

## Memorandum

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To: Wells, Rocky Reach, and Rock Island HCP Hatchery Committees, and Priest Rapids Coordinating Committee Hatchery Subcommittee Date: September 26, 2022

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

cc: Larissa Rohrbach, Anchor QEA, LLC

**Re: Final Minutes of the August 17, 2022, HCP Hatchery Committees and PRCC Hatchery Subcommittee Meetings**

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The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plan Hatchery Committees (HCP-HCs) and Priest Rapids Coordinating Committee's Hatchery Subcommittee (PRCC HSC) meetings were held in person at Douglas PUD Headquarters in East Wenatchee, Washington, on Wednesday, August 17, 2022, from 10:00 a.m. to 12:40 p.m. Attendees are listed in Attachment A to these meeting minutes.

The August meeting was held online with Webex due to elevated COVID-19 risk in the region.

## Action Item Summary

### Long-Term

#### Joint HCP-HCs and PRCC HSC

- Mike Tonseth will distribute the analysis showing feasibility of the Methow spring Chinook Salmon Outplanting plan based on historical run size data (Item I-A). *(Note: This item is ongoing; expected completion date to be determined.)*
- Kirk Truscott will work with Confederated Tribes of the Colville Reservation (CTCR) 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 date to be determined.)*
- 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 date mid- to late 2022)*

- Members of the HCP-HCs and PRCC HSC will discuss potential hatchery management changes for rearing and release following completion of the 10-year Comprehensive Reports (Item I-A).  
(Note: This item is ongoing.)

## Near-Term (To Be Completed by Next Meeting)

### Joint HCP-HCs and PRCC HSC

- Todd Pearsons and Catherine Willard will revise Grant and Chelan PUD's draft Statements of Agreement (SOAs) on Sockeye Salmon obligations for approval in an upcoming meeting (Item I-A). (Note: This item is ongoing.)
- Members of the HCP-HCs and PRCC HSC will provide feedback to the Washington Department of Fish and Wildlife (WDFW)-revised version of questions on recalculation for Policy Committees prior to the next meeting (Item III-A).
- Members of the HCP-HCs and PRCC HSC will summarize their questions about the Yakama Nation's (YN's) proposal to continue spring Chinook Salmon at the Goat Wall site and send them to Keely Murdoch no later than September 2 (Item III-B).
- Mike Tonseth will work with Douglas PUD and Grant PUD to prepare a draft comprehensive version of the 2022 Broodstock Collection Protocols for approval in the September 21, 2022, meeting (Item III-C).

### Wells HCP-HC

- Members of the Wells HCP-HC will review the CTCR evaluation of summer Chinook Salmon rearing space at Wells Fish Hatchery and return comments to Kirk Truscott by August 31, 2022 (Item II-A).

### Rock Island/Rocky Reach HCP-HCs

- Members of the RI/RI HCP-HC will review Chelan PUD's response to WDFW's comments on the proposed Wenatchee Steelhead Escapement Modeling approach and respond to Catherine Willard with comments prior to the next meeting (Item IV-A).

## Decision Summary

- None.

## Agreements

- None.

## Review Items

- The recalculation questions for Policy Committees with WDFW's suggested revisions was distributed for review on August 11, 2022.
- The YN's *Proposal on the Continuation of the Upper Methow Spring Chinook Acclimation Project* was distributed on July 19 with comments to be provided to Keely Murdoch no later than September 2, 2022.
- Chelan PUD's written response to WDFW's comments on the proposed Wenatchee Steelhead Escapement Modeling Approach was distributed for review on August 15, 2022.
- The *Grant County Public Utility District Implementation Plan for 2022-2023 Priest Rapids Hatchery Monitoring and Evaluation* was distributed on Tuesday August 16, 2022, with comments to be provided to Todd Pearsons by Thursday September 15, 2022.
- The CTRC's *Memorandum to the Wells HCP-HC on Juvenile Summer Chinook Reintroduction Production at Wells Fish Hatchery* was distributed on August 15, with comments to be provided to Kirk Truscott no later than August 31, 2022.

## Finalized Documents

- None.

## I. Welcome

### A. Agenda, Approval of Past Minutes, Action Item Review

Tracy Hillman welcomed the HCP-HCs and PRCC HSC. Hillman reviewed the revised agenda (distributed on August 16, 2022) and asked for any additions or changes to the agenda. No additions were made to the agenda.

The HCP-HCs and PRCC HSC reviewed and approved the revised July 20, meeting minutes.

Action items from the HCP-HCs and PRCC HSC meeting on July 20, 2022, were reviewed (*Note: Italicized text below corresponds to action items from the previous meeting*).

### Joint HCP-HCs and PRCC HSC

#### *Long-Term*

- *Mike Tonseth will distribute the analysis showing feasibility of the Methow spring Chinook Salmon Outplanting plan based on historical run size data (Item I-A).*  
This item is ongoing; expected completion date to be determined in the future.
- *Kirk Truscott will work with Confederated Tribes of the Colville Reservation staff to develop a model that addresses the probability of encountering natural-origin Okanogan River spring Chinook Salmon at Wells Dam (Item I-A).*

This item is ongoing; expected completion date to be determined in the future.

- *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; 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 programs (Item I-A).*

This item is ongoing; expected completion date mid- to late 2022

- *Members of the HCP-HCs and PRCC HSC will discuss potential hatchery management changes for rearing and release following completion of the 10-year Comprehensive Reports (Item I-A).*

This item is ongoing.

### *Near-Term (To Be Completed by Next Meeting)*

#### **Joint HCP-HCs and PRCC HSC**

- *Todd Pearsons and Catherine Willard will revise Grant and Chelan PUD's draft Statements of Agreement (SOAs) on Sockeye Salmon obligations for approval in an upcoming meeting (Item I-A).*

This item is ongoing.

- *All PUDs will distribute final versions of their SOAs on recalculated hatchery compensation for release years 2024 to 2033 (Item I-A).*

This item is complete. Final versions of recalculated hatchery compensation SOAs for all three PUDs were distributed on August 11, 2022.

- *Mike Tonseth will include effective methods of counting surplus fish in the comprehensive draft 2022 Broodstock Collection Protocols (BCPs; Item III-C).*

This item is ongoing. Mike Tonseth will share a draft of the comprehensive BCPs on Monday for Grant PUD and Douglas PUD to revise.

- *Mike Tonseth will distribute the comprehensive draft 2022 Broodstock Collection Protocols (BCPs) for approval in the August 17, 2022 meeting (Item III-C).*

This item is ongoing. Mike Tonseth will share a draft of the comprehensive BCPs on Monday for Grant PUD and Douglas PUD to add revisions.

- *Tracy Hillman will revise the draft set of questions on recalculation for the Policy Committees to be discussed further in the August 17, 2022 meeting (Item III-A)*

This item is complete and will be discussed in today's meeting. An updated version of recalculation questions for Policy Committees with WDFW's suggested revisions was distributed on August 11, 2022.

## Wells HCP-HC

- *Brett Farman will reach out the Craig Busack (NMFS) to evaluate use of natural-origin fish in broodstock to meet the current production levels and the implications meeting Proportionate Natural Influence (PNI) targets in Methow Basin conservation areas (Item I-A).*

This item is complete. Farman said Busack has reached out to Greg Mackey and Mike Tonseth. Tonseth said as part of approving Douglas PUD's recalculated hatchery compensation, the Wells HCP-HC agreed to review the management of Methow spring Chinook Salmon. That process should be initiated now that recalculation is complete, and a list of specific questions should be prepared to engage Busack on this issue when appropriate.

