

Memorandum

To: Wells, Rocky Reach, and Rock Island HCP Hatchery Committees, and Priest Rapids Coordinating Committee Hatchery Subcommittee Date: May 18, 2021

From: Tracy Hillman, HCP Hatchery Committees Chairman and PRCC Hatchery Subcommittee Facilitator

cc: Larissa Rohrbach, Anchor QEA, LLC

Re: Final Minutes of the April 21, 2021, HCP Hatchery Committees and PRCC Hatchery Subcommittee Meetings

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plan Hatchery Committees (HCP-HCs) and Priest Rapids Coordinating Committee Hatchery Subcommittee (PRCC HSC) meetings were held by conference call and web-share on Wednesday, April 27, 2021, from 9:00 a.m. to 12:00 p.m. Attendees are listed in Attachment A to these meeting minutes.

Joint HCP-HCs and PRCC HSC

Long-term Action Items

- Greg Mackey will work with Mike Tonseth to test a modeling approach and prepare a white paper on the method for determining a range for the number of females to be collected for a given broodstock in the upcoming year (Item I-A). *(Note: this item is ongoing; expected completion by August.)*
- Greg Mackey will prepare a plan for alternative mating strategies based on findings described in his previously distributed literature review (Item I-A). *(Note: this item is ongoing; expected completion by July.)*
- Mike Tonseth will distribute the analysis showing feasibility of the Methow Spring Chinook Outplanting Plan based on historical run size data (Item I-A). *(Note: this item is ongoing; expected completion by September.)*
- Kirk Truscott will work with Colville Confederated Tribes (CCT) staff to develop a model that addresses the probability of encountering natural-origin Okanogan River spring Chinook salmon at Wells Dam (Item I-A). *(Note: this item is ongoing; expected completion by September.)*
- Kirk Truscott will determine the number of scales that should be collected from spring Chinook salmon at Wells Dam for elemental signature analysis to discern Okanogan River spring Chinook salmon from Methow River spring Chinook salmon (Item I-A). *(Note: this item is ongoing; completion depends on the outcome of the previous action item.)*

- Keely Murdoch and Mike Tonseth will obtain estimates of pre-spawn mortality from Andrew Murdoch to update the retrospective analysis for Wenatchee spring Chinook salmon (Item I-A). *(Note: this item is ongoing; expected completion by August.)*

Near-term Action Items (to be completed by next meeting)

- Mike Tonseth and Greg Mackey will solicit input from hatchery managers on effective methods to count surplus fish (Item I-A). *(Note: this item is ongoing.)*
- Members of the HCP-HCs and PRCC HSC will review the information presented by Brett Farman on multi-population proportionate natural influence (PNI) in the Wenatchee Subbasin to better define the intent of the PNI calculation and develop questions for model developers Mike Ford and Craig Busack (National Marine Fisheries Service [NMFS]) for discussion in the next meeting (Item II-B).
- Mike Tonseth will update the HCP-HCs on spring Chinook salmon passage and tagging activities at the Priest Rapids Dam Off-Ladder Adult Fish Trap (Item II-C).

Rock Island/Rocky Reach HCP-HCs

- None.

Wells HCP-HC

- None.

PRCC HSC

- None.

Decision Summary

- The Chelan and Grant PUD's SOAs *Regarding the "Success" of the Okanagan Sockeye Salmon Reintroduction Program* relative to mitigation goals were unanimously approved by the Rock Island/Rocky Reach HCP-HCs and PRCC HSC (Item II-A).
- The 2021–2022 Priest Rapids Hatchery Monitoring and Evaluation Implementation Plan was unanimously approved by the PRCC HSC (Item III-A).

Agreements

- No other agreements were made in today's meeting.

Review Items

- A presentation on approaches to calculating multi-population PNI in the Wenatchee Subbasin presented by Brett Farman was distributed by Larissa Rohrbach on April 26, 2021, for review and discussion in the next meeting on May 19, 2021 (Item II-B).
- A summary of the past methodology for recalculating hatchery compensation levels presented by Tracy Hillman was distributed by Larissa Rohrbach on April 26, 2021, for review and discussion in the next meeting on May 19, 2021 (Item II-E).
- The draft 2022 Grant PUD Hatchery Monitoring and Evaluation Implementation Plan for the Wenatchee and Methow Basins was distributed by Larissa Rohrbach on April 14, 2021, with edits and comments to be sent to Todd Pearsons by May 14, 2021 (Item III-B).

Finalized Documents

- The final *2021-2022 Priest Rapids Hatchery M&E Implementation Plan* was distributed to the PRCC HSC by Larissa Rohrbach on April 26, 2021.
- Final versions of the Chelan PUD's and Grant PUD's SOAs *Regarding the "Success" of the Okanagan Sockeye Salmon Reintroduction Program* were distributed to the HCP-HCs and PRCC HSC by Larissa Rohrbach on April 29, 2021.

I. Welcome

A. Review Agenda, Announcements, Approve Past Meeting Minutes, Review Last Meeting Action Items

Tracy Hillman welcomed the HCP-HCs and PRCC HSC to the meeting and read the list of attendees signed into the meeting. The meeting was held via conference call and web-share because of travel and group meeting restrictions resulting from the coronavirus disease 2019 (COVID-19) pandemic. Hillman reviewed the agenda and asked for any additions or changes to the agenda. No additions were made, and all HCP-HCs and PRCC HSC representatives approved the agenda.

Revised minutes from the March 17, 2021, meeting were reviewed and approved by all members of the HCP-HCs and PRCC HSC.

Action items from the HCP-HCs and PRCC HSC meeting on March 17, 2021, were reviewed. Hillman suggested noting whether action items fall into a subcategory of long-term actions that are set aside in a "parking lot" to be addressed later in the year (with a suggested completion date) and a subcategory of near-term actions that need completion within the month. Action items will be

grouped accordingly in meeting records going forward. Follow-up discussions of action items were addressed (*Note: italicized text below corresponds to action items from the previous meeting*):

Joint HCP-HCs and PRCC HSC

- *Brett Farman will discuss with National Oceanic and Atmospheric Administration (NOAA) staff and Mike Tonseth the potential use of a multi-population model for estimating proportionate natural influence for the Nason and Chiwawa spring Chinook salmon programs (Item II-B).*
This item will be discussed in today's meeting. This item is complete.
- *Greg Mackey will work with Mike Tonseth to test a modeling approach and prepare a white paper on the method for determining a range for the number of females to be collected for a given broodstock in the upcoming year (Item I-A).*
This item is ongoing and was identified as long-term. Mackey said progress is being made and suggested that it be discussed in the August meeting.
- *Greg Mackey will prepare a plan for alternative mating strategies based on findings described in his previously distributed literature review (Item I-A).*
This item is ongoing and was identified as long-term. Mackey said he will strive to have a plan by July.
- *Mike Tonseth will distribute the analysis showing feasibility of the Methow Spring Chinook Outplanting Plan based on historical run size data (Item I-A).*
This item is ongoing and was identified as long-term. Tonseth said a projected end-date for this item is September.
- *Kirk Truscott will determine the number of scales that should be collected from spring Chinook salmon at Wells Dam for elemental signature analysis to discern Okanogan River spring Chinook salmon from Methow River spring Chinook salmon (Item I-A).*
This item is ongoing and was identified as long-term. Truscott said they are not planning to use this method for the immediate future (as in this year) because they do not want to handle fish for pulling more scales than necessary pending the outcome of the following action item (an encounter probability assessment).
- *Kirk Truscott will work with Colville Confederated Tribes (CCT) staff to develop a model that addresses the probability of encountering natural-origin Okanogan spring Chinook salmon at Wells Dam (Item I-A).*
This item is ongoing and was identified as long-term. Truscott said this item may be discussed in September.

