenna for the tag trails outside of the body and behind the smolt. Antenna can be a vector for infection and possible cause the smolt to get hung-up on items it swims past. Receivers can be placed above the water and still receive a tag signal. Receivers have a higher tag detection efficiency than the PIT receivers at McNary, but not as high as the acoustic tag system. Depending on study design, would most likely need 3,000 – 5,000 smolts to conduct a study. Grant has not done a radio tag study in about 20+ years, so a

whole new receiver system would need to be purchased. Not aware of any radio-tag survival studies taking place in the mid-Columbia for many years.

- **Acoustic tags:** Presently the most common tag used to conduct Project-wide smolt survival studies in the mid-Columbia River. Battery-life is around the 30-day mark, ping-rate influencing battery life. There is a tag/body weight ration factor to consider when using an acoustic tag, but most smolts studied in the mid-Columbia can handle the tag size, sub-yearlings and possibly sockeye being the species where weight is most seen to be issue for study species. In sub-yearling studies conducted recently, 95 mm is the smallest smolt used to insert an acoustic tag. Receiver arrays are deployed in the river and tag detection efficiencies are usually in that 97% - 99% range, this means that your study sample size can be reduced – an acoustic tag study in the PRP is around 2,000 – 2,500 smolts per species (depending on study design).

- **standard to measure (combine projects? combine adult + juvenile?)** - In the 2004 BiOp, under section 9.0 (Reasonable and Prudent Alternatives), part 9.1 (Performance Standards), Action 1 states:
“...The performance standard can also be accomplished as a composite; Grant PUD can compensate for a failure to achieve the performance standard at one of its developments by exceeding the performance standard at the other development...”

Grant takes this to mean that at the end of the day, the survival estimate that is used to determine if Grant has met its required performance standard is the survival estimate for the total Priest Rapids Project (aka RIS tailrace to the PRD tailrace). An example of this would be the 2017 survival study, which had only two release points – RIS tailrace and PRD tailrace – to fulfill the requirement of a “paired release study” and generated only one survival estimate. An estimate for the total PR Project.

- **accuracy/precision of data analysis** – In the 2004 BiOp, under section 9.0 (Reasonable and Prudent Alternatives), part 9.1 (Performance Standards), Action 1 states:
Survival estimates shall be measured at the 95% confidence level with a standard error of not more than plus or minus 2.5%. For any specific study, a less precise estimate of not more than plus or minus 3.5% may be acceptable if the PRCC agrees.)
- **fish source** – fish source has many options, each with its pros/cons. The different sources of study fish are:

- Gate well dipping at WAN and PRD – Gate well dipping at both WAN and PRD has been the predominant source for study fish. The last gate well dipping done at Grant was in 2017. Presently Grant does not have any equipment nor experienced labor force for gate well dipping. The collecting of needed numbers of smolts has become more and more challenging as the years have gone by. Before the installing of the WAN Fish Bypass, all study fish could be collected at WAN Dam, after the installing of the Bypass, gate well collection at PRD was initiated to get enough smolts. With the installing of the PRD Fish Bypass, sometimes the gate wells are dipped twice a day to get enough study fish. Gate well dipping is also very susceptible to wind – if the wind comes up, gate well dipping is shut down for the day as a safety concern. Our survival studies are conducted in the spring/early summer, time that we see most of our wind. Breaks in gate well dipping puts “holes” in the tagging schedule for the study.
- Fish raised in hatchery for study – Grant has done this before for a source of study fish, but it was quite a while ago. I don’t know if capacity is available at hatcheries to raise the needed study fish and also the concern is that your study is only studying smolts from that one particular hatchery and not the population at-large in the river.
- Fish collected from the Rocky Reach collection facility – Grant has not used this fish collection facility before as a source of study fish, but has been used by Chelan PUD quite successfully as a source of study fish. Getting the needed number of study fish from this facility is not an issue and weather (i.e. wind) does not impact the collection of fish. If Grant were to use this facility as a source of study fish, Grant would have discussions with Chelan PUD as a “contractor” to collect study fish for Grant’s survival study. Items to look at if this were an option to be considered is the need of the facility by Chelan for any study they have going at the same timeframe and also the lack of the “Wenatchee fish” as part of the study sample.
- Fish collected from the Rock Island Dam index facility – This is also a facility that Grant has not used before. Smolts have been collected from this facility for a number of years – for the FPC smolt PIT tagging program (prior to 2021), RTR PIT-tagging for evaluating avian predation rates within the PRP (8,000 STHD), and GBT monitoring by Chelan PUD. Weather (wind) would not be a factor in smolt collection. “Wenatchee fish” would be part of the sample size. Concern of the depth of the holding facility and possible effects of GBT would need to be addressed, (but workable). Also would need to contract with Chelan PUD and also see what their Schule/need for the facility is during the timeframe of the Grant survival studies.

- **tagging location** – The “fish source” may influence where the tagging of the smolts takes place. Three locations presently available are at Rocky Reach, Rock Island and WAN Fish Town.
 - Rocky Reach – Chelan PUD used this facility as part of their fish survival studies. Issue of getting the Grant tagged smolts from the tagging location to the study river release locations. Logistics would definitely need to be looked at. Contracting and scheduling with Chelan PUD would also need to happen.
 - Rock Island – Chelan PUD has also used this tagging facility for some of their fish studies. Obviously much closer to the Grant river-release locations than Rocky Reach. Contracting and scheduling with Chelan PUD would also need to happen.
 - WAN Fish Town – Location that has been used for most of Grant’s fish survival studies. Somewhat centrally located between the RI tailrace release location and the PRD tailrace release location.

- **release points** - GCPUD has used two different “sets” of release points for conducting its fish studies: 1) a two (2) release study, which were the tail races of RI and PRD. 2) a three (3) release study, which were the tailraces of RI, WAN & PRD. The main differences between using the two different “sets” of release points is that the 2-release point study only gives a Project wide survival estimate and with the 3-point release, you can get a survival estimate for each of the two developments – Wanapum and Priest Rapids.

- **assessing tag and tagger effects detection points** – The aspect/influence of tag-life issues, tagger-effects (i.e., variation of surgical/tagging skills seen within a team of taggers, which may be manifested in fish survival post-tagging), and the simple aspect of “handling” effects upon the smolts, are always addressed within a Grant’s survival study.
 - Tag-life issues are looked at via a tag-life evaluation within the study – random tags pulled from each tag lot and activated and retained until the tag fails.
 - Tagger-effects are evaluated in that each fish that an individual tagger has tagged is recorded and assigned to that specific tagger. As each mortality is seen, that specific fish can be traced back to who tagged it and if a specific tagger had an abnormal amount (%) of the study’s mortality rate.