## Rock Island/Rocky Reach HCP-HCs

- *RI/RR HCP-HC will respond to Catherine Willard with feedback on the proposed Wenatchee Steelhead Escapement Modeling approach, for discussion in the August 17, 2022 meeting (Item III-A).*

This item will be discussed in today's meeting. Chelan PUD's response to feedback provided by WDFW was distributed on August 15, 2022.

- *Catherine Willard will provide additional feedback from WDFW's Fish Health veterinarian to the RI/RR HCP-HC on Chelan PUD's proposal to live-spawn female Wenatchee steelhead at Eastbank Hatchery in 2023 (Item I-A)*

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

## II. Wells HCP-HC

### A. Rearing Summer Chinook Salmon at Wells Hatchery for CTCR Reintroductions

Kirk Truscott informed the Wells HCP-HC by email on August 15, 2022, that the CTCR would like to rear approximately 160,000 brood year 2022 summer Chinook Salmon through the fall parr stage at Wells Fish Hatchery to support Upper Columbia United Tribes (UCUT) reintroduction efforts. A memorandum was distributed summarizing the CTCR request for additional production that would only use summer Chinook Salmon resources at Wells Fish Hatchery (Attachment B). The memorandum provided an assessment of available summer Chinook Salmon adult holding, incubation, and rearing resources at Wells Fish Hatchery, considering HCP production obligations, production for orca prey, and the added reintroduction production.

Truscott thanked the Committee for accommodating this late change to the agenda. Truscott said the memo distributed on August 15 explains the proposal, and the table attached to the memo was developed to transparently show their due diligence demonstrating that the proposed production would not adversely impact HCP programs.

Brett Farman noted there was some history behind an initial request from USFWS and asked how this request is related. Truscott said originally, CTCR had requested production from Entiat National Fish

Hatchery to support this proposal. Upon talking to Douglas PUD, it became apparent that it would be much more cost effective and efficient to use the Wells stock reared at Wells Fish Hatchery than Wells stock reared at Entiat. At Wells Fish Hatchery, adults could be co-mingled and temperature units would not need to be matched between two different facilities. Farman asked about funding if this program is shifted to Wells Fish Hatchery, noting that he had conversations with Bill Gale last week and they have done a lot of the background work for using the Entiat National Fish Hatchery fish, for which there is a federal nexus between USFWS and NMFS. Farman said the use of that federal nexus would provide a faster and easier way for NMFS to handle the Endangered Species Act (ESA) review, but he understands the cost and biological reasons for using the Wells Fish Hatchery. Truscott said he will look into that concern, noting that the funding is likely to be a combination of tribal funds and state funds intended to support the reintroduction effort.

Matt Cooper said that if the program chooses to switch to Wells Fish Hatchery, the internal consultation Gale had been working on would likely be incomplete, and consultation on Bull Trout effects would likely still need to be completed. Truscott said, to be clear, this proposal may not preclude members of UCUT from requesting eggs from the Entiat National Fish Hatchery. The consultation work that the USFWS has done to date will likely be useful. Farman said, from a biological perspective, there is likely not much concern about these fish having much impact in the anadromous areas and, biologically, he does not know whether it makes a difference whether they come from the Entiat National Fish Hatchery or Wells Fish Hatchery. It's the permitting process that will hold this up. The way to move forward through permitting would be to obtain a Section 10 permit, whether it's for research or education purposes; by that avenue, NMFS becomes the lead agency for the federal permit, which opens up the process to National Environmental Protection Act (NEPA) review as well as ESA concerns. That would require a minimum of 6 months to go through NEPA because of public comment periods and phases that have timelines associated with them that cannot be changed and would push this implementation out substantially. Shane Bickford (Douglas PUD) asked for clarification around whether Douglas PUD can accept eggs from Entiat National Fish Hatchery. Bickford said it is a funding, temperature control, and bio-programming issue. The fish culturists on the ground would prefer to have one group of eggs for both the HCP and CTCR programs, which would allow them to use less water, less chilling, and less formalin. Bickford said he does not believe there is a federal Bull Trout issue. The need from the USFWS would strictly be egg collection but rearing would happen at Wells Fish Hatchery. Fish would be released from the blocked areas of the Upper Columbia River and not from Wells Fish Hatchery. Farman said the tie in would be a federal nexus at the Entiat National Fish Hatchery, which allows them to go through Section 7 instead of Section 10 for ESA permitting. Going through Section 10 would open the program to NEPA review and a public process. While it seems like a very small change, there is no direct federal agency to consult with under Section 7 if the fish originate from Wells Fish Hatchery. Farman suggested continuing the discussion between the agencies and said that in the short-term, perhaps the Entiat National Fish Hatchery could be used for establishing that federal nexus to initiate

Section 7. Mike Tonseth asked Farman why an ESA Section 4(d) determination would not work for this program, as was done for the orca prey program. Farman said it potentially could, but the process is very similar to Section 10. NMFS becomes the federal agency, which opens us up to NEPA and consultation with ourselves, involving public comment.

Keely Murdoch said she has some concerns. There have been several instances where the YN has asked Wells Fish Hatchery for rearing space, or to make changes, and it seems like it has always been an issue. For instance, in the past, the YN program held adult broodstock at Wells Fish Hatchery but in recent years we were told that space was limited, and we have since moved the adult broodstock holding to Eastbank Hatchery. In addition, during recalculation, the idea of holding two separate groups of summer Chinook Salmon or steelhead at Wells Fish Hatchery was discussed and at first, the Wells HCP-HC was told there wasn't the space and then space was found, which is wonderful. The Wells HCP-HC has also committed to M&E programs for those fish. Murdoch said it seems like there are always space limitations and she has concerns that addition of another program will affect the ability to adaptively manage the existing programs. Any additional production is likely to affect HCP programs in some way, the numbers could be within capacity guidelines, but they are likely to be minor effects. This is not something that the YN will be able to take lightly and will not be an easy approval.

Truscott said, regarding this assessment conducted with Douglas PUD of the summer Chinook Salmon production capabilities, Douglas PUD now has a programming model that they had not had to support previous requests for summer Chinook Salmon holding and rearing in conjunction with other plan species. Additional wells (source for groundwater supply) have also now been developed for the program. Truscott said his interpretation is that with this added production, there would be 54% of the adult broodstock capacity in use. This request by the CTCR is specific to brood year 2022 and is not at this time a request for multiple or consecutive brood years. This would be an annual request to Douglas PUD.

Truscott said he would continue discussions with the Services and Douglas PUD relative to the origin of the eggs should we choose to proceed with the proposal. However, the CTCR need some confidence to ensure Wells HCP-HC members agree with the evaluation provided in the memorandum and table.

Andrew Gingerich (Douglas PUD) said the CTCR proposal works because the source of the broodstock comes from what otherwise would be surplus summer Chinook Salmon at Wells Fish Hatchery. It makes use of vessels that were otherwise already in use. Gingerich said Douglas PUD does take Murdoch's concerns very seriously. The broodstock would be held in common, they can be reared in common, and those fish would not be on station for the full rearing cycle. They would not be held for their full rearing cycle at Wells Fish Hatchery. The fall parr would be transported for overwintering in the blocked areas. Douglas PUD would prefer to take eggs from Wells Fish Hatchery

than Entiat National Fish Hatchery because there are issues with accumulation of temperature units and potentially fish health issues. The issues that arose during recalculation were around much smaller groups of fish. Ironically, it's much easier to add 160,000 juveniles reared in common with the existing program than separating out a smaller number of steelhead that have to be reared separately. Douglas PUD has had some intense dialogues with the Wells Fish Hatchery staff to make sure this is something that can be done, and the feasibility has to do with rearing fish in common.