- *Mike Tonseth and Greg Mackey will solicit input from hatchery managers on effective methods to count surplus fish (Item I-A).*

This item is ongoing. Tonseth said he has additional follow-up questions for Mackey and will resolve this item in the next week or two, although it should be retained as an action item to provide an update in next month's meeting.

- *Representatives will review the NOAA research summary and Hatchery and Genetic Management Plans presentation distributed by Tracy Hillman and consider whether to request the authors attend a future committee meeting to discuss their research (Item I-A).*

Hillman suggested eliminating this action item because the HCP-HCs and PRCC HSC have now moved on to other business. Members agreed that it could be revisited in the future. This item is complete.

- *Keely Murdoch and Mike Tonseth will obtain estimates of pre-spawn mortality from Andrew Murdoch to update the retrospective analysis for Wenatchee spring Chinook salmon program sizing (Item I-A).*

This item is ongoing and was identified as long-term. Murdoch said she has no update at this time and that this should be addressed this summer prior to drafting the next Broodstock Collection Protocols. She noted that her retrospective analysis of program size uses the basic PNI formula, so the analysis may change to include a multi-population PNI model though it is unknown at this time how that could be done.

- *Catherine Willard and Todd Pearsons will revise the Statements of Agreement (SOAs) with Chelan PUD and Grant PUD on the success of the Okanagan Sockeye Salmon Reintroduction Program for final review (Item II-B).*

This item will be addressed in today's meeting. This item is complete.

Wells HCP-HC

- *Bill Gale will convene a Joint Fisheries Parties (JFP) meeting on the disposition of surplus yearling summer Chinook salmon from Wells Hatchery and report their decision to the Wells HCP-HC (Item V-B).*

This item is complete.

II. Joint HCP-HCs and PRCC HSC

A. DECISION: Okanagan Sockeye Salmon Reintroduction Statement of Agreement

The updated draft SOA *Regarding the "Success" of the Okanagan Sockeye Salmon Reintroduction Program* relative to mitigation goals was prepared by Catherine Willard and distributed by Larissa Rohrbach on April 13, 2021, for approval by the Rock Island/Rocky Reach HCP-HCs and the PRCC HSC. Edits were submitted to Willard after last month's meeting. In the most recent version, a

one-word change from “actions” to “goals” was made, consistent with other sentences in the introductory paragraph. A vote to approve the SOA prepared by Chelan PUD for the Rock Island/Rocky Reach HCP-HCs would also apply to Grant PUD’s version of the same SOA for the PRCC HSC.

All Rock Island/Rocky Reach HCP-HCs and PRCC HSC members approved the revised SOA.

B. Multi-population Proportionate Natural Influence Model

Brett Farman gave a presentation entitled *Multi-Population PNI (Proportionate Natural Influence) in the Wenatchee Subbasin* (Attachment B) and said Mike Tonseth contributed most of the content. Farman said the intent of the discussion was to determine what more may be needed for the model and to identify topics to consider that will influence the decision whether to use the multi-population model.

Farman reviewed the potential population combinations that could be used in the model and suggested the content of the presentation be considered for further discussion.

Farman noted the Committees would need to consider whether the choice of certain population combinations affects management. For instance, if each spawning aggregate will be managed separately, then each will need to be modeled separately. Other considerations were presented regarding marking, monitoring, and legal implications. Farman said the next important step is to identify and define which populations (or spawning aggregates) should be modeled.

Tonseth said a better understanding of the spatial scale for analyzing PNI is needed. The multi-population approach was piloted in the Methow Basin, which was simpler because of compositing Methow and Chewuch spawning aggregates, and the Twisp aggregate was an independent aggregate. The Wenatchee Basin is much more complicated, and questions arise about how to manage the population as a whole and how to manage individual spawning aggregates. The various combinations were presented as conceptual examples for consideration. Reconsultation on Wenatchee Basin hatchery program permits will not occur for 5 years, so there is time to determine the preferred approach. Tonseth suggested members consider which approach to measuring PNI is going to be most informative—it may be analyzing at the entire basin scale with partial percent hatchery-origin spawners (pHOS) expectations for individual hatchery programs similar to what has been done in the Methow Basin.

Bill Gale thanked Farman and Tonseth for the presentation. Gale said all parties have struggled with defining the future population structure in the Wenatchee Basin. There is more potential to manage fish escapement at Tumwater Dam and the Chiwawa Weir compared to the Methow Basin. Gale asked NMFS to tell the Committees the intent of measuring PNI and how the metric is used. He

added that his interpretation is that PNI is used as a metric to determine or describe how an intentionally supplemented population is being influenced by the hatchery population, and how the hatchery population is being influenced by the natural population, reflecting an intentional linkage between natural and hatchery programs. Gale suggested strays should not be included in the PNI model because they are not an intentional component of the program. The first step should be to determine which natural population is being described (e.g., the entire Wenatchee Basin or just the Chiwawa or Nason spawning aggregates separately), then identify the hatchery programs that are intentionally linked to that population. For instance, the White River spawning aggregate should not be included because it is not an intentional program; they are strays.

Keely Murdoch said she is not interested in micromanaging each spawning aggregate. The intent is to manage the entire Wenatchee Basin population, but Murdoch said she also supports some partial pHOS calculations to understand the influence of hatchery programs on individual partial pHOS for each hatchery program. As in the Methow Basin, she supports an effort to capture the connection of safety net programs to conservation programs with the understanding that a safety net program is not a separate program but has influence on the conservation program. Murdoch suggested that the goals should be to understand which hatchery programs are influencing PNI so that management in the Wenatchee Basin can be adjusted. Furthermore, the purpose of managing PNI is to ensure hatchery programs are not having detrimental effects on productivity of natural populations. Managers are fortunate to have a relative reproductive success study in the Wenatchee Basin showing no difference in reproductive success between hatchery-origin and natural-origin fish, but it is important to track whether there is an overall decline in productivity.

Tonseth said the examples were provided to stimulate the conversation, noting that determining an approach with partial pHOS took approximately 2 years during consultation on the Methow Basin programs. His greatest concern is that by splitting a population, resolution could be poor and the ability to manage is lost. For this reason, the Committees need to make a decision on how to define a population (as used in the PNI model), where those effects should be measured, and how those effects should be described.

Farman responded to Gale's comment on whether to include strays in the analysis and said that PNI can inform managers about gene flow in general and about whether or not the gene flow is attributed to a hatchery program. If managing at the spawning aggregate level with a lot of exchange to other spawning aggregates, groups would have to be weighted to better understand gene flow. It would be difficult to weight the contribution from other Wenatchee aggregates not related to hatchery programs, but it is an influence on total PNI. Discussions could be had on what is considered a stray and how they are weighted. Strays from outside the spawning aggregate may be weighed differently from strays from outside the evolutionarily significant unit (ESU).

Gale said the whole concept of PNI is based on modeling gene flow between two populations, and he is concerned about expanding beyond the intent of that model. The problem in the Methow Basin was that the simpler PNI method was not describing the situation well because the model is based on exchange between only two populations. Gale suggested talking to Mike Ford (NOAA Fisheries) to determine whether there is valid support for including more populations like strays. Including strays does not help measure the hatchery influence on the natural population. Strays moving between populations or spawning aggregates is a different problem and different management action, not necessarily informing how to adjust the supplementation effort. The Committees should ask about the intended influence of the hatchery programs. For instance, with Nason Creek, are we trying to supplement the entirety of the upper Wenatchee Basin or just the Nason Creek spawning aggregate? Same with the Chiwawa program. In general, managers are balancing the maintenance of subpopulation structure and the Wenatchee Basin population.