- Handling-effects are addressed by having each study be a “paired-release” study. There is a “test” group of tagged fish and a “control” group of tagged fish. The “test” fish are released at RI Dam and the “control” fish are released below PRD. The delta between the two survival rates of each group of tagged fish is the survival estimate for the PR Project.
- **dealing with adverse river flow conditions** – The HCP has language in it that addresses the issue of adverse river flow conditions and if an on-going survival study is valid or not, based on those river conditions. Grant does not have any language in its documents (SSSA and/or BiOp) that addresses this issue (river flows/survival study). This may be a subject we want to discuss.
- **plant operations** – Unless a specific aspect of plant operations (i.e., turbine operated outside of fish mode range, less flow thru the bypass, etc.) were being investigated within the study, the plants are operated in their “normal fashion” while a study is taking place.. An exception from this would be related to plant maintenance, etc. – (i.e., a turbine was down for maintenance, a crack in the dam, etc.)
- **achieving standard or not – path forward**
- **factoring in avian predation** – For UCR Steelhead in the PRP, avian predation by the terns on Goose Island has been a factor affecting survival estimates for steelhead within the PRP. For the years prior to tern dissuasion program at Goose (2007 – 2013), the ave. predation rate on steelhead was 15.7% (14.1% – 18.9%), The (Goose Island) tern predation rate in 2021 was 3.9%. The tern predation rate on UCR Spring Chinook prior to 2014 was 2.5%. Very little predation on sub-yearlings and sockeye.
- **others, per PRCC discussion?**

Attachment 2 - Expanding Fish Mode – Memo (C. Dotson)

MEMORANDUM

September 27, 2022

TO: Priest Rapids Coordinating Committee

VIA: Bryan Nordlund, Priest Rapids Coordinating Committee Facilitator

FROM: Curt Dotson, Fisheries Scientist
Tom Dresser, Fish, Wildlife and Water Quality Manager

Subject: Extending the Lower Range of Fish Mode at Wanapum Dam

Purpose: To extend the lower range of Fish Mode operations at Wanapum Dam to Improve Smolt Survival and Reduce Turbine Startups and Shutdowns

FISH MODE:

During the juvenile fish passage season, Wanapum and Priest Rapid turbines are operated in a protocol referred to as “Fish Mode”. The goal of Fish Mode is to constrain the discharge of each turbine to a range associated with $\geq 95\%$ smolt survival.

Fish Mode ranges are generally centered on the full operational range of each turbine (Figure 1). Operationally, Fish Mode limits the turbines from their maximum and minimum capability. Limits on the upper end of the range reduce the Project’s generating capacity and ability to move water through the turbines during high flows. Limits on the low end of the range create challenges to unit startups/shutdowns and frequency regulation¹, which has become increasingly important as wind and solar are added to the grid.

The purpose of this memo is to describe the challenges associated with limits to the low end of the turbine range, and how by expanding the lower limit of Fish Mode at Wanapum Dam, smolt survival and turbine operations can both be improved upon.

Load Following and Frequency Regulation:

Turbine units at Wanapum and Priest Rapids are dispatched (operated) to match load on a second-by-second basis. Generally, dispatching is through a turbine unit commitment program designed to efficiency match load while minimizing unit startups and shutdowns.

¹ Frequency regulation is the balance of electricity supply, particularly over time frames from seconds to minutes. It occurs automatically in response to frequency changes. Large turbines, like hydro, provide the inertia to help stabilize the grid.

To match the load, a specified number of units are dispatched, and those units will float, or range, up and down within their operating range as the load rises and falls. Many of these rises and falls in load are small, fast, and frequent. During Fish Mode season, when the operational range of each unit is narrowed, the frequency of units starting up and shutting down is increased to meet load and frequency demands. An example of this is illustrated in Figure 2 below.

Matching load and balancing frequency become particularly challenging when Fish Mode season overlaps with Hanford Reach Protection Program obligations. To meet the Hanford Reach obligations, discharge from Priest Rapids Dam is set at specified discharge, and flow fluctuations are minimized (e.g., <20 kcfs per day). During low flow periods, Hanford Reach requirements at Priest Rapids push nearly all load following and frequency regulation to Wanapum Dam. Because of the narrow Fish Mode operating range at Wanapum Dam, units are forced to startup/shutdown frequently and rapidly to match the changes in load or frequency imbalances (Figure 2).

Turbine Operation and Fish Survival:

The Fish Mode range at Wanapum Dam was established from a 1996 fish turbine survival study (11.8-15.7 kcfs; Normandeau et al. 1996). The result of that study illustrated that survival was highest at 15 kcfs and declined in both directions moving away from 15 kcfs (Figure 3, top panel). At 11 kcfs, average survival was approximately 95% and presumably was used as the lower bound of the allowable range (Figure 3, top panel).

In 2005, the 1996 Fish Mode survival study was repeated to evaluate the new advanced hydro turbine design. The purpose of the 2005 evaluation was to determine if smolt survival through the new turbine was equal to or greater than the old turbines (Normandeau et al. 2006). The result of the 2005 study was that the new turbine had survival rates that were not statistically different than the old turbines. The new turbines had the highest survival at 9 kcfs (99.56%) at the 10 ft entrainment depth, and survival remained above 95% at the 10 ft. and 30 ft. entrainment depth from ~9.5 - 16 kcfs (Figure 3, bottom panel), as required per Action 1 of the 2004 NOAA-Fisheries Biological Opinion for the Priest Rapids Project (NOAA-Fisheries 2004).

FERC confirmed that the biological results from the new advanced hydro turbine had similar survival to the old turbines and issued an order on December 14, 2005, authorizing Grant PUD to install the remaining nine (new) turbines (FERC 2005). The Fish Mode range was not updated based on the 2005 results.

Proposal:

Using the turbine survival study information collected during the 2005 evaluation, Grant PUD would like to propose that the lower end of the Fish Mode range at Wanapum Dam be adjusted from 11.8 kcfs to 9.5 kcfs. At 9.5 kcfs, fish survival remains above 95%, and because turbine operations tend to center on Fish Mode range, the overall average survival may increase (Figure 4).

For the District, expanding the lower end of Fish Mode at Wanapum Dam would improve electrical reliability and reduce the frequency of turbine unit startups and shutdowns, which themselves are not healthy for fish.