Murdoch said the issue with the YN arose when there was a switch to obtaining broodstock from surplus, that the YN were no longer able to hold the fish to spawning at Wells Fish Hatchery, so that doesn't really fit with the explanation given for why this program would be different. She still has concerns for spawning and rearing. Murdoch said she will discuss the proposal internally with the YN, but it will be a significant ask.

Tom Kahler said the broodstock holding limitations in the past were complicated by fall collection of adult steelhead into Pond 6 and holding of adult steelhead in two other ponds (ponds 4 and 5), which left only three adult ponds for Chinook broodstock. Murdoch asked if the YN wanted to start holding their broodstock at Wells Fish Hatchery, whether they could be held there too. Kahler said to keep in mind that for holding and spawning the fish, the direction given from Douglas PUD's manager is that we would not be able to do that without compensation because otherwise it could be considered a gifting public funds. The CTCR proposal would compensate Douglas PUD for our work. Murdoch said the YN are compensating Chelan PUD at this time for holding their broodstock and she does not recollect being offered the opportunity to have those discussions with Douglas PUD. Kahler said this is different because a conversation about costs has been included from the beginning with an understanding that we would be compensated. He offered that if the YN want to discuss adult holding or opportunities to use adult surplus at Wells Fish Hatchery, Douglas PUD is open to that and hopes in no way to be dismissive in commenting on that. Murdoch said she would discuss that internally.

Tonseth asked Truscott to clarify that the proposed program focuses solely on Wells Fish Hatchery and his interpretation of the issues. Tonseth said part of the discussion has been to identify Entiat National Fish Hatchery as another egg source and there are still some unresolved issues for that process. Regardless of whether the broodstock comes from Entiat National Fish Hatchery or Wells Fish Hatchery, Wells Fish Hatchery will still be needed for some component of the rearing process either from late egg stage through early parr, or early parr to late parr. Because an integral part of the CTCR proposal will require capacity for incubation and early rearing through fall parr, the Wells HCP-HC needs to review that carefully as well. Truscott agreed with that interpretation and clarified that the ask is for members of the Wells HCP-HC to review the information and indicate whether they concur with CTCR that there are adequate resources to accommodate the added production at the Wells Fish Hatchery. That is how proposals have always been evaluated for additional production at HCP facilities. He requested feedback from members soon because brood would be collected



before the next HCP-HC meeting. If the eggs come from the Entiat National Fish Hatchery, they would have brood collected for those purposes as well, and the CTCR would continue to discuss the federal nexus to confirm the source of eggs for the production to be reared at Wells Fish Hatchery. Truscott requested feedback from members no later than Wednesday, August 31. An additional conference call could be held as needed to confirm committee concurrence based on adequate resources at Wells Fish Hatchery. Cooper said Gale will need to be a part of this discussion and he will not return until August 29. Truscott said he could be available to discuss the issue directly with USFWS representatives between August 29 through 31. All members of the Wells HCP-HC present agreed to review the material by August 31.

### **III. Joint HCP-HC and PRCC HSC**

#### **A. Revisions to Recalculation Policy Questions**

An updated version of recalculation questions for Policy Committees that included suggested revisions by WDFW was distributed on August 11, 2022. Tracy Hillman noted that there is no major urgency to complete this task and other members have indicated they would like to spend additional time reviewing the material. Hillman confirmed that the version with WDFW's additions is the newest version, and additional revisions by others should be made to that version. There is no deadline for the work and Committee members will make revisions as time allows.

#### **B. 2023 Goat Wall Acclimation Proposal**

Tracy Hillman asked whether there were comments on the YN's proposal for the continuation of spring Chinook Salmon acclimation at the Goat Wall Acclimation Facility in the Methow Basin, presented by the YN in last month's meeting.

Kirk Truscott said in the proposal and presentation, the overall spawner distribution was based on carcass recoveries, with a graph showing all carcass recoveries broken into low, middle, and upper Methow Basin (e.g., in Figure 1 of the proposal). He noted he could better evaluate the results if instead of those three categories, carcass recoveries were identified by river kilometer, similar to the violin graph (Figure 3 in the proposal). Truscott also noted, regarding the data shown in the violin graph, the sample size seems very low relative to the total sample size of all carcass recoveries. An N of 40 was the largest sample size. While it's understood these data were limited to females, wild fish carcasses numbered in the range of 200-300 carcasses.

Keely Murdoch asked if Committee members would like the potential agreement formalized in an SOA similar to what was prepared for the first 5-years of the study. Truscott said an SOA would be appropriate for consistency given that it involves HCP production and Mike Tonseth agreed.

Todd Pearsons asked, as he had in the previous two presentations, about potentially hindcasting how often fish redds could become dewatered associated with a juvenile release from the Goat Wall site.

Pearsons noted that Tom Kahler also raised the issue that there is a need to consider drying during later juvenile rearing life stages. Pearsons appreciated that there was an analysis of redds that were desiccated over two years of observations, but it would be nice to have an analysis over a longer time period, especially because there is likely to be larger areas of drying or more frequent drying events in the future due to climate change. Pearsons also noted it might be helpful to compare fish released at Goat Wall versus the Methow Hatchery to see how many progeny of those redds would be affected by desiccation. If both groups are affected similarly, perhaps those are the conditions throughout the Methow River, and perhaps the effects would be the same for both groups.

Murdoch said one of the difficulties of that analysis Pearsons has requested is it is important to consider the timing of when the reaches go dry. In dry years, the reach dries up before the spawning season, so there is no spawning in the reach and no redds become desiccated. There are only two years of data, and it is also difficult to project what could happen based on limited data. The YN at this time is not proposing to add more numbers at Goat Wall, so the observations over the past two years could be considered typical. Pearsons said it's an interesting concept that perhaps more drying or earlier drying could actually prevent redds from becoming desiccated and agreed any evaluation would have to consider the temporal aspect of when redds become dry. Pearsons asked if Douglas PUD had considered that in their past evaluation. Kahler agreed and said the past evaluation was based on gage data for discharge. The Goat Wall gage was at 0 until October in some years, and in many other years it would not go to 0 until after spawning. In those latter years, surveyors would not observe desiccation during spawning surveys, but had they surveyed again in October, they would have observed desiccation. Charlie Snow's (WDFW) crews have been looking at desiccation in reaches M13 and M14; Kahler was not sure if observations include whether desiccation occurs after spawner surveys were complete. Kahler was not aware of any analysis that calibrated flows at the gage with habitat conditions, so that we could know precisely how much spawning habitat is dry or available under various gage values. When flows are 0, we know its dry, but we have no idea if there is a threshold for redd desiccation at low flows above that 0 point. Kahler said that information might be available from others.

Murdoch said the reason the YN is proposing the Goat Wall site over the Early Winters site was because the habitat was better in the Goat Wall area, but there could be an opportunity to adaptively manage the program if redd desiccation was identified as an issue at Goat Wall in the future. Pearsons said his interpretation was that Goat Wall was chosen because that would contribute to a broader spawner distribution upstream compared to Early Winters. He asked if there is any information about whether the Early Winters incubation or rearing would be affected by desiccation. Kahler said the river is usually wetted from Early Winters downstream. Pearsons asked if Kahler thought redd desiccation was not an issue if acclimation occurred at Early Winters rather than Goat Wall. Kahler said it is a supposition about what adults would do if returning to Early Winters because the flows in Early Winters Creek are low and cold; fish may choose to back out and try to move

upstream in the mainstem Methow River. But it is likely that fish reared at Early Winters would stay within the wetted areas of the river.