Catherine Willard thanked Farman and Tonseth for the presentation. Willard recalled that one of the reasons this discussion was prompted was the Chiwawa supplementation program has been using hatchery-origin fish to backfill the Chiwawa program due to shortfalls in natural-origin returns and wanted to know what effect the program was having on PNI in the Chiwawa population. The intent is to understand the effect of the hatchery population on the natural population, although she disagreed with excluding strays because they can represent an effect of hatchery production. Permits dictate managing for the entire Wenatchee Basin, although programs are already reporting independent PNI estimates based on the Chiwawa and Nason spawning aggregates. It is important to account for partial pHOS, which has a large effect on PNI. The Committees should decide which populations (aggregates) should be evaluated in the future, and current data could be used in the model to understand how the model reflects the current effect of hatchery programs on natural populations.

Kirk Truscott said he is typically a splitter but shares concerns about including strays into understanding gene flow, which would require a value of fitness to apply to those categories of fish in order to calculate an effective PNI (though programs may lack that level of detail). Few out-of-ESU strays are likely to be observed on the spawning ground. He would ask Ford whether it is possible to look at these various combinations retrospectively in order to discern the precision of each. Tonseth said the data likely exist; however, it is uncertain whether it is worth the effort to determine weighed values for each one of those populations. Farman agreed that before engaging in an exercise like that, the first step would be to agree to what questions managers are trying to answer with PNI. This will refine the focus of PNI modeling.

Todd Pearsons asked how many other basins are using a multi-population PNI model. Farman said several populations are using the model, but they are not the same as the Wenatchee population.

They are different types of programs within the same basin, but most are based on Technical Recovery Team population designations and not modeling at the level of spawning aggregates. The Wenatchee is more complex because of the nature of the programs. Farman will look for similar examples of managing smaller units within the population for PNI. Pearsons said there are different scales of analysis for different purposes. For example, there is the permitting at a larger scale, managing issues within the management plans, and monitoring and evaluation (M&E) issues that look at the effect of hatchery programs on natural productivity.

Tracy Hillman asked whether Ford should be involved in future discussions on multi-population PNI modeling. Farman said yes and also suggested that Craig Busack (NMFS, retired) may be able to participate. Murdoch said she supports inviting Busack because he was the developer of the multi-population model, especially in the Methow Basin, and was instrumental in permitting in the Wenatchee Basin.

Tonseth said the multi-population calculation weights contributions based on parental assignments. A critical question before including Busack and Ford is whether the multi-population PNI model provides any additional information on population management or spawning aggregate management. Gale agreed it would be best to allow time to review the information presented before inviting Busack and Ford to the discussion. Farman agreed.

Larissa Rohrbach will distribute Farman's presentation for review by all Committees' members to prepare for a deeper discussion in the next meeting and the development of a focused set of questions that could be brought to Ford or Busack. Farman will inquire about Ford and Busack attending a future meeting after focused questions are developed.

C. Priest Rapids Off-ladder Adult Fish Trap Sampling of Spring Chinook Salmon

Jeremy Cram, Washington Department of Fish and Wildlife (WDFW), joined the meeting and gave a presentation entitled *Spring Chinook Salmon PIT tagging at Priest Rapids Dam*. Cram said this was an effort that has been developed over the past couple of years and that implementation kicked off this past week. He showed the project goals, which were to expand existing methods for steelhead monitoring to spring Chinook salmon.

Cram said, despite the Wenatchee Basin being a relatively data-rich system, run escapement has still been difficult to estimate due to complex migration behaviors and incomplete dam counts. Previous steelhead work with marking adults at the off-ladder adult fish trap (OLAFT), and detecting them in tributaries, demonstrated that run escapement can be better estimated, and at a finer scale, using a patch occupancy model. Bonneville Power Administration is also interested in better estimates to evaluate effectiveness of restoration projects they have funded.

Fish are "marked" with a passive integrated transponder (PIT) tag at the Priest Rapids Dam (PRD) OLAFT and "recaptured" at any PIT-tag array upstream. A real-time model was developed for steelhead that allowed estimation of hatchery fish abundance within fine-scale patches and allow for in-season fisheries management in a specific management area.

Currently, for spring Chinook salmon, adult management is largely at Tumwater and [in the Methow basin at the Twisp Weir, Methow Hatchery adult trap and WNFH adult trap; to date, adult management has not been done at Wells Dam] but could also be done in other areas of the Wenatchee Basin like Icicle Creek to support specific in-season management actions. Management could be applied at the finest scale the data allow.

Cram showed a demonstration of the modeled abundance that can be provided in real-time for steelhead on the existing project website (currently hosted by Biomark-Applied Biological Services and developed primarily by Kevin See from Biomark). The intent of the website is to show abundance at different locations in season to inform managers and support management decisions. The steelhead model was used specifically for harvest management based on abundance, but the spring Chinook salmon model will have some additional features based on other conservation and management uses.

Greg Mackey asked if there will be web-based results on a weekly basis for spring Chinook salmon for this year. He asked if WDFW could send out weekly updates to inform managers in-season this year. Cram said he is hoping the tool is accessible by anyone within a few weeks and people can be informed when updates will occur. The steelhead results are hosted on the website. They are also working quickly to post the spring Chinook salmon results to the website, although there will not be useful information on spring Chinook salmon for a few weeks because it is early in the run. The results become more useful once there are 10 to 20 hits at a given detection site. The website should be available long before the peak of the run at Wells Dam. Cram said he can be contacted by people interested in viewing the status of the model.

Hillman asked if the spring Chinook salmon model would be used only for estimating in-season escapement and whether spawning ground surveys would still be used for estimating spawning escapement. Cram said yes. Implicit in the use of the model for spawning escapement for steelhead was the difficulty of estimating spawning escapement from redd surveys (e.g., high flows during steelhead spawning times).

Kirk Truscott asked what the anesthetizing agent is for tagging at the OLAFT because the fish may still be subject to a fishery [and human consumption] after tagging. Catherine Willard said AQUI-S was used for steelhead at the OLAFT, so it is likely the same will be used for spring Chinook salmon. Truscott asked if the idea for implanting the PIT tag in the pelvic girdle was because that is not an

edible portion of the fish. Cram said the original purpose was to improve tag retention because of iteroparity in steelhead and, additionally, the tag is located in closer proximity to the detection plate arrays on the bottom of rivers. Truscott said it may be wise to put out a public notice so that people do not consume that portion of the fish.

Truscott said in 2014, due to the fracture at Wanapum Dam, fish were being captured at PRD for transport around Wanapum Dam, and collection activities had a negative impact on passage time through the PRD ladder (i.e., fish stopped moving through the ladder after the picket weir was lowered). He asked about whether or not passage metrics are being collected on spring Chinook salmon and what would be done to mitigate for passage delay if it is observed, adding that given the low run projections, additional adverse impacts during migration should be minimized. Cram said he would look into their operations guidance, but they have not observed delays for steelhead, even when the ladder was extremely crowded with shad (PRD is the upstream extent of the shad migration). Mike Tonseth said a wait-and-see approach was discussed. Given that the sampling at PRD is every other day for 8 hours at a time, there would be 36-hour periods when the trap is open, and they are reasonably optimistic fish will move when pickets are opened. Truscott said he agrees, but WDFW should consider contingency plans. Tonseth said the difference compared to the 2014 Wanapum fracture was that trapping occurred 7 days a week, making for a much greater potential impact.

Truscott asked if the Lower Okanogan River PIT-tag array will be included in spring Chinook salmon escapement modeling as it will be a key site for detection for the Okanogan Basin. Cram said it will be included in the model, and the component upstream of Zosel Dam will also be added to observe whether fish migrate upstream of Zosel Dam.