Figure 1. The distribution of turbines operations at Wanapum and Priest Rapids dams during a typical Fish Mode season (pink bars) and non-Fish Mode season (blue bars).

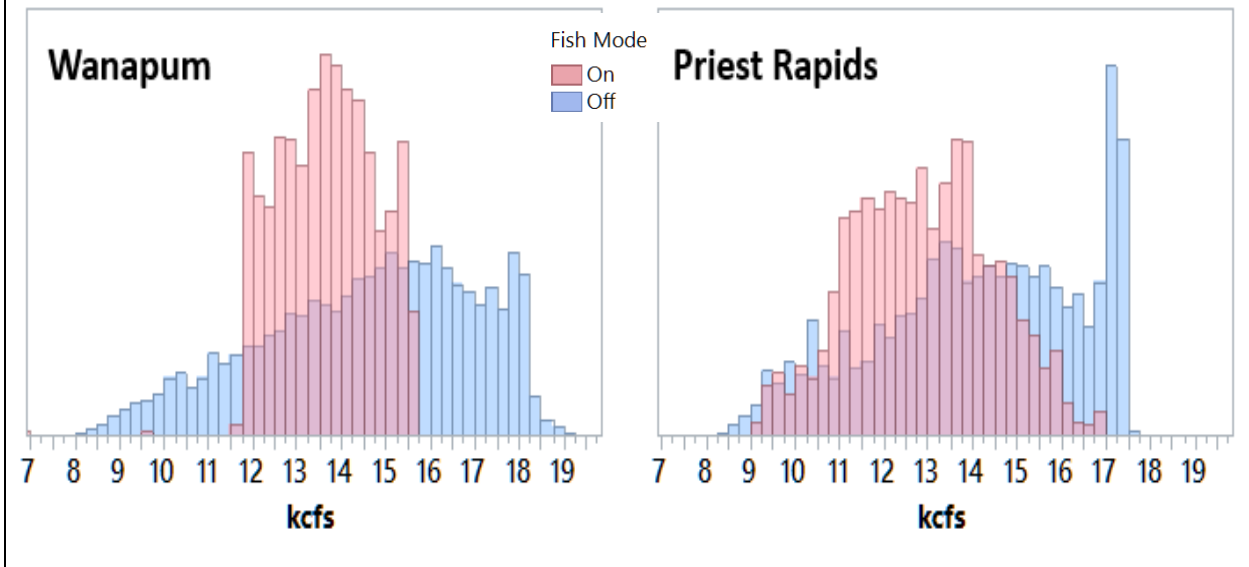


Figure 2. Unit dispatch at Wanapum to match load before and after Fish Mode began on April 19, 2022. Up to nine units are rapidly dispatched to meet load and operate within the Fish Mode band (11.8-15.7 kcfcs).

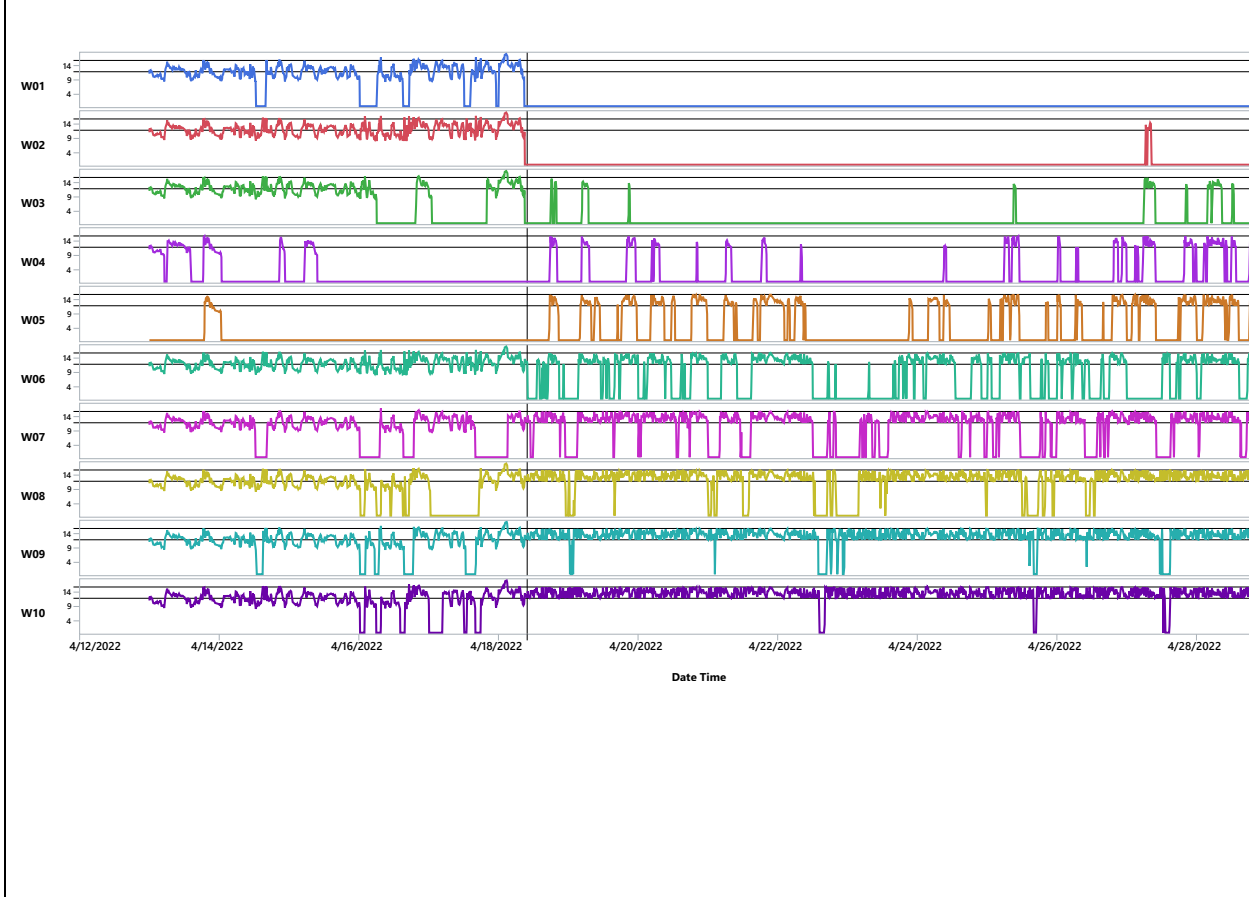


Figure 3. Wanapum unit discharge and fish survival results from 1996 (top) and 2005 (bottom). The 2005 study evaluated the new turbine. Vertical dashed lines are current Wanapum Fish Mode range. 10 ft. and 30 ft. refer to the distance from the intake ceiling that the fish were released. The intake ceiling is ~64 below the water surface. Acoustic survival studies and Fyke net sampling has shown that the majority of smolts are surface oriented and generally well above the intake ceiling (e.g., Fyke net study showed 78% of smolts in the top 0 – 18 feet of the intake). Using the Fyke net results, the Fyke Weighted Average is the weighted survival average where the 10 ft. below the intake ceiling was weighted by 78%.