Murdoch asked members to assemble their questions in writing so they can be passed to the people who are intimately familiar with the data. Murdoch said she would like members to vote on the issue in September. The Committee members agree to provide questions and comments, which are due to Murdoch by September 2. Murdoch would strive to provide responses by September 16 to prepare for a decision in the September 21 meeting. Additional discussion of the topic can occur in the September meeting. Murdoch said the YN staff will make their best effort to meet the deadlines, but that some questions may require obtaining additional data and analysis. Tonseth asked if the draft SOA would be available 10 days before the September meeting. Murdoch said that was her intent. The SOA itself will be a simple document and it would not address any of the questions asked today but the draft could be edited to add information to the background section.

Truscott and Pearsons provided written summaries of their comments via email after the meeting (Appendix C).

### **C. 2022 Broodstock Collection Protocols**

Mike Tonseth said he is working on a draft of the comprehensive 2022 Broodstock Collection Protocols, including all species and updated changes in numbers resulting from last month's decisions about recalculated program sizes. He anticipates making the draft available to Douglas and Grant PUDs for their contributions by late Monday and will then determine when it can be shared with the Committees for approval.

Todd Pearsons said he is assuming in the interim they can provide guidance to their hatchery staff based on past collection needs for fall Chinook Salmon, which are released as subyearlings in 2023, knowing there will only be small changes driven by survivals and fecundities. Pearsons asked if there was any other guidance to provide to fish culture staff. Tonseth said there should be no other guidance necessary. He agreed with Pearsons. The Wells steelhead are not collected until spring, so the next group of focus will be fall Chinook Salmon and the brood number changes are likely to be small because we are still working off the previous recalculated production levels for fish to be released in 2023 as subyearlings. Tracy Hillman asked if approval of the BCPs will be needed prior to the September meeting. Tonseth said no, the emails sent out after the July meeting that provided updated numbers for summer Chinook Salmon and steelhead provide the guidance for the broodstock collection happening now.

### **D. Chair Performance Evaluation**

Kahler said it is a routine HCP requirement to review the performance of the Committee Chair every three years. Kahler said a request for comments was sent out for input on Tracy Hillman's performance and Larissa Rohrbach's support. Feedback from the Coordinating Committees and

Tributary Committees has already been shared, and the outcome was the same in the HCs. Everyone is very happy with their performance and would like to retain their services over the next 3 years.

## IV. RI/RR HCP-HC

### A. Wenatchee Steelhead Escapement Modeling Feedback

Chelan PUD's response to feedback provided by WDFW on the proposed Steelhead Escapement Modeling Approach was distributed on August 15, 2022 (Appendix D). Catherine Willard thanked WDFW for their comments and noted she would not be asking for a vote to approve the method in today's meeting.

Willard said Chelan PUD appreciates the previous DABOM model approach developed to evaluate steelhead, which are by nature a difficult species to track, and noted that the proposed BRANCH model would build upon those past efforts. Willard shared a brief slideshow to compare the approaches (Appendix E). Willard's summary was as follows:

Slide 1. The intent of this response was to clarify the similarities and differences between the current model and how the proposed model, which eliminates spawning ground surveys, is more accurate and less biased than the current method that includes spawning ground surveys. There are two components to estimating spawner escapement for the Wenatchee Sub-basin: tributary spawner escapement estimates and mainstem spawner escapement estimates. The current model and the proposed model both use similar methodology (i.e., multi-state mark-recapture data) to generate spawner escapement estimates in the tributaries. Both models assume 0 percent pre-spawn mortality for fish that enter the tributaries. Chelan PUD is not claiming that the mark/recapture component of the proposed model is less biased than the current mark/recapture model that Kevin See (WDFW) has developed. The mark/recapture data analysis is very similar. Although there have been efforts put forth to reduce bias with spawning ground surveys for steelhead, Chelan PUD maintains that bias still remains with estimating spawners with redd surveys, discussed in the following slides.

Slide 2. The main difference between models is the estimation of mainstem Wenatchee River spawner escapement. Both models remove fish for broodstock, recreational harvest, and adult management. The current model uses redd surveys to generate a spawner escapement estimate in the mainstem Wenatchee. The proposed model corrects the total escapement estimate for pre-spawn mortality (PSM) using a two-year radio telemetry study that was conducted in 2015 and 2016 by the University of Idaho and WDFW.

Slide 3. One of the comments we received on the proposed model was that the PSM rate that we applied was fixed and may not account for interannual variability. A simple sensitivity analysis was done to evaluate the effect that variable estimates of PSM would have on the total

Wenatchee sub-basin spawner escapement estimate. Small (600 fish) and large (2,000 fish) total escapement estimates were used for comparison, and 15%, 20%, 30% and 40% PSM rates were applied to 20% of the total escapement because, based on data reported in our annual M&E report that 20% of the spawner escapement occurs in the mainstem Wenatchee. Using the described parameters, there was a six-fish loss per 5% increase in PSM under a low run (600 fish) and 20-fish loss per 5% increase in PSM under a high run (2,000 fish) of the total escapement estimate. The fish lost per 5% prespawn represents 1% of the population. The results of the sensitivity analysis show that because PSM is applied to a small proportion of the total escapement estimate, it does not cause major differences in total escapement estimates.

We maintain that the PSM rates estimated by Fuchs et al. 2021<sup>1</sup> are reasonable compared to the PSM estimates generated by the currently used model, which estimates PSM for hatchery- and natural-origin fish for two reaches; above Tumwater and below Tumwater. These estimates are highly variable from year to year and are biased either extremely low or high as explained in the next three slides.

Slide 4. Previous PSM estimates are given for 2015-2021 in Chelan PUD's M&E annual reports in Appendix E. Out of 18 estimates of hatchery- and natural-origin PSM (9 above Tumwater and 9 below Tumwater), six were negative to 0% PSM (more spawners than total escapement for a reach) and 5 ranged from 75% to 99%. The range of estimates was -1,350% to 99.4%. This wide range of estimates indicate bias in the redd surveys.

Slide 5. A negative estimate of PSM is obtained when the spawner escapement estimate is greater than the total escapement estimate. For example, in 2019, the total escapement estimate below Tumwater was 2 hatchery-origin fish. However, the spawning ground surveys estimated 29 spawners, resulting in a PSM rate of -1,350%.

Slide 6. Conversely, PSM estimates can be overinflated. In 2021 the total hatchery-origin escapement estimate below Tumwater was 62 fish and the spawner escapement estimate was zero, resulting in a PSM estimate of 99%. The zero estimate for spawners was a result of observing two redds below Tumwater in 2021, which, when adjusted with the observer efficiency model, resulted in 1 redd below Tumwater. This points to the challenges of conducting redd surveys on the Wenatchee River during the spring for steelhead.

Slide 7. Spring flows in the Wenatchee mainstem create poor visibility. Peak steelhead spawning typically occurs the last week of April through the first week of May when the 98-year median daily flow of the Wenatchee River is 4,000 cfs. Steelhead spawning ground surveys occur between March 1 through May 30th when the 98-year median flow ranges between 800 cfs to

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<sup>1</sup> Fuchs, N. T., C. C. Caudill, A. R. Murdoch, and B. L. Truscott. 2021. Overwintering distribution and postspawn survival of steelhead in the Upper Columbia Basin. *North American Journal of Fisheries Management* 41 (3):757-774.