Bill Gale reiterated concern about passage delays at PRD. There is a high level of concern about obtaining sufficient broodstock for all upper Columbia programs this year, so affecting migration of 15% of the run could be significant. This plan should also be discussed at the HCP Coordinating Committee. Keely Murdoch said she sits on the PRCC and this project was not discussed in that forum, but no other actions or projects like this have ever been discussed at the PRCC meetings. The plan to prevent trapping on consecutive days seems like an adequate method for reducing risk. Gale said he would agree this is adequate in a normal year, but this is not a normal year. Cram said he will monitor delays to the extent possible. Tonseth said he would update the HCP-HCs and PRCC HSC on trapping and tagging progress in the next meeting, including an update on whether migration delays are observed.

Murdoch said she is excited to see these data and asked if the links to the web-based mark-recapture data could be shared for distribution with the Committees. Cram agreed that it can

be shared with those who inquire with him or Ben Truscott (WDFW), but not more broadly for the protection of the fish.

D. Wenatchee River Passive Integrated Responder Barge Array Installation Update

Jeremy Cram provided an update on the status of PIT-tag detection array mounted on a barge to be located near the mouth of the Wenatchee River.

Juvenile salmon and steelhead PIT detection is difficult, yet there is a desire to leverage the relatively large number of tagged juveniles that are released into the Upper Columbia River to estimate the success of programs. Tagged fish from Wenatchee Basin programs cannot reliably be detected until they pass McNary Dam, and flat plate arrays in the Wenatchee system are relatively ineffective for juvenile detection. The Wenatchee River was the first choice for installing a barge array and the installation is planned for 2021; the Methow River was the second choice because of the greater complexity of the Lower Methow River channel. A screw trap has been added to the Chewuch River, in addition to those operated in the Twisp and lower Methow Rivers, to detect juveniles in the Methow system. WDFW is hopeful the Wenatchee River barge array can be installed by the end of June and the array will be active by fall, with detection data available via the usual databases such as PTAGIS.

Barge arrays detect juvenile tags effectively because they sample the upper portion of the water column and the majority of the depth of the water column. Cram showed photographs of other barge arrays in the Walla Walla River (operated by the Umatilla Tribe), in the Yakima River, and in the Lower Columbia River. The technology is still cutting edge. They are produced commercially by West Fork Environmental and Biomark. They were originally developed by NOAA fisheries in Pasco. They can be anchored to the riverbed or tied to an abutment. Manufacturers suggest they can fish through high flows. WDFW plans a more conservative approach by removing the barge prior to peak flows in the Wenatchee River. There are concerns about signage and boating notification for recreational boaters in the Wenatchee River. The barge will be located between the pipeline bridge and the Highway 2 bridge on the Lower Wenatchee River. Some reconnaissance surveys are being done on the Methow River to determine the best location for a barge array there. The Methow has more active channels at this time of year, which complicates site selection. Each barge has approximately 12 fins and samples an area approximately 25 feet wide by 5 feet deep. WDFW hopes that one barge will be enough and will evaluate detection efficiency based on subsequent detections at McNary and John Day dams. Tom Kahler said the barge array on the Lower Columbia River detected 9% of Douglas PUD survival-study fish that had been detected at Bonneville Dam. He was impressed that it captured that many fish at that location with relatively high flows.

Cram said the greatest interest in the Wenatchee River is to estimate parr-to-smolt survival (especially overwinter survival) and smolt-to-smolt survival for fish tagged and released upstream of

the interrogation system. This is better than the current method of backing into survival estimates by other ratio-based methods. Also, this work will provide better estimates of when fish leave the subbasins. In discussions with the Bureau of Reclamation (BOR) and other funders, there could be benefits to habitat restoration and hatchery evaluations.

Scott Hopkins asked if the BOR was funding both the Wenatchee and Methow river barges. Cram said internal state funds were reprioritized this year for the Wenatchee River barge. The Methow River barge is part of a BOR-funded juvenile survival study.

E. Hatchery Production Recalculation Methods and Data Sources

Tracy Hillman presented an overview of the approach used by the HCP-HCs during the last recalculation (recalc) in 2013 entitled "*Hatchery Production Recalculation*." He used this opportunity to better understand how recalc was done in the past and to remind members of the process and methods used. The previous process required 16 months to complete, but that was also the first iteration of this process. He suggested the current process could take 6 to 8 months to complete. The goal is to have a final implementation plan by the end of the year.

Keely Murdoch commented, regarding the methodology for recalculating hatchery compensation levels, the agreement to compensate for loss of federal hatchery fish implies losses of PUD program fish were not considered (e.g., losses of Wells Fish Hatchery program fish due to operation of Rock Island Dam). This was in fact considered but remained a point of disagreement throughout the process. In the end, the sensitivity analysis examined the range of production that would be necessary with and without mitigating for losses of other hatchery fish, and ultimately the amount of production required for each PUD program to mitigate for losses of fish from other PUD programs was a negotiated amount. Kirk Truscott commented that there was agreement that compensation for hatchery-origin smolts would include Chief Joseph Hatchery fish.

Todd Pearsons said that after the draft comprehensive report is completed (by July 2021), an update to the M&E Plan should also be initiated as an additional large task this year.

Katy Shelby asked, who compiles and synthesizes the data? Hillman said the Committees did the work amongst themselves during the last recalc, but WDFW should expect to be asked to help with data compiling because they maintain a major source of data. It will be up to the Committees whether to assign specific members to certain tasks. Murdoch said last time several members worked separately on calculations that were brought back to the group to refine. A large spreadsheet was prepared, and all members approved the data to be used. The dataset was assembled incrementally as it was obtained and was approved and cleaned up for use. (Larissa Rohrbach distributed the Excel file "*Mid-Columbia PUD Recalculation Data_updated*" following the meeting on April 26, 2021.)

Hillman asked if there were other questions or comments on the proposed schedule for moving forward on recal. No other questions were raised. Hillman asked the Committees to study the methods and the sensitivity analysis used in 2013 and to propose any changes to the analysis for discussion in upcoming meetings.

F. COVID-19 and Monitoring and Evaluation Activities

Tracy Hillman asked Committees' members to provide their monthly updates on impacts of COVID-19 restrictions on M&E activities.

- Mike Tonseth said there were new standard operating procedures adopted for overnight travel and in-person gatherings from WDFW. Tonseth will review those plans if this committee moves into meeting in person. Katy Shelby had no updates to WDFW field work protocols.
- Matt Cooper had no updates from U.S. Fish and Wildlife Service (USFWS). USFWS now has a process in place for requesting approval for overnight travel. Meeting in person may need to be approved as "mission-critical."
- Brett Farman had no updates from NMFS. NMFS has taken the position that they will not ask staff about vaccinations. In-person participation is still subject to determinations based on risk level per area. NMFS personnel will not travel for some time. All entry into offices or travel must be approved as "mission-critical."
- Kirk Truscott had no updates from the CCT. The CCT representatives would have to evaluate the county's reopening phase in order to work in person.
- Todd Pearsons had no updates from Grant PUD. Pearsons said COVID-19 testing is still necessary for working at the OLAFT, whether vaccinated or not.
- Catherine Willard had no updates from Chelan PUD.
- Greg Mackey had no updates from Douglas PUD.
- Keely Murdoch had no updates from the YN.

III. PRCC HSC

A. DECISION: 2021-2022 Priest Rapids Hatchery M&E Implementation Plan

Todd Pearsons said no comments or edits were submitted; the only changes made to last year's plan were changes to dates. All members of the PRCC HSC voted to approve *the 2021-2022 Priest Rapids Hatchery M&E Implementation Plan*.

B. Draft 2022 Wenatchee and Methow M&E Implementation Plan

Todd Pearsons said the draft *Grant County PUD Hatchery Monitoring and Evaluation Implementation Plan for Spring and Summer Chinook in the Wenatchee Basin and Summer Chinook in the Methow*

Basin 2022 was distributed for review with comments due to him by Friday, May 14, 2021, for approval in the May 19, 2021, meeting. Only dates were changed with no other significant updates.