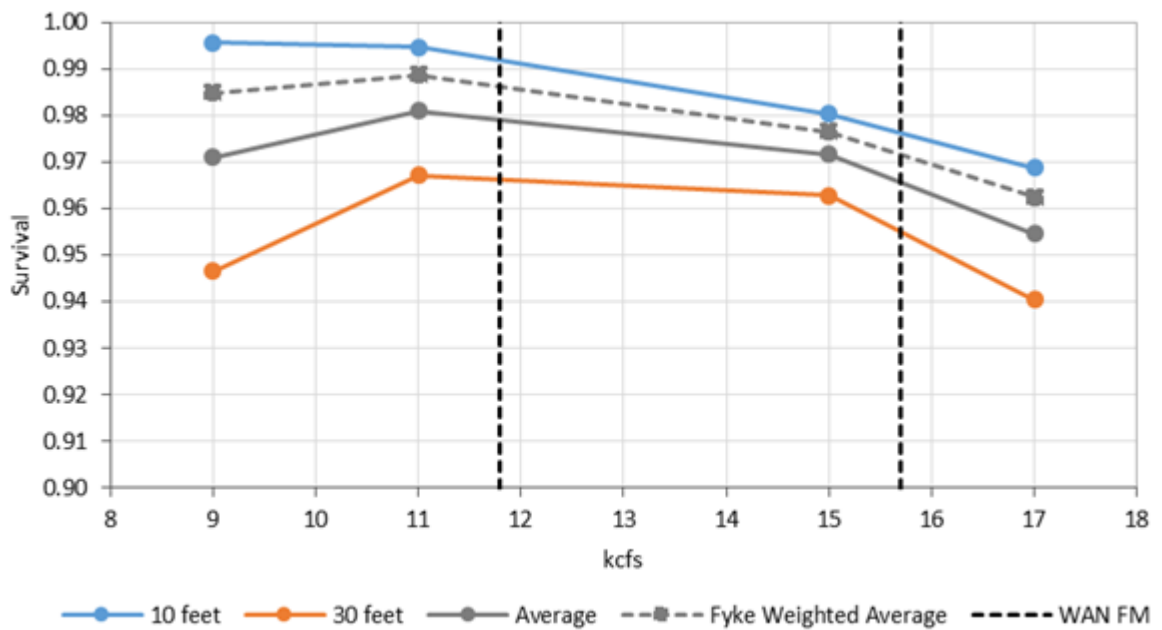
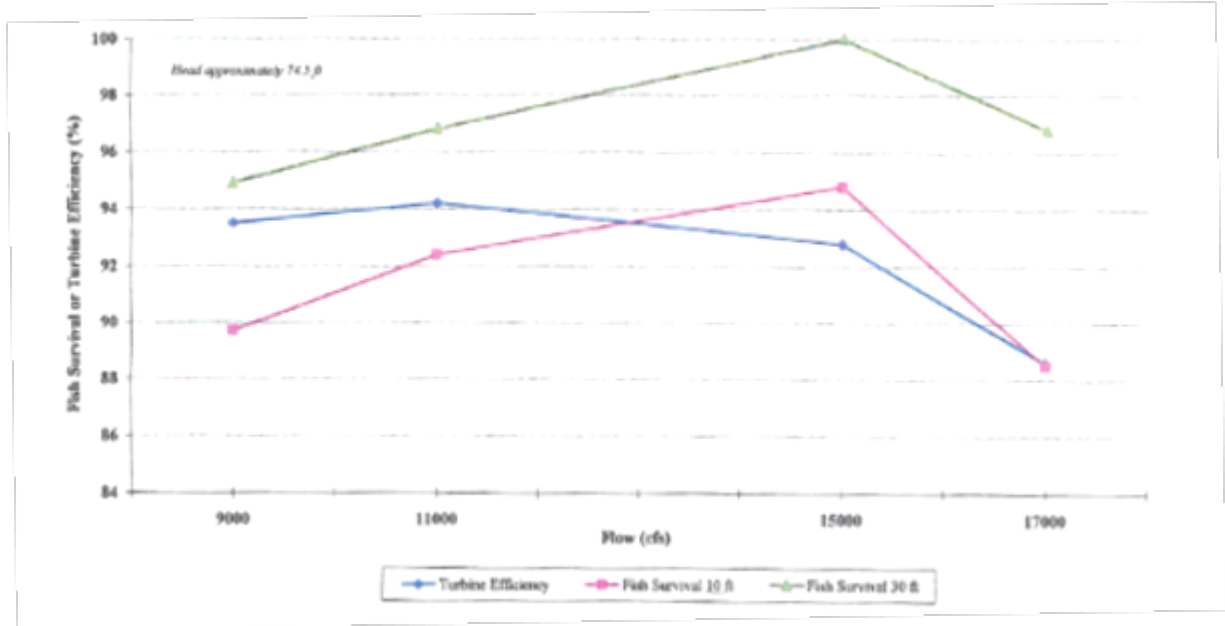
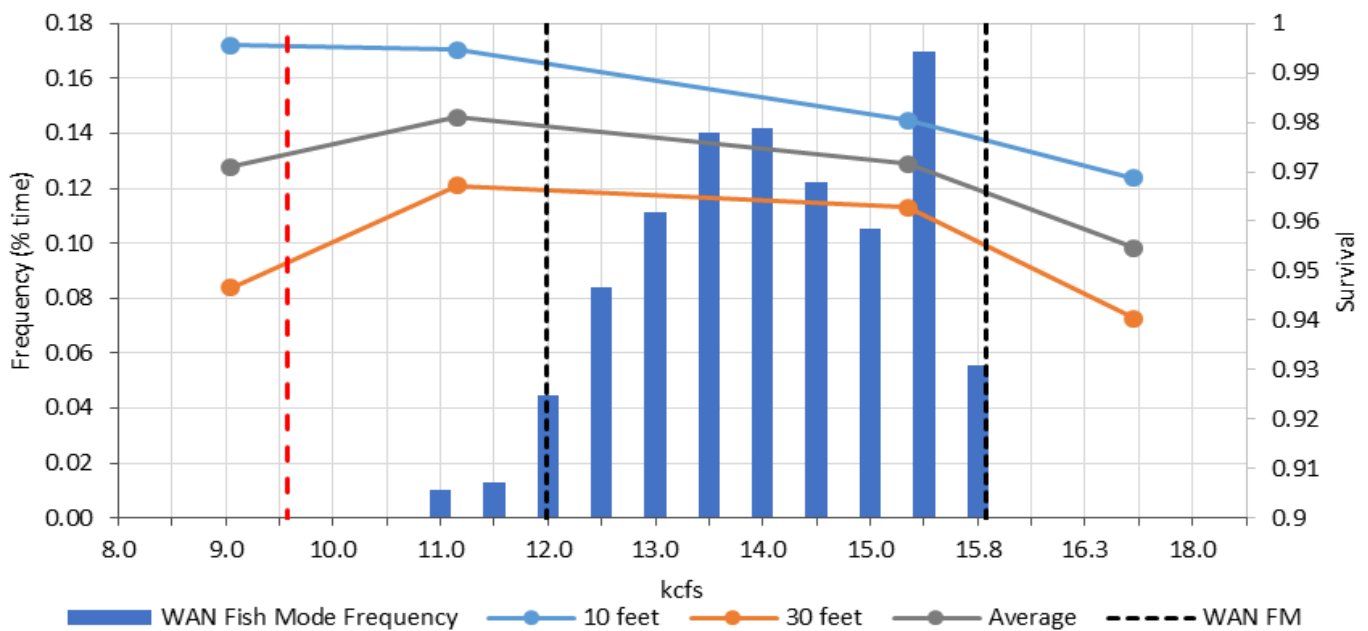