6,000 cfs. In comparison, summer Chinook Salmon spawning ground surveys are conducted in October 1 to November 15 when the 98-year median flow ranges between 500 to 1,100 cfs (USGS 2022). Chelan PUD currently uses the spawner observer efficiency model to adjust spring Chinook Salmon redd counts, and it works well because flows are low and visibility is good during the time that spawning ground surveys occur.

Slide 8. The observer efficiency model can only correct redd estimates when redds are visible. If a survey results in zero redds being observed, zero cannot be expanded. Additionally, the mainstem is broken into 5 index reaches and 5 non-index reaches. The non-index reaches, which is 41% of the mainstem, are only surveyed once during peak spawning, and if peak spawning occurs when visibility is minimal, spawner escapement estimates will be biased low.

Slide 9. The proposed model addresses all Section 10 Permit requirements and M&E requirements. Question 5.2.1 in the M&E Plan evaluates similarities in spawn timing between hatchery- and natural-origin fish. PIT-tag detections are currently used to evaluate spawn timing within spawning tributaries as described in the steelhead migration and spawn timing chapter of the 10-Year Comprehensive Report. The next iteration of the proposed model will include estimates of hatchery- and natural-origin spawners, applied estimates of PSM for hatchery- and natural-origin fish, repeat spawners, and recreational harvest.

Willard concluded by reiterating that Chelan PUD appreciates the efforts by WDFW and partners to minimize bias in estimating steelhead spawner escapement in the Wenatchee sub-basin; however, we maintain that bias remains with steelhead spawning ground surveys.

Keely Murdoch said it seems like the real issue is the spawning ground surveys and a conversation should be had about the spawning ground surveys, not about scrapping the entire Patch Occupancy Model (POM) and starting with a new model. The POM can be run with the exact same PSM constants that are being proposed for use here. In fact, that was what was done in 2020 when spawner surveys could not be done. Murdoch said she is not convinced that using a constant based on just 2 years of data is actually more accurate or less biased. It's unknown if the 2 years is capturing the range of PSM. Murdoch questioned why a whole new model would be built with a new set of assumptions when there is already one that has been in use and peer reviewed. The current models are also part of a DPS-wide effort. As research managers, we are concerned about resource obligations to the rest of the DPS, as should others on the Committee. It's a powerful thing to be able to get estimates of overwinter mortality, overshoots, and PSM from the existing model and it provides a lot more information. Chelan PUD does have a mitigation obligation to demonstrate that mitigation is being met, that is, replacing mortalities to all 4 tributary populations. For simplicity, the HCPs allow for consolidation of all mitigation and funding to the Wenatchee Subbasin, and we are not asking Chelan PUD to fund M&E outside of the Wenatchee basin, but that doesn't mean we don't have an obligation to understand how that mitigation fits in with wild and hatchery spawner

distribution outside of the Wenatchee Subbasin. Today's presentation really shows that the issue isn't really the model, it's really the spawning ground surveys, and improving estimates of PSM from spawner surveys should be investigated. Willard agreed with Murdoch and said Chelan PUD did pursue the proposed approach to estimate escapement without relying on spawner surveys. Chelan PUD would considering going forward with using the POM to be consistent with how steelhead escapement is being estimated in other basins but does not support going forward with reliance on spawning ground surveys. A PSM constant is used, but the PSM based on spawner ground surveys is completely inaccurate. Murdoch said it would be good to bring in other minds to develop a better PSM constant. Willard said Chelan PUD has the same concerns with approaches that do not account for variability in PSM and how that affects the overall escapement estimate. The sensitivity analysis shown today demonstrates that variability in PSM has hardly any effect because it is assumed that most of the spawning occurs in the tributaries where there is no PSM.

Mike Tonseth said he is still in the process of reviewing Chelan PUD's responses and has no immediate questions. He thanked Willard for Chelan PUD's response. There is more discussion that should be had about the challenges with inaccuracies in the spawning ground surveys and WDFW would welcome expanding those discussions with other participants.

Matt Cooper thanked Willard and Murdoch. He agreed the issues are spawner surveys and estimates of PSM and less about what type of model is best. Cooper wondered if there are better ways to estimate PSM rather than relying on just 2 years of data. Willard asked if he had any feedback on the sensitivity analysis. Cooper said he is wondering how to address PSM in the tributaries. We assume that once they make it to the tributaries they will survive to spawn, but we don't know. Murdoch said the tributary escapement is estimated in the spring. In the mainstem it is actually overwinter mortality not just PSM, which is presumably captured in the mortality estimate because they tend to overwinter in the mainstem. There may be PSM in the tributaries, but it is likely that most of the fish that make it to the tributaries survive to spawn. Willard agreed that PSM and overwinter mortality have been used interchangeably during this conversation, which is technically incorrect because the overwinter mortality occurs over a much longer period.

Willard said the next steps for Chelan PUD are to review the 2023 M&E Implementation Plan in the September meeting in which they will not include the steelhead redd surveys. Willard said she would follow up with individual members prior to the next meeting. Members of the RI/RR HCP-HC agreed to provide additional responses on the proposed Wenatchee Steelhead escapement modeling approach to Willard prior to the next meeting.

## **B. Fish Health and Live Spawning Wenatchee Steelhead**

Catherine Willard said she spoke with Megan Finley (WDFW Fish Health Veterinarian), who was able to address fish health concerns that were raised in the June 15, 2022 meeting.

One issue raised by Kirk Truscott was disease sampling; if live spawning, testing of females could only be done on ovarian fluid and he also questioned whether eggs from those females could be kept separate until results were obtained. Willard summarized Finley's response that all egg batches are kept separate until eyed eggs are moved to Chelan Hatchery where they are incubated in red zone boxes. There would be no difference compared to the current early egg incubation practices.

Another issue raised by Mike Tonseth was how disease screening would work for males. Willard said that disease screening is not currently done on males. Tonseth had also raised concerns about the effectiveness of using luteinizing hormone releasing hormone (LHRH) to stimulate the females to ripen, and Finley also had the same concerns. After further discussion, Chelan PUD decided to evaluate this more and are working with WFDW to develop a work plan to determine if all eggs can be obtained. Chelan PUD will wait for approval for live spawning until after an additional year of data can be obtained using this alternative hormone.

Truscott said part of the issue is a change in how to sample for fish health; whether we would know that a disease was manifesting itself with the new protocol versus the existing protocol. Tonseth said yes, results from disease testing would be returned before those eyed eggs were transferred to Chelan Hatchery and the eggs would be kept in different incubation trays until those results are returned. The difference is that with lethal spawning, the kidney and spleen are also sampled. Finley explained to him that the probability of having a positive or negative result for Infectious Hematopoietic Necrosis Virus (IHNV) is the same if sampling just ovarian fluid versus sampling the other organs. Truscott said that answers his primary question, which was whether fish would have to be held longer to be able to observe a disease issue. Tonseth said no, Finley did not feel there would be an effect of implementing a live spawning method on disease detection.

Tonseth said anecdotal information about the efficacy of LHRH was obtained this year. There is information from the Methow program, but a difference compared to the Wenatchee program is that Methow-program fish are caught in the spring, and the Methow-program fish seem to be farther along in their maturation when they are captured. The Wenatchee fish are caught in the summer and fall and held over winter. WDFW wants to ensure that by live-spawning we are not reducing fecundity and egg viability substantially and the proposed study will evaluate those issues. Tonseth said he is supportive of kelt reconditioning, but not if reliance on this hormone to achieve maturation results in a significant increase in the number of broodstock needed because of lower fecundity and egg viability. Willard said this issue will be brought back to the committee in the spring.