IV. Administrative Items

A. Next Meetings

The next HCP-HCs and PRCC HSC meetings will be Wednesday, May 19, 2021; Wednesday, June 16, 2021; and Wednesday, July 21, 2021; held by conference call and web-share until further notice.

V. List of Attachments

Attachment A List of Attendees

Attachment B Multi-Population Proportionate Natural Influence in the Wenatchee Subbasin

Attachment C Sampling Spring Chinook at Priest Rapids Dam Off-ladder Adult Fish Trap

Attachment D Hatchery Production Recalculation

Attachment A
List of Attendees

Name	Organization
Larissa Rohrbach	Anchor QEA, LLC
Tracy Hillman	BioAnalysts, Inc.
Scott Hopkins*	Chelan PUD
Catherine Willard*	Chelan PUD
Kirk Truscott*‡	Colville Confederated Tribes
Tom Kahler*	Douglas PUD
Greg Mackey*	Douglas PUD
Peter Graf‡	Grant PUD
Rod O'Connor	Grant PUD
Deanne Pavlik-Kunkel	Grant PUD
Todd Pearsons‡	Grant PUD
Brett Farman*‡	National Marine Fisheries Service
Matt Cooper*‡	U.S. Fish and Wildlife Service
Bill Gale*‡	U.S. Fish and Wildlife Service
Jeremy Cram	Washington Department of Fish and Wildlife
Katy Shelby	Washington Department of Fish and Wildlife
Mike Tonseth*‡	Washington Department of Fish and Wildlife
Keely Murdoch*‡	Yakama Nation

Notes:

* Denotes HCP-HCs member or alternate

‡ Denotes PRCC HSC member or alternate

Attachment B

Multi-Population Proportionate Natural Influence in the Wenatchee Subbasin

Multi-Population PNI in the Wenatchee Subbasin

Group Discussion on how or if to implement a multi-population model

Things to consider before applying a PNI model

- What is the scale of the model?
- How do we define “populations” within the model?
- What will the model outputs tell us?
- What are the management implications?

Regardless of Scale – PNI Models need “populations”

- We need to decide what “populations” to consider
 - **Wild**
 - Aggregate specific or
 - Combined Wenatchee
 - **Conservation**
 - Program specific or
 - Combined composite Chiwawa and Nason
 - **Safety net**
 - Nason only
 - **Strays**
 - Out of spawning aggregate (Hatchery + Natural)
 - Out of subbasin
 - Out of ESU
- Examples follow:

Subbasin Scale PNI

- **Example 1 – Entire Subbasin** - This approach looks at the aggregate PNI effect of the current Chiwawa and Nason hatchery programs on the Wenatchee population (above Tumwater) as a whole. This is the simplest approach and easiest to manage but does not measure the effects of the individual hatchery programs.
- **Subbasin Population: 5 Populations**
 1. *Wild*: Total Wenatchee population – includes NO fish from all above Tumwater spawning aggregates
 2. *Conservation*: Nason + Chiwawa
 3. *Safety-net*: Nason
 4. *Within ESU Hatchery Strays*: - Methow/Winthrop/Okanogan 10j
 5. *Out of ESU Hatchery Strays*: - Leavenworth, CJH segregated, Snake River etc.

Tributary/Spawning Aggregate Level PNI:

Example 2 – Chiwawa + Nason - This approach looks at the aggregate effects of the two hatchery programs on the Nason and Chiwawa spawning aggregates. While there would still be hatchery effects associated with strays to the other three spawning aggregates (Upper Wenatchee, Little Wenatchee, and White River), specific hatchery program metrics for effects on these aggregates would be based on stray rates identified in the permits.

- **Chiwawa + Nason: 5-pop model**

1. *Wild*: NO returns to Chiwawa + Nason – excludes NO spawners in Upper Wenatchee, Little Wenatchee, and White River
2. *Conservation*: Nason + Chiwawa
3. *Safety-net*: Nason
4. *Within ESU Hatchery Strays* - Chiwawa/Methow/Winthrop/Okanogan 10j
5. *Out of ESU Hatchery Strays* - Leavenworth, CJH segregated, Snake River etc.

Tributary/Spawning Aggregate Level PNI:

Example 3 - Nason Creek Separate - This approach treats Nason Creek as a separate “population” and treats adults from any other hatchery program as a stray with varying degrees of separation.

- **Nason Creek: 6-pop model**

1. *Wild*: NO returns to Nason only
2. *Conservation*: Nason only
3. *Safety-net*: Nason only
4. *Within population Hatchery Strays* - Chiwawa
5. *Within ESU Hatchery Strays* - Methow/Winthrop/Okanogan 10j
6. *Outside ESU Hatchery Strays* - Leavenworth, CJH segregated, Snake River etc.

Tributary/Spawning Aggregate Level PNI:

- **Example 4 - Nason Creek-Composite** - This approach treats Nason Creek as a separate population but because the program uses a composited approach, this model would weight the gene flow of returning conservation fish to Nason Creek from both the Nason and Chiwawa hatchery programs equally.
- **Nason Creek with Composite consideration: 5-pop model**
 1. *Wild*: NO returns to Nason only
 2. *Conservation*: Nason + Chiwawa
 3. *Safety-net*: Nason only
 4. *Within ESU Hatchery Strays* - Methow/Winthrop/Okanogan 10j
 5. *Outside ESU Hatchery Strays* - Leavenworth, CJH segregated, Snake River etc.

Tributary/Spawning Aggregate Level PNI:

- **Example 5 - Chiwawa Separate** - This approach treats Chiwawa River as a separate “population” and treats adults from any other hatchery program as a stray with varying degrees of separation.
- **Chiwawa River: 6-pop model**
 1. *Wild*: NO returns to Chiwawa only
 2. *Conservation*: Chiwawa only
 3. *Safety-net*: Only when Chiwawa hatchery fish are used to backfill short falls in NO progeny and provided those fish are uniquely marked to differentiate from their WxW cohorts
 4. *Within population Hatchery Strays* - Nason
 5. *Within ESU Hatchery Strays* - Methow/Winthrop/Okanogan 10j
 6. *Outside ESU Hatchery Strays* - Leavenworth, CJH segregated, Snake River etc.

What are the management implications?

- Does the choice of PNI “populations” used in the model require management at the same level?
 - Not necessarily, but it may not be clear what the triggers for management changes are if data is reported at a finer scale than required.
 - If we manage at the spawning aggregate level, how do we handle Upper Wenatchee, Little Wenatchee, and White River?
- Marking and monitoring implications
 - Will additional efforts be needed in other areas to gather information by the populations we’ve identified in the model?
 - Is the spawning aggregate mis-assignment rate something can be overcome with monitoring or tagging?

What are the legal implications?

- Multi-population model is not “required” in the permit
 - Currently, program changes are only triggered by Wenatchee PNI
- It is likely that PNI from a multi-population would result in very slight increases in PNI, rather than decreases because weighting of broodstock with natural influence
- For reporting/compliance, the PNI would need to be rolled up to Wenatchee scale, unless we modify the consultation.

Next Steps

1. Get group consensus on if we want to use a new PNI model
2. If the group agrees that we should pursue a new PNI model, we need consensus on:
 - 1) What “populations” we include
 - 2) How we define each “population”
 - 3) Make sure we have (or can get) data to accurately measure each component’s contribution for the calculation.
 - 4) Develop and agree on a management framework to define triggers and expectations based on results.
 - 5) Decide if this an interim/trial monitoring plan, and how it might change the consultation.