Figure 4. The distribution of a Wanapum turbine during peak a summer period (July 2018-2021) and the turbine survival curves from the 2005 turbine survival study. The black vertical bars are the current Fish Mode range. The red vertical bar is the proposed update to the Wanapum Fish Mode range.



Literature Cited

Federal Energy Regulatory Commission (FERC). 2005. Order 113 FERC § 62,205 authorizing installation of remaining turbines at Wanapum Dam.

National Marine Fisheries Service. 2004. Biological Opinion for ESA (Endangered Species Act) Section 7 Consultation on Interim Operations for the Priest Rapids Hydroelectric Project (FERC No. 2114). NOAA (National Oceanic and Atmospheric) Fisheries Consultation No. 1999/01878.

Normandeau Associates, J.R. Skalski, and Mid-Columbia Consulting Inc. 1996. Fish Survival Investigation compared to Turbine Survival at Wanapum Dam, Columbia River, Washington. Report prepared for the Public Utility District No. 2 of Grant County, Washington, Ephrata, WA.

Normandeau Associates, J.R. Skalski, and R.L. Townsend. 2006. Performance Evaluation of the New Advanced Hydro Turbine System (AHTS) at Wanapum Dam, Columbia River, Washington. Report prepared for the Public Utility District No. 2 of Grant County, Washington, Ephrata, WA.

Attachment 3 - PRCC Operating Protocols – Working Document (B. Nordlund)

Priest Rapids Coordinating Committee

Operations Protocols – Working Document (10/3/22)

General – These protocols have been developed through discussion by the Priest Rapids Coordinating Committee (PRCC) in 2022. This document captures the consensus reached by the PRCC in its discussion. The PRCC realizes this document is not complete and thorough, and as such, can be considered a living document suitable for updates when the need arises.

By PRCC member (Members) consensus, any protocol timeline can be adjusted to allow for expanded review period if suggested by a Member. For example, on occasion, experts may need to be consulted on a particular topic. By consensus, the PRCC can elect to expand the timeline to accommodate the circumstance.

Meeting Protocols

Agenda Development - Agenda items for the next meeting should be sent by Members to the Facilitator as they arise, or with an official e-mail call for agenda items from the Facilitator two weeks prior (at the latest) to the upcoming PRCC meeting. From time to time upon request, walk-on agenda items can be added after the Facilitator opens a PRCC meeting. If the PRCC deems it necessary, walk-on agenda items may be deferred to the next PRCC meeting. Approval of the agenda will occur at the initiation of the PRCC meeting.

Meeting Minutes - The timeline described below will allow for final approval of the minutes at the next PRCC meeting.

The draft meeting minutes shall be sent out for PRCC review by e-mail no later than 10 business days after the PRCC meeting.

Members shall review and provide any comments on the draft meeting minutes to the Facilitator within two weeks of receipt, either by voice, edited draft minutes or email.

The Facilitator shall incorporate comments received, then advise Members of any substantive revisions requiring a revised draft. If a revised draft is needed, it will be distributed prior to the subsequent meeting of the PRCC. Members will be expected to vote on approval of the meeting minutes at the following PRCC meeting.

Members absent from a meeting do not need to comment on or approve the draft meeting minutes but are welcome to review and comment through the Facilitator. If discussion is needed or if distribution of review comments is desired, individual Member comments will be distributed by the Facilitator to the PRCC. Members are also free to discuss any uncertainty they may have on meeting notes with other Members or the Facilitator before submitting their comments or approval.

Document Review

Survival Study Development and Implementation - Basically, survival study reports have three phases:

- 1) study design and implementation document issued for review prior to the onset of a Survival Study,
- 2) initial draft report of study results and
- 3) the final Survival Study report.

These three phases would be allowed a 90/30/30-day review period respectively for the three phases. From time to time, study plan logistics may require flexibility on this review timeline. For example, tags for a subsequent study may need to be ordered before the final study report review period ends. If this circumstance occurs (or by other circumstance) and an expanded or contracted review period is needed, the PRCC agreed that flexibility on the duration of Survival Study review periods is appropriate and necessary and will be allowed by consensus of the PRCC.

Members shall submit comments and suggested text revisions on each phase of the survival study reports by email to Grant PUD in “Track Changes” format.