## V. PRCC HSC

### A. Grant PUD's Wenatchee and Methow Basin M&E Implementation Plan

The *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 2023* was distributed July 18, 2022, for 30-day review.

Todd Pearsons noted that no comments were received to date. The approval of the implementation plan for the Wenatchee Basin required further discussion and will be delayed for approval until the September meeting because of ongoing discussions between the PUDs and USFWS about spawner surveys in the Icicle River.

### B. Grant PUD's Priest Rapids Hatchery M&E Implementation Plan

The *Grant County Public Utility District Implementation Plan for 2022-2023 Priest Rapids Hatchery Monitoring and Evaluation* was distributed on Tuesday August 16, 2022 for 30-day review with comments to be provided to Todd Pearsons by Thursday September 15, 2022.

## VI. Administrative Items

### A. COVID-19 Impacts

COVID risk levels are moderate in Chelan and Douglas counties according to the Center for Disease Control's risk rating by county.<sup>2</sup>

- Kirk Truscott said protocols for the CTCR are unchanged at this time. There are several staff that have become sick and they are adapting to staff needs.
- Mike Tonseth said there are no changes for WDFW.
- Keely Murdoch said there are no changes for the YN.
- Brett Farman said there are no major differences in protocols for NMFS at this time; staff are not required to return to the office at this time.
- Matt Cooper said there are no changes for USFWS.
- Todd Pearsons said there are no changes for Grant PUD. Pearsons said a recent addition to the AFS Annual Meeting plan is that attendees must provide proof of vaccination or recent negative test and must wear a mask at all times unless outside or while eating or drinking.
- Catherine Willard said there are no changes for Chelan PUD.
- Tom Kahler said there are no changes for Douglas PUD.

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<sup>2</sup> <https://www.cdc.gov/coronavirus/2019-ncov/your-health/covid-by-county.html>

## **B. Distribution List Update Request**

Grant PUD has requested that Nathan Buck be added to the primary HCP-HC and PRCC HSC distribution list. Nathan Buck will be attending or calling into future meetings and will be supporting Clayton Buck in representing the Wanapum's interests in Grant PUD's various forums.

The HCP-HC and PRCC HSC approved this request (Note that this request was also approved by the Wells HCP-Coordinating Committee on August 22, 2022).

## **C. Next Meetings**

The next regular HCP-HCs and PRCC HSC meetings will be held on Wednesday September 21; Wednesday October 19, 2022; and Wednesday November 16, 2022.

The HCP-HC and PRCC will plan to hold the September and October meetings in person at Douglas PUD's auditorium with a WebEx virtual attendance option.

The HCP-HC and PRCC HSC agreed they would consider meeting virtually in the winter because of travel challenges (from November through February).

## **VII. List of Attachments**

- Attachment A List of Attendees
- Attachment B Memorandum to the Wells HCP-HC from CTCR regarding Juvenile Summer Chinook Reintroduction Production at Wells Fish Hatchery
- Attachment C Emails Re: Questions and Comments on the YN's Proposal for Expanded Acclimation at Goat Wall
- Attachment D Chelan PUD's response to WDFW's Comments on the Proposed Change to Wenatchee Steelhead Escapement Modeling
- Attachment E Presentation: Chelan PUD's Summary of Responses to WDFW's Comments on the Proposed Change to Wenatchee Steelhead Escapement Modeling

**Attachment A  
List of Attendees**

Name	Organization
Larissa Rohrbach	Anchor QEA, LLC
Tracy Hillman	BioAnalysts, Inc.
Scott Hopkins*	Chelan PUD
Catherine Willard*	Chelan PUD
Tom Kahler*	Douglas PUD
Shane Bickford	Douglas PUD
Andrew Gingerich	Douglas PUD
Brandon Kilmer	Douglas PUD
Brad Hostetler	Douglas PUD
Todd Pearsons‡	Grant PUD
Tim Taylor	Grant PUD
Brett Farman*‡	National Marine Fisheries Service
Alf Haukenes	Washington Department of Fish and Wildlife
Mike Tonseth*‡	Washington Department of Fish and Wildlife
Keely Murdoch*‡	Yakama Nation
Matt Cooper*‡	U.S. Fish and Wildlife Service

Notes:

\* Denotes HCP-HCs member or alternate

‡ Denotes PRCC HSC member or alternate

**Attachment B**  
**Memorandum to the Wells HCP-HC from CTCR regarding Juvenile Summer Chinook Reintroduction  
Production at Wells Fish Hatchery**

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**The Confederated Tribes of the Colville Reservation  
Fish and Wildlife Department  
PO Box 150  
Nespelem, WA. 99155**

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**August 15, 2022**

**\*\*\*\*\* MEMORANDUM\*\*\*\*\***

**TO: Wells Habitat Conservation Plan, Hatchery Committee**

**FROM: Kirk Truscott, Confederated Tribes of the Colville Reservation**

**SUBJECT: Juvenile Summer Chinook Reintroduction Production at Wells FH**

The Confederated Tribes of the Colville Reservation (CTCR) is proposing summer Chinook broodstock collection/holding of 80 adults obtained via CTCR surplus allocation, the incubation of 180,000 eggs and rearing of approximately 160,000 Brood Year (BY) 2022 juvenile summer Chinook through the fall-parr development stage at Wells Fish Hatchery (WFH). This production is to support blocked area reintroduction Phase II initial juvenile studies above Grand Coulee Dam. The 160,000 juveniles will be transferred from WFH to the blocked area in late-October or early-November the year prior to release for final rearing and release.

Consistent with other recently added orca production at WFH, DCPUD and CTCR have developed adult brood holding, incubation and rearing strategies that minimize resources (water and space) at WFH, such that the proposed production is consistent with existing available WFH summer Chinook broodstock holding, incubation/rearing space resources at WFH (Table 1). This rearing strategy is consistent with prioritizing DCPUD's HCP mitigation production and will not impact mitigation requirements.

After review, should the Committees agree that sufficient summer Chinook production resources exist at WFH to accommodate the summer Chinook reintroduction production at WFH, the CTCR and DCPUD will proceed with brood collection and permitting required to implement the proposed program.

Table 1. Capacity and current use of summer Chinook infrastructure at Wells Fish Hatchery and relative impacts of rearing 160,000 additional fall parr for the UCUT reintroduction program.

	Total SUC Capacity	Wells 1+	Wells 0+	Orca 0+ 1M	Met 1+ 35k	Reintro 160k	Total (Wells + 1M Orca + Met 35k)	Total (Wells + 1M Orca + Met 35k + Reintro 160k)	% of Capacity (Wells + 1M Orca + Met 35k)	% of Capacity (Wells + 1M Orca + 35k Met + Reintro 160K)
Broodstock Capacity/Requirements	2,100 <sup>1</sup>	192	290	550	20	80	1,052	1,132	50	54
New Incubation (eggs)	3,528,000 <sup>2</sup>	432,000	652,500	1,237,500	45,000	180,000	2,367,000	2,547,000	67	72
Old Incubation (eggs)	2,457,000	0	0	0	0	0	0	0	0	0
	Available Flow/DI	Wells 1+	Wells 0+	Orca 0+ 1M	Met 1+ 35k	Reintro. 160k	Total (Wells + 1M Orca + Met 35k)	Total (Wells + 1M Orca + Met 35k + Reintro 160k)	% of Capacity (Wells + 1M Orca + Met 35k)	% of Capacity (Wells + 1M Orca + 35k Met + Reintro 160K)
Broodstock (gpm)	2,250 <sup>3</sup>			1,500			1,500	1,500	67	67
Incubation Trays – New	784	96	145	275	10	40	526	566	67	72
Incubation Trays – Old	546	0	0	0	0	0	0	0	0	0
Inc. Flow – New (gpm)	392	49	74	140	7	21	270	291	69	74
Inc. Flow – Old (gpm)	275	0	0	0	0	0	0	0	0	0
Outside Rearing (Density) <sup>4</sup>	0.060	0.03	0.03 <sup>5</sup>		0.07	<0.01 <sup>6</sup>	4	4	4	4

## Notes

<sup>1</sup> Broodstock capacity assumes use of all 6 adult ponds.