Attachment C

Sampling Spring Chinook at Priest Rapids Dam Off-ladder Adult Fish Trap

Spring Chinook Salmon PIT tagging at PRD



Jeremy Cram – WDFW

Project goals:

- Expand successful steelhead monitoring program to spring Chinook Salmon.
- Produce accurate and precise estimates of spring Chinook Salmon run escapement at multiple spatial scales.
- Leverage new data and associated tools for maximum benefit – hatchery, habitat, harvest, and population modeling



A Bayesian nested patch occupancy model to estimate steelhead movement and abundance

LYNN WATERHOUSE ^{1,2,6}, JODY WHITE,³ KEVIN SEE ⁴, ANDREW MURDOCH ⁵ AND BRICE X. SEMMENS ¹

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²*John G. Shedd Aquarium, 1200 South Lake Shore Drive, Chicago, Illinois 60605 USA*

³*29463 Hexon Road, Parma, Idaho 83660 USA*

⁴*Biomark, 705 South 8th Street, Boise, Idaho 83702 USA*

⁵*Washington Department of Fish and Wildlife, Wenatchee, Washington 98801 USA*

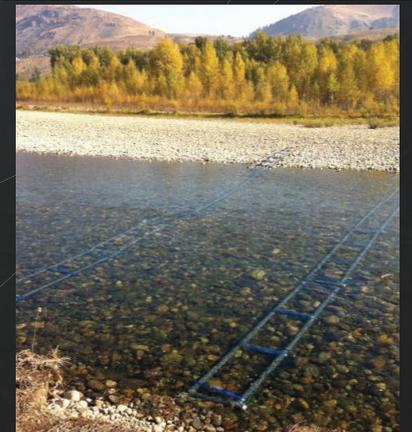
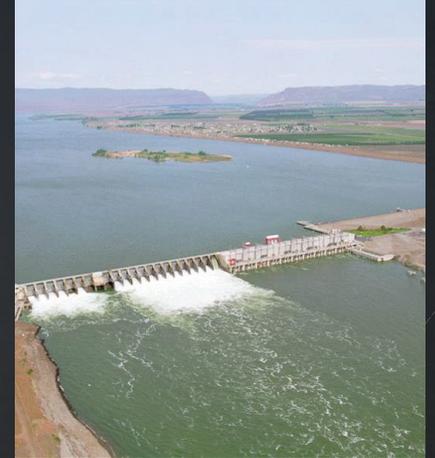
Citation: Waterhouse, L., J. White, K. See, A. Murdoch, and B. X. Semmens. 2020. A Bayesian nested patch occupancy model to estimate steelhead movement and abundance. *Ecological Applications* 00(00): e02202. 10.1002/eap.2202

Abstract. Anthropogenic impacts on riverine systems have, in part, led to management concerns regarding the population status of species using these systems. In an effort to assess the efficacy of restoration actions, and in order to improve monitoring of species of concern, managers have turned to PIT (passive integrated transponder) tag studies with in-stream detectors to monitor movements of tagged individuals throughout river networks. However, quantifying movements in a river network using PIT tag data with incomplete coverage and imperfect detections presents a challenge. We propose a flexible Bayesian analytic framework

Use patch occupancy
model to estimate
abundance
(Waterhouse et al. 2020)

Methods

- Trap Operations (mark)
 - Representative sample of upstream migrants
 - Trap open 8 hrs/day
 - 3d/wk ~ 15%
 - PIT tag in pelvic girdle
 - Sample scales, sex via ultrasound, external marks, CWT
- Detections at dams and instream sites (recapture)
 - Define the scale of resolution and management opportunity



In-season output

- Real-time reporting R shiny application hosted on WDFW website
- Weekly timestep
- Numerous “management areas” defined by PIT detection sites
 - Abundance by origin and sex
 - Toggle between total, H/W, and clipped H, unclipped H, W
 - Toggle for sex on/off
- [demo](#)

Potential applications of real-time model

- Adult management
 - Meet PNI and pHOS goals
- Broodstock collection
 - Downstream management areas can inform broodstock collection by sex and origin
- Fisheries
 - Informed by weekly abundance and origin

Applications of full project

- Run escapement at multiple spatial scales
 - ESU, Population, Tributary/MaSA/MiSA/Reach
- Movement and distribution throughout the season
- Overshooting and migration patterns
- PSM – Run escapement and spawning grounds surveys info
 - Multiple spatial scales
 - Application to habitat restoration
- Stock assessment for all UC spring Chinook Salmon at PRD
 - Reduce double handling that may occur at Tumwater and Wells dams

Study sites

Dams

Priest Rapids
Rock Island
Tumwater
Rocky Reach
Wells
Zosel

Population

Wenatchee

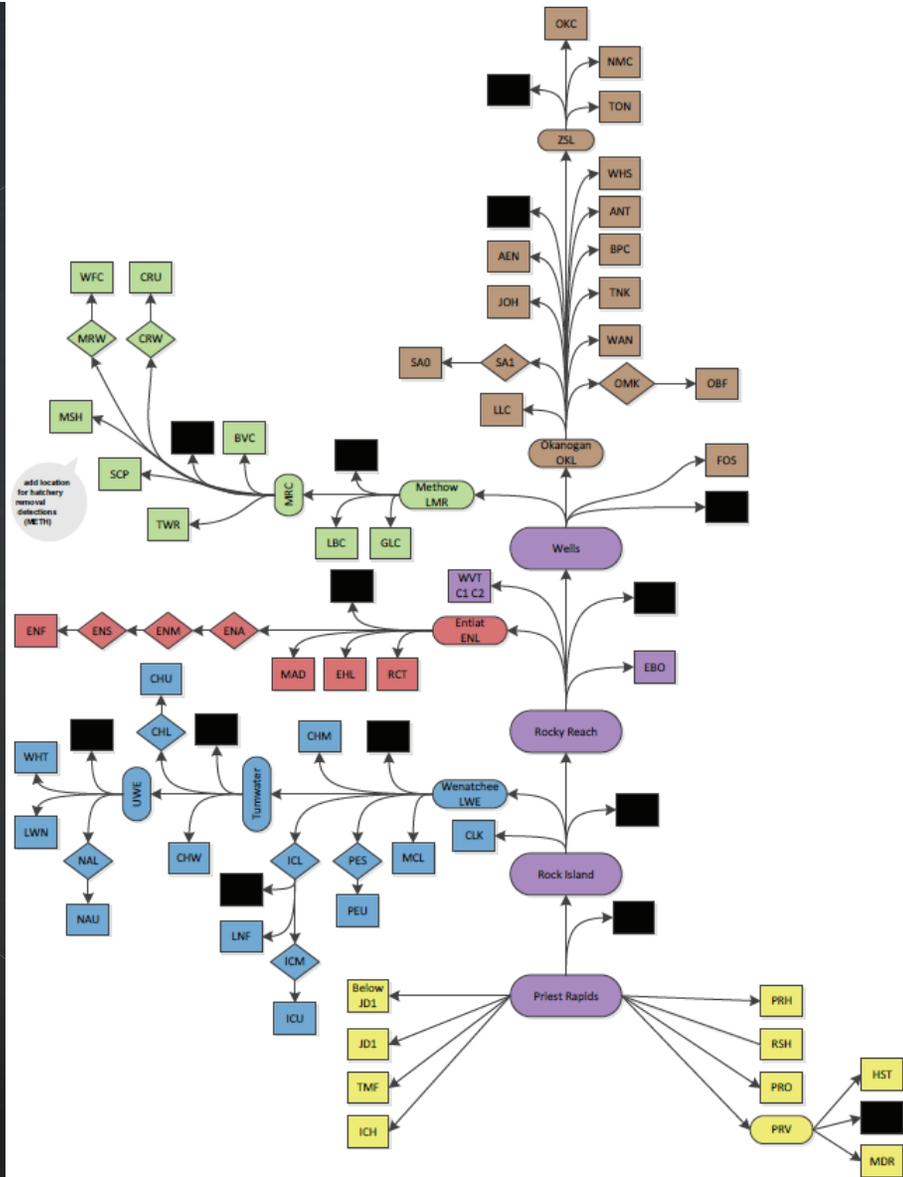
MaSA/MiSA

Icicle Creek
Chiwawa River
Nason Creek
Little Wenatchee River
White River
Chiwaukum Creek
Peshastin Creek
Chumstick Creek
Mission Creek
Mad River
Upper Entiat River
Twisp River
Chewuch River
Upper Methow River
Gold Creek
Beaver Creek
Salmon Creek
Omak Creek
Loup Loup Creek