No Net Impact (NNI) Fund Proposals – After NNI funding proposals are received, the sponsors (a sponsor is the Member bringing the proposal to the PRCC) will distribute the proposal package to the PRCC. Members shall have 30 days to review a funding request for NNI funds. It is expected that this review may generate questions that could require PRCC discussion and/or a presentation from the project sponsor. When discussions and presentations are completed, the proposal will be presented for voting at the next PRCC meeting. Voting by email prior to the next PRCC is allowable if necessary due to timing of implementing the proposed project.

Progress and Implementation Reports – The PRCC will have 60 days to comment on the annual Progress and Implementation Report that Grant PUD develops as a License requirement. Comments should be sent directly to Grant PUD.

Joint Committee Studies – When a funding proposal is received that calls for joint funding by a Sub-committee, the sponsors will distribute the proposal package to the PRCC. Members shall have 30 days to review a joint funding request for NNI funds. It is expected that this review may generate questions that could require PRCC discussion and/or a presentation from the project sponsor. When discussions and presentations are completed, the proposal will be presented for voting at the next PRCC

meeting. Voting by email prior to the next PRCC is allowable if necessary due to timing of implementing the proposed project.

PRCC Study proposals – When a PRCC member submits a funding proposal for NNI funds, that Member becomes the project sponsor. The sponsor is responsible for distributing details about the proposal to the rest of the PRCC. Upon receipt of the project proposal, Members shall have 30 days to review the NNI funding request. It is expected that this review may generate questions that could require PRCC discussion and/or a presentation from the project sponsor. When discussions and presentations are completed, the proposal will be presented for voting at the next PRCC meeting. Voting by email prior to the next PRCC is allowable if necessary due to timing of implementing the proposed project.

Statement of Agreement

Statement of Agreement (SOA) development – SOA's can be submitted for the purpose of modifying or clarifying the Salmon and Steelhead Settlement Agreement at a PRCC meeting. After discussion and potentially modification, 10 business days shall be allowed for voting on a SOA after the final draft of the SOA has been presented. As the need arises, voting on a particular SOA can be expedited by either by voting at the PRCC meeting where the SOA is presented, or by email vote after the meeting ends. Similarly, voting on a particular SOA can be delayed if Members need time for internal deliberation. If a Members are absent when the vote is taken, the Facilitator will contact each absent Member for their vote as soon as possible. Any Member can request a one-time time delay of up to five business days to submit their vote.

Member Absence

On occasion, Members will not be able to attend a PRCC meeting. If this occurs, Members can either send their alternate PRCC representative, or choose to forego input to the missed meeting. The absentee Member is welcomed to submit any thoughts or specific comments on the meeting's agenda to the Facilitator and/or the other PRCC Members prior to the missed meeting.

When a Member realizes they must miss a meeting, they shall provide notice as soon as possible to the Facilitator who will then advise the PRCC of the absentees at the initiation of the meeting.

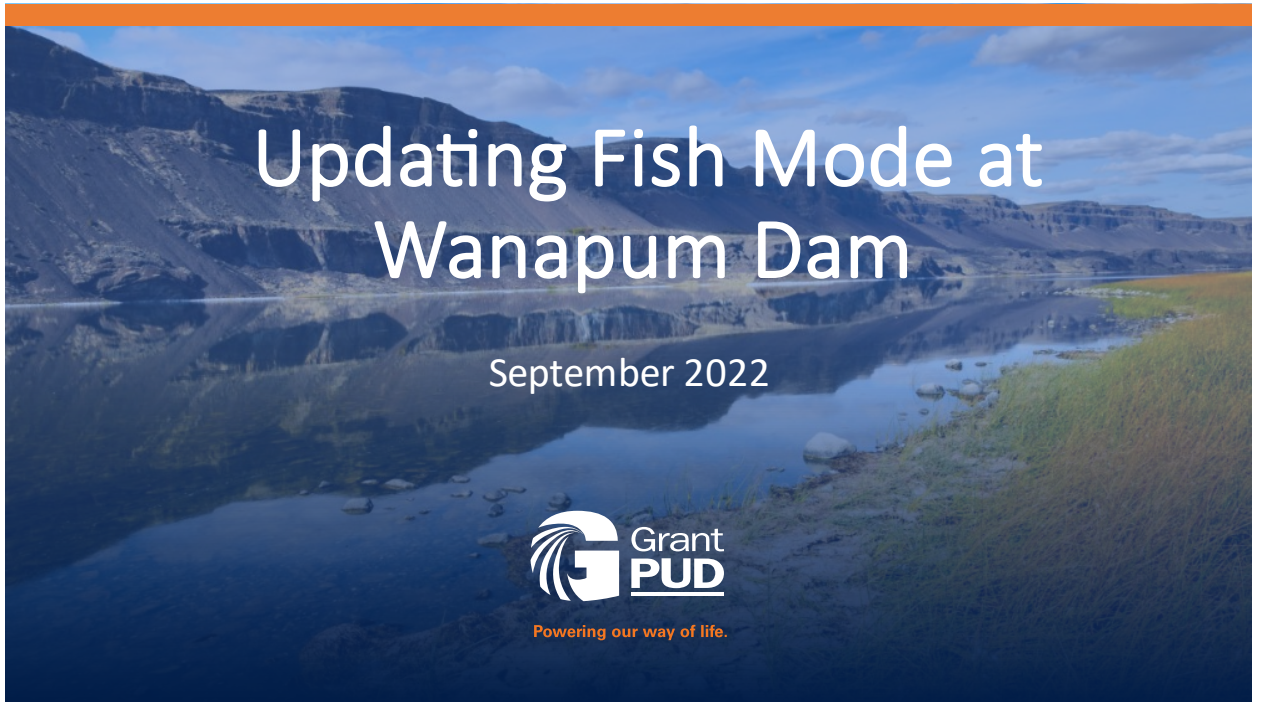
If a vote is taken at a meeting with a Member absent, the SSSA allows up to five business-days for the absent Member to vote. After a meeting, the Facilitator will contact the absent Member by email and/or phone and advise them of the issue voted on by the PRCC at the missed meeting, and of the timeline for their vote to be submitted. Unless this timeline is extended by consensus of the PRCC, the absent members vote will not be considered after the five-business day period after the meeting.