<sup>2</sup> Assumes use of all 7 incubation rooms in new building. No conflict with Coho or steelhead incubation due to timing. Does not include the option to add 315,000 egg bonus incubation stacks in 4 rooms.

<sup>3</sup> Assumes biological program flow of 500 gpm for ponds 1-3 and 250 gpm for ponds 4-6 and fully loaded ponds with 2,100 adults in all 6 ponds.

<sup>4</sup> Outside rearing ponds are managed to a maximum density index of 0.07 per HSRG recommending a DI of no greater than 0.12 for Chinook. Density index (DI) values for dirt ponds are <0.03 and therefore do not limit dirt pond rearing poundage. Instead flow index (FI) is used as the limiting factor.

<sup>5</sup> Orca production is reared in common with Wells HCP inundation subyearlings.

<sup>6</sup> The reintroduction program yearlings will be reared in a separate pond (3B) on partial reuse water.

**Attachment C**

**Emails Re: Questions and Comments on the YN's Proposal for Expanded Acclimation at Goat Wall**

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**From:** [Todd Pearsons](#)  
**To:** [Larissa Rohrbach](#)  
**Cc:** [Keely Murdoch](#); [Rolland O'Connor](#); [Tim Taylor](#); [Deanne Pavlik-Kunkel](#); [Tracy Hillman](#)  
**Subject:** GPUD Questions about YN Goat Wall Proposal  
**Date:** Wednesday, August 17, 2022 2:29:58 PM

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**CAUTION:** This email originated from outside of Anchor QEA. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Hi Larissa,

Per the action item from today's meeting, below are GPUDs questions about the YNs Goat Wall Acclimation proposal.

The heart of GPUDs questions about the YN Goat Wall Acclimation Proposal is about whether juvenile acclimation at Goat Wall increases the risk of redd dessication in the future. Depending upon answers to the questions below, GPUD may be more comfortable providing fish for acclimation at Early Winters Pond rather than Goat Wall Pond.

1) What % of redds created by adults that were acclimated as juveniles at Goat Wall Acclimation Facility would be predicted to produce no progeny based upon redds going dry prior to juvenile emergence from redds? Please provide annual estimates.

An estimate could be made by looking at the historical relationship between stream discharge and the time of stream reach drying after spawning. Data should be available for the past few decades, but some assumptions may be required to produce estimates.

2) What are the annual % of redds that go dry for the Methow Hatchery releases vs. Goat Wall releases during the past few years of data availability?

3) What are the predicted risks of redd dessication for adults that produced redds and were acclimated at Goat Wall vs. Early Winters as juveniles?

Please consult relevant meeting summaries for additional context about questions.

Thanks,

Todd Pearsons, Ph.D., FP-C  
Senior Fisheries Scientist  
Grant County Public Utility District

**From:** [Kirk Truscott](#)  
**To:** [Keely Murdoch \(murk@yakamafish-nsn.gov\)](mailto:keely.murdoch@yakamafish-nsn.gov); [Larissa Rohrbach](#)  
**Cc:** [Tracy Hillman](#)  
**Subject:** Re: HCP-HCs and PRCC HSC: 7/20 action items; Goat Wall presentation.  
**Date:** Monday, August 22, 2022 9:56:51 AM

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**CAUTION:** This email originated from outside of Anchor QEA. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Keely,

Per our conversation last week, I'm providing you with a couple of questions regarding the Goat Wall presentation provided to the Hatchery Committee. Please feel free to circulate my questions to the balance of the HC and HSC.

1) Slide #6 depicts the spring Chinook carcass recoveries in the Methow River (presumed spawning location) based on a geographic description of low, middle and upper Methow River. Is it possible to provide the same information, but include the rkm rather than the general low, middle and upper classifications? What I'm concerned with, is the proximity of recovered carcasses to the dewatered reaches in the Methow River. It appears as if the Goat Wall fish do not spawn in the "lower" areas of spring Chinook habitat and occupy the middle and upper reaches, which at first thought seems like a good thing. However, if they are occupying habitat in the areas prone to dewatering during the spawning/incubation/early rearing periods then that could be detrimental. It appears as if the natural origin fish occupy predominantly the "middle" reaches (~67% of the carcass recoveries) and less so in the "upper" reaches (~30%). Conversely the Goat Wall carcass recoveries indicated the majority of the recoveries (~60%) were recovered in the "upper" reaches. Proportionally, the Goat Wall fish appear to be occupying the "upper" reaches in much higher proportion than the natural origin fish. Why might this be? longer-term habitat conditions limiting natural production in the "upper" reaches? I don't know, but if this were to be the case, an artificial propagation program that returns the majority (~60%) of the returning hatchery adults to a geographic area with limited productivity potential may be detrimental to overall spring Chinook production in the Methow River.

2) Slide #7 shows the same general trend as slide #6, but restricted to female carcass recoveries and includes rkm as the geographic description, which is appreciated. My question is "why are the N values so low?" For example, slide #6 indicates that ~330 natural carcasses were recovered; however, Slide #7 analysis includes only 40 female carcasses. This same trend appears for Goat Wall and Methow FH spring Chinook. It's hard to imagine that the sex ratio was that skewed towards males. Were all female carcass recoveries included in this analysis or a sub-sample?

3) Slide #12- The notes for this slide as well as the presentation on juvenile survival, stated that "comparing the two groups over the years we did not find a significant difference". While this may be, in all but 1 year, Goat Wall fish survived at lower rates than Methow fish, and 2 of six years (33%), Goat Wall fish survived at considerably lower rates (~33%-45% lower) than Methow fish. This is concerning to me. Is there data that could be used, such as known PIT tags leaving Goat Wall and Methow FH rather than the number of PIT tags at tagging? Seems that given the likely differences in the ability to account for mortality/predation between Goat Wall and Methow FH facilities, this would normalize the data.

Thanks and sorry it took me this long to have more time to review the presentation and provide written questions.

Kirk

On Mon, Jul 25, 2022 at 3:23 PM Larissa Rohrbach <[lrohrbach@anchorqea.com](mailto:lrohrbach@anchorqea.com)> wrote:

Hi HCP-HCs and PRCC HSC: Please find attached the action items from last Wednesday's 7/20 meeting and the presentation from Danielle Grundy on the YN Proposal for the Continuation of Goat Wall Acclimation.

These items are also available for download from the following locations:

- HCP Hatchery Committees Extranet Site under Final Documents -> All by Mtg Date - > 7/20/2022
- PRCC HSC Sharepoint site under Meeting Agendas and Minutes (for action items) and Other Documents > Goat Wall Acclimation Documents

Thanks! Larissa

**Access Instructions:**

To gain access to the **HCP Hatchery Committees Extranet** Homepage, please use the following procedure:

- \* Visit: <https://extranet.dcpud.net/sites/nr/hcphe>
- \* Login using "Forms Authentication" (for non-Douglas PUD employees)

You should now be at the HCP HC page.