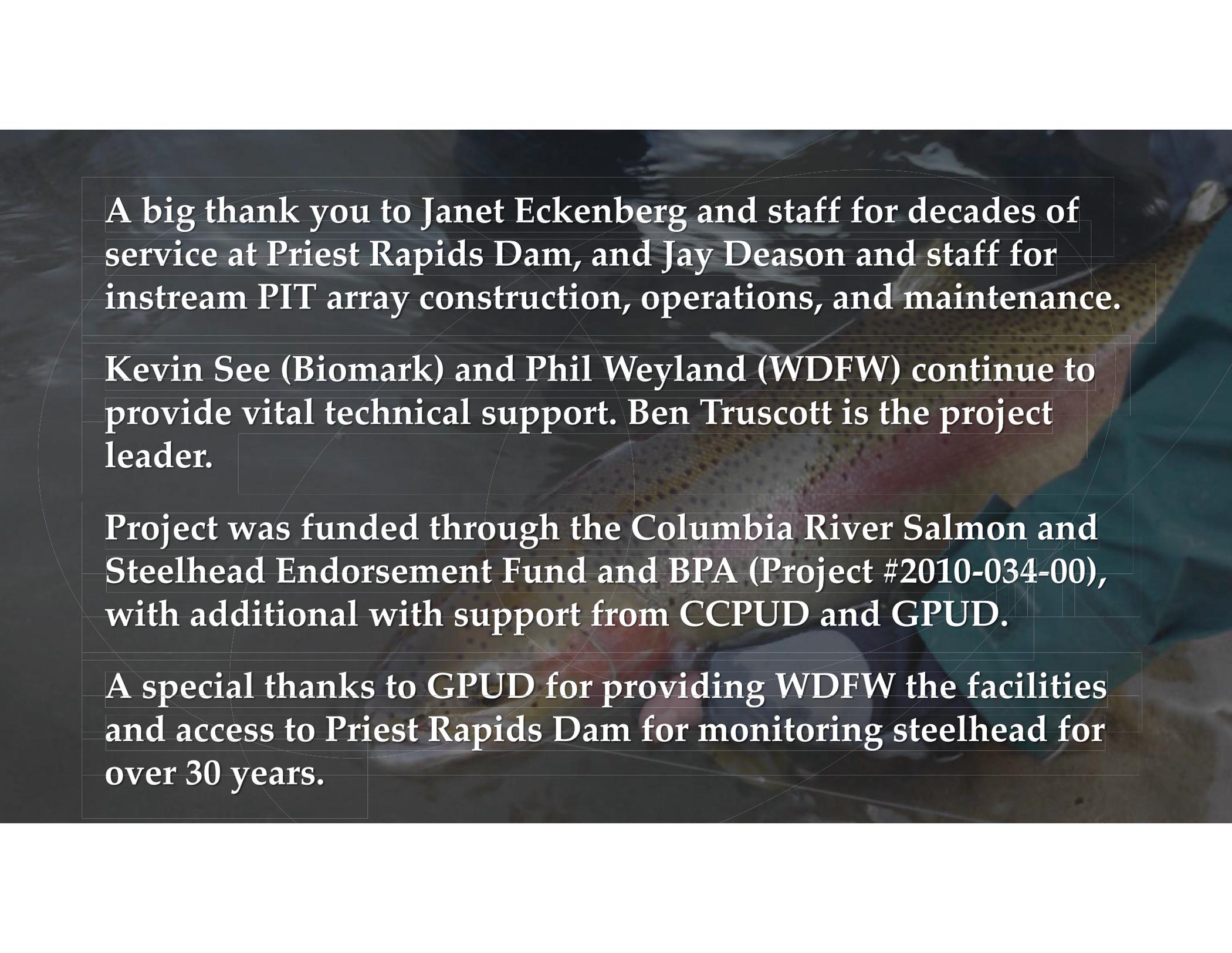
Entiat

Methow

Okanogan



Generate abundance estimates after conclusion of spawning

A steelhead fish is being held by a person wearing a teal shirt. The fish is the central focus, showing its characteristic spotted pattern. The background is dark and slightly blurred, suggesting an outdoor setting near water.

A big thank you to Janet Eckenberg and staff for decades of service at Priest Rapids Dam, and Jay Deason and staff for instream PIT array construction, operations, and maintenance.

Kevin See (Biomark) and Phil Weyland (WDFW) continue to provide vital technical support. Ben Truscott is the project leader.

Project was funded through the Columbia River Salmon and Steelhead Endorsement Fund and BPA (Project #2010-034-00), with additional with support from CCPUD and GPUD.

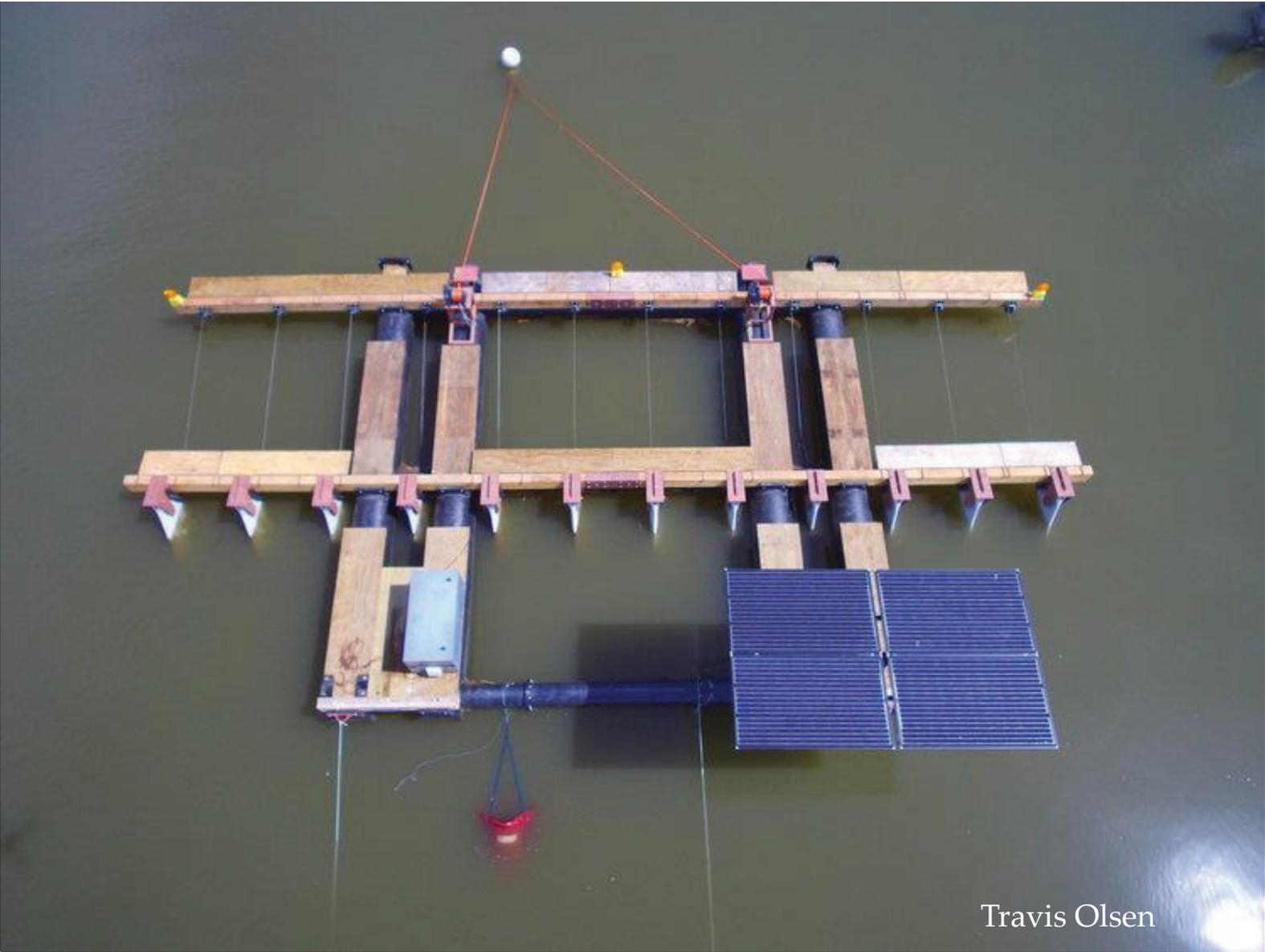
A special thanks to GPUD for providing WDFW the facilities and access to Priest Rapids Dam for monitoring steelhead for over 30 years.