Attachment 3A – Operating Protocols Summary Matrix

Working Document - PRCC Operations protocols (October 3, 2022)						
General Protocol Topic	Specifics	Initiation timing	Review timing	Comment venue	Additional	
Statement of agreement	SOA	Anytime	10 business days prior to vote	Vote in committee, or by email		
New PRCC agenda topic	Call for agenda items	Call for agenda item at preceding meeting, and again two weeks (10 days) in advance of meeting date.	Final agenda to be distributed 1 week (5 business days) in advance of meeting date	PRCC e-mail	Walk-on agenda items can be accepted day of meeting but ideally should be shorter time commitment items.	
Meeting protocols	Meeting Agenda	Draft 2 weeks prior to meeting	Final for approval 1 week prior to meeting	Approval of agenda at meeting		
	Meeting Minutes	Draft one week post meeting	two-week review of draft with any revisions distributed one week before next meeting	Approval of draft with any revisions at following meeting		
Document review	NNI study report	upon completion	30 days	PRCC email	Vote for approval	
	Survival study report	upon completion	90 days	Agency letter	Vote for approval	
	Draft survival study	upon completion	30 days	PRCC email	Vote for approval	
	Joint study (e.g. HSC)	upon completion	30 days	PRCC email	Vote for approval	
	PRCC generated study	upon completion	30 days	PRCC email	Vote for approval	
Voting	Members absent from PRCC meeting	Facilitator follow-up after PRCC	5 days after PRCC	Facilitator e-mail to PRCC	Any party may request a onetime delay in voting of up to 5-days.	
	General Item	after PRCC discussion	30 days	PRCC vote	Any party may request a onetime delay in voting of up to 5-days.	

<i>Vetting Issues</i>	none	anytime		next PRCC		NA		
<i>Notification of meeting absence</i>	meeting topics	at least 1 day prior to meeting		NA		waive input for meeting or send alternate		
	meeting votes	Facilitator follow-up after PRCC		5 days after PRCC		Facilitator e-mail to PRCC		

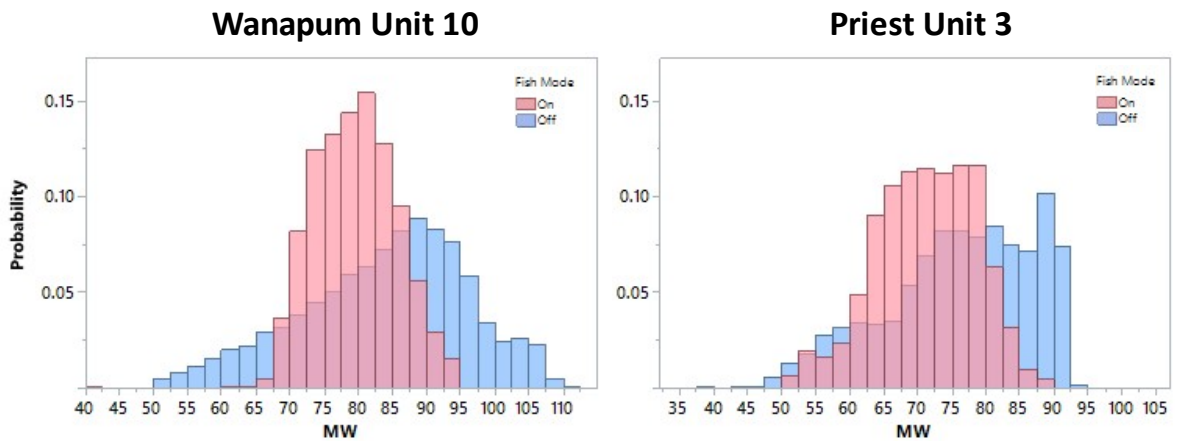
**Attachment 4 - Updating Fish Mode at Wanapum Dam –
PowerPoint Presentation (C. Dotson)**



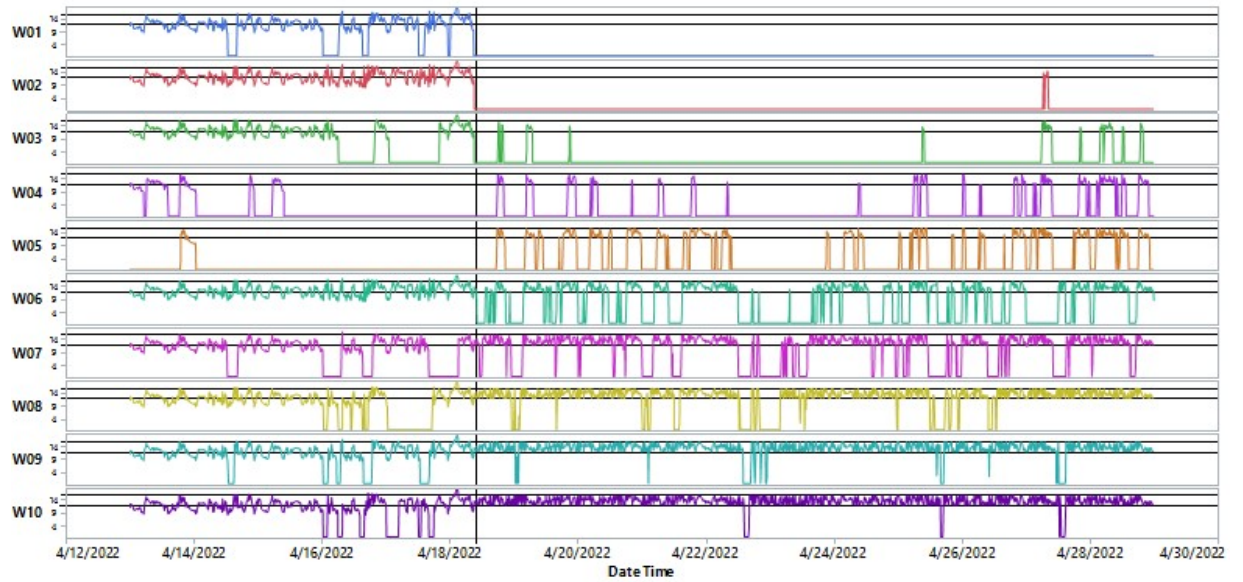
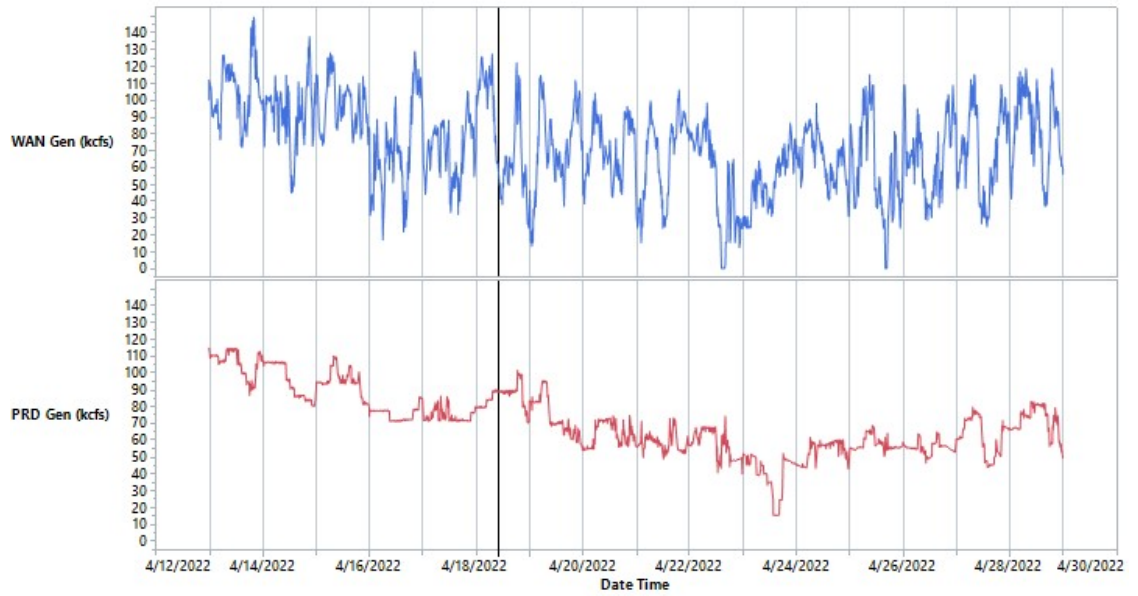
Fish Mode:

- Turbine operational range to achieve 95% survival or greater.
- Ranges were determined from smolt survival studies and modeling.
- At Wanapum, survival study in 1996 set the range at 11.8 – 15.7 kcfs.
- Study repeated in 2005 to assess new turbines:
 - Focus was on upper end of fish mode (expanding beyond 15.7 kcfs).
 - Study result: survival was not statistically different from old turbines.
 - Fish mode range was unchanged.
- Since 2005, the lower end of the range has become more important due to Hanford Reach Agreement (2004), lower Spring flows, and more volatility in load (wind & solar).
- 2005 survival studies showed high survival at lower end of turbine range.
- Expanding lower end of Fish Mode at WAN would improve Grant's operations and likely improve fish survival.

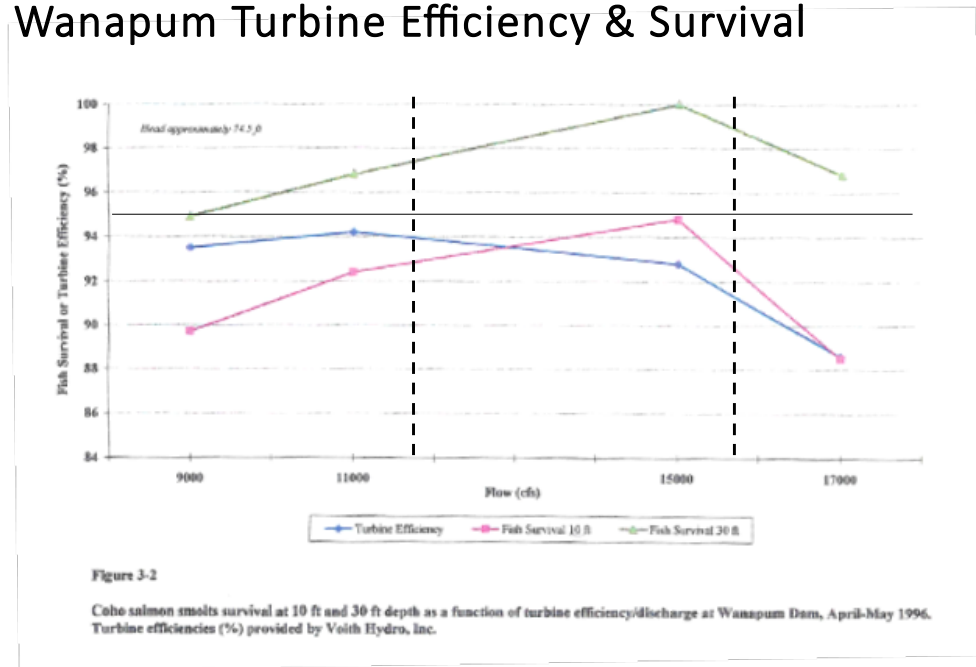
Fish Mode Unit Generation Range



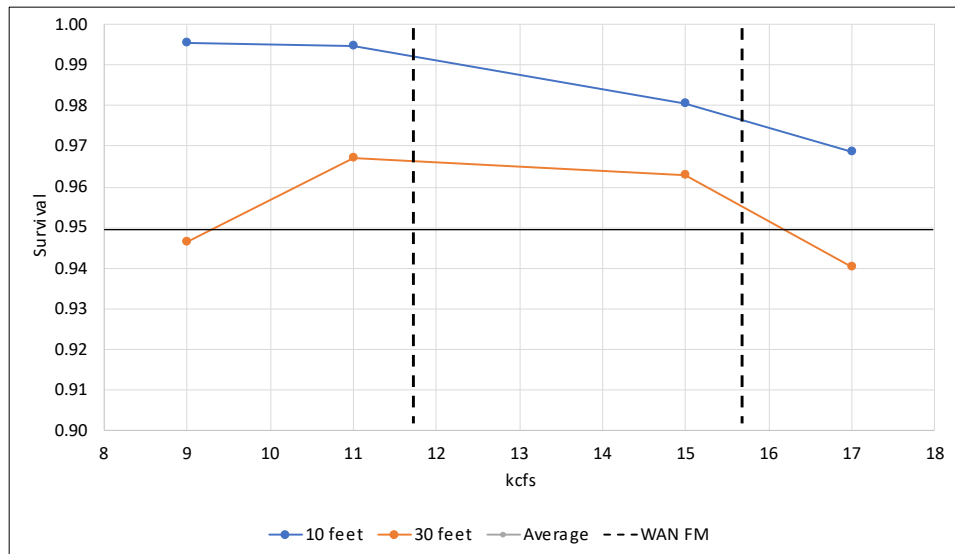
WAN and PRD Generation



1996 Wanapum Turbine Efficiency & Survival



2005 Wanapum Turbine Survival Results:



Wanapum Fish Mode Turbine Operations