Travis Olsen



Travis Olsen



Travis Olsen



Travis Olsen



Travis Olsen



Travis Olsen



To be continued....

Attachment D
Hatchery Production Recalculation



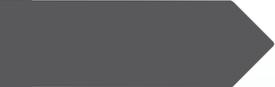
Hatchery Production Recalculation

A Review of the 2014-2023 Recalculation Experience



HCP and Agreement Requirements: Hatchery Production Commitments

- ▶ Calculation of Hatchery Levels (Section 8.4.2 in RI HCP)
 - ▶ The Districts shall provide the funding and capacity required to meet the hatchery compensation level necessary to achieve NNI for all Plan Species.
- ▶ Periodic Adjustment of District Hatchery Levels (Section 8.4.3 in RI HCP)
 - ▶ Hatchery production levels, except for original inundation mitigation, shall be adjusted in 2013 and every 10 years thereafter.
 - ▶ This is necessary to adjust for the following changes:
 - ▶ Average adult returns of Plan Species
 - ▶ Changes in the adult-to-smolt survival rate
 - ▶ Changes to smolt-to-adult survival rate from hatchery production facilities



Outline

- ▶ Timeline
- ▶ Methodology for Recalculating Production
- ▶ Database Used for Recalculation
- ▶ Sensitivity Analysis
- ▶ Implementation Plan
- ▶ Next Steps



Timeline

- ▶ Last Recalculation took about 16 months.
 - ▶ Agreement on methodology (began fall of 2010 and approved July 2011)
 - ▶ Agreement on data used to calculate production (approved August 2011)
 - ▶ Agreement on sensitivity analysis (approved August 2011)
 - ▶ Agreement on Implementation Plan (approved December 2011)
- ▶ Current Recalculation Effort (about 6-8 months)
 - ▶ 2024-2033 Implementation Plan completed by end of 2021



Methodology for Recalculating Hatchery Compensation Levels

- Recalculation Methods Used to Reflect Unavoidable Project Mortality
 - Compensation for hatchery-origin smolts from federal hatcheries was based on projected hatchery smolt releases.
 - Compensation was estimated by multiplying the annual release targets by the unavoidable project mortality for each project.
 - Compensation for natural-origin smolts was based on adult returns at the individual PUD projects.
 - Following the BAMP methodology, compensation was estimated as the quotient of adult equivalents required to meet NNI to the average hatchery-specific SAR
 - Total hatchery compensation was estimated as the sum of compensation for hatchery-origin smolts and compensation for natural-origin smolts.
 - Identified three compensation options for hatchery-origin smolts (sensitivity analysis)



Database Used for Recalculation

- ▶ Annual returns of Plan Species to mid-Columbia Hydroelectric Projects from 2001-2010
 - ▶ Assignment of Chinook run distribution
 - ▶ Account for adipose-present hatchery-origin adults
 - ▶ Average returns to mid-Columbia projects
- ▶ Average spawning escapement proportions by basin
- ▶ Hatchery SARs
 - ▶ Five-year average SARs (based on CWT and PIT tags)
- ▶ Juvenile salmon/steelhead survival and compensation



Sensitivity Analysis

- ▶ Natural-origin compensation was based on BAMP (only one estimate)
- ▶ Hatchery-origin compensation considered three different options
 - ▶ Option 1: $(\text{Project Release Number} \times \text{Unavoidable Project Mortality}) \times \text{Relative Hatchery Performance}$
 - ▶ Option 2: $[(\text{Project Release Number} \times \text{Unavoidable Project Mortality}) + \text{Mitigation for NNI Hatchery Compensation}] \times \text{Relative Hatchery Performance}$
 - ▶ Option 3: $[(\text{Project Release Number} \times \text{Unavoidable Project Mortality}) + \text{Mitigation for NNI Hatchery Compensation} + (\text{Inundation Release Number} \times \text{Unavoidable Project Mortality})]$
- ▶ The three options provided different estimates that made up the sensitivity analysis

Sensitivity Results

Table 2. Range of recalculated values based upon options 1, 2, and 3.

PUD	Species	Option 1	Option 2	Option 3
		<i>a+c+f</i>	<i>a+c+e+f</i>	<i>a+b+d+f+g</i>
Douglas	SpCH	17,801	20,663	29,123
	SuCH	489,540	489,540	489,540
	StHD	307,052	308,352	308,352
Chelan	SpCH	97,712	112,649	204,542
	SuCH	975,228	991,039	1,047,545
	StHD	186,621	189,242	211,211
Grant	SpCH	191,942	218,254	357,796
	SuCH	645,049	661,051	773,829
	StHD	101,231	107,890	196,007
Total	SpCH	307,455	351,566	591,461
	SuCH	2,109,817	2,141,631	2,310,915
	StHD	594,903	605,484	715,570
<i>Chief Joseph funding arrangement</i>		✓	✓	✓
<i>Inclusion of BAMP (natural-origin fish)</i>		✓	✓	✓
<i>Calculated NNI on GCFMP releases</i>		✓	✓	✓
<i>PUD SAR credit for GCFMP adult equivalents</i>		✓	✓	
<i>Mitigation for NNI on hatchery releases</i>			✓	✓
<i>Inclusion of mitigation for inundation¹</i>				✓

Sensitivity Comparisons



Implementation Plan

- ▶ Accepted the range of outcomes based on sensitivity analysis.
 - ▶ These ranges provided the flexibility and management discretion to arrive at final production targets.
 - ▶ Additional production changes were also negotiated (e.g., species exchange)



Next Steps

- **Action Item:** Study the methods, data, and sensitivity analyses used during the first recalculation
- **May Meeting:** Identify and discuss proposed alternatives (if any)
- **June Meeting:** Evaluate proposed methods and identify preferred methods
- **July Meeting:** Approve recalculation methods
- **August Meeting:** Review data sources and any sources of variability that need to be evaluated (sensitivity analysis)
- **September Meeting:** Approve recalculation data sources and review results of sensitivity analysis
- **October Meeting:** Review and discuss options for the Implementation Plan
- **November or December Meeting:** Approve 2024-2033 Implementation Plan
- *****Plan for All-Day Meetings*****