If you encounter problems, or need a login username and password to access the site, contact me or Julene McGregor [[jmcgregor@dcpud.org](mailto:jmcgregor@dcpud.org); (509) 881-2236] for assistance.

To gain access to the **PRCC Hatchery Subcommittee Sharepoint**, please use the following procedure:

- \* Visit: <https://gcpud.sharepoint.com/sites/ResourceCommittes/PRCCHatchery>
- \* Login using Microsoft 365 credentials

You should now be at the PRCC Hatchery Subcommittee page.

Contact me or Erin Harris [[eharris@gcpud.org](mailto:eharris@gcpud.org); (509) 793-1487] for assistance

Thank you,

Larissa

**Larissa Rohrbach** | ANCHOR QEA, LLC

**Attachment D**  
**Chelan PUD's response to WDFW's Comments on the Proposed Change to Wenatchee Steelhead**  
**Escapement Modeling**

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**STATE OF WASHINGTON**  
**DEPARTMENT OF FISH AND WILDLIFE**  
**FISH PROGRAM -SCIENCE DIVISION**  
**HATCHERY/WILD INTERACTIONS UNIT**

*3515 Chelan Hwy, Wenatchee, WA 98801*  
*Voice (509) 664-3148 FAX (509) 662-6606*

July 8, 2022

To: Rock Island HCP Hatchery Committee

From: Andrew Murdoch and Kevin See

**Subject: Proposed changes in steelhead spawner escapement methodology**

**Background**

Steelhead spawner escapement estimates are essential for status and trend monitoring, population viability analysis, and assessing progress towards recovery goals. Unbiased abundance estimates of wild and hatchery steelhead are important components for both hatchery management and estimating population productivity (recruits/spawner). Historically, spawning escapement estimates for the four independent populations in the Upper Columbia River (UCR) Distinct Population Segment (DPS) were derived from fish ladder counts at mainstem Columbia River dams, fixed values from a radio telemetry study (1999-2001) and an assumption of constant prespawm mortality (5%). This method used fixed values through time and space without incorporating any uncertainty from any parameters used to estimate abundance. More simply, the historical method was inaccurate and insensitive to any changes in migrations patterns, spawning distribution, and survival either positive or negative. Following a series of regional meetings (2008-2009) sponsored by NOAA throughout the Columbia Basin, WDFW and CCT submitted a proposal to BPA in 2010 with multiple objectives but with a common goal of improving spawning escapement estimates for ESA-listed populations in the UCR DPS.

Twelve years later, a fully integrated comprehensive adult steelhead monitoring program exists in the UCR that address required monitoring and management objectives. Specific applicable monitoring questions (Hillman et al. 2017) and special conditions of Section 10 Permit 18583 are provided in bold. The primary components of the program are listed below:

1. Unbiased and precise estimates of wild and hatchery spawners in all major and minor spawning tributaries upstream of Rock Island Dam (Waterhouse et al. 2020). WDFW and CCT constructed, installed, and maintain approximately 44 instream PIT tag detection systems (IPDS) to generate the detection data required for the patch occupancy model (Waterhouse et al. 2020). This infrastructure and statistical model allow for the simultaneous estimation of abundance at many spatial scales (DPS, population, spawning stream) using the same statistical model and the same group of fish tagged at Priest Rapids Dam (**Q1.1.1, 1.2.1, 2.1.1, 2.2.1, 3.2.1, 3.2.2, 4.1.1, 5.1.1,8.1.1, 8.2.1, 8.4.1**)
  - a. A modified version of that model can be used to estimate reach-specific estimates of wild and hatchery fish abundance on a weekly time step. This model is used to inform broodstock

collection, hatchery fish management and prosecute sport fisheries with a goal of reducing hatchery fish abundance while minimizing wild fish impacts (**Q4.1.1; Special Condition 1 and 2**)

2. Lack of PIT detections within the mainstem Wenatchee, Methow and Okanogan rivers was identified as an issue early in the process as well as observation error associated with steelhead redd counts. Studies were initiated in the Wenatchee and Methow rivers to develop models that could account for observation error with respect to surveyor experience, river conditions, habitat complexity and redd density (Murdoch et al. 2018). Two models were developed based on historical redd count methods (Wenatchee = 1 observer; Methow = 2 observers). The 2-observer methodology and model were implemented in the Wenatchee because of a small difference in model performance, but either model is acceptable. Since 2014, Wenatchee steelhead spawning escapement estimates integrate unbiased PIT tag-based estimates of spring spawners from all spawning tributaries with an estimate of mainstem spawners generated from an unbiased estimate of redds and a fish per redd and pHOS value generated from PIT tagged fish not assigned to a spawning tributary (i.e., mainstem spawners) (**Q1.1.1, 1.2.1, 2.1.1, 2.2.1, 3.2.1, 3.2.2, 4.1.1, 5.2.1, 5.3.1, 8.1.1, 8.2.1, 8.4.1**)
  - a. WDFW is currently using the 1-observer redd model to estimate Wenatchee spawner abundance for years (2004-2013) when PIT tag data is not available.
3. Important untested assumptions associated with these models were subsequently evaluated using a radio telemetry study (Fuchs et al. 2021). For example, fish that survived the winter and were detected migrating into a spawning tributary in the spring exhibited 100% survival to spawn. We also confirmed that while steelhead may enter the Entiat in the fall, they leave and do not overwinter in the Entiat. Hence, estimates of abundance from the patch occupancy model for the Entiat are all spawners. Estimates of overwinter survival within each population were also generated just in case mainstem redd surveys were not conducted due to poor environmental conditions or in the case of 2020, COVID restrictions. WDFW did not conduct steelhead spawning grounds surveys in 2020 and used estimates of overwinter survival to generate estimates of mainstem spawners (See 2021). We also confirmed PIT tag detection migration routes were consistent with radio telemetry data including the downstream migration of steelhead tagged at Priest Rapids Dam back to their natal downstream populations or overshoots.
4. The patch occupancy model was modified again to include downstream detection sites to estimate the abundance of overshoot fallbacks. Based on those data, we developed another model to estimate the abundance of overshoot fish at Priest Rapids Dam that, when combined with the estimates of upstream populations, provided a better accounting of all steelhead counted at Priest Rapids Dam (Murdoch et al. 2022). The model can now fully account for all steelhead that migrate past Priest Rapids Dam, both those that are destined for UCR populations and those from Snake River and Mid-Columbia populations. While not specifically related to the M & E Plan, this component of the model allows for the monitoring of previously unquantified mortality of adult steelhead from downstream populations and will be an important tool when additional measures are implemented to improve the downstream migration survival thereby improving the status of those populations.

5. More recently, we used the patch-occupancy model to estimate Priest Rapids ladder counts based on counts from other dams when errors in ladder counts were observed (e.g., more steelhead counted at Rock Island than Priest Rapids). One beneficial feature of the patch occupancy model is that it can operate using abundance estimates at any detection location (See and Truscott 2022). In summary, WDFW asserts the current steelhead monitoring approach utilizes the best available science, conducted within the Upper Columbia, and provides the HCP HC a robust, dynamic, and flexible approach that does not exist anywhere else in the world. WDFW has developed the current monitoring approach to be consistent with guidance on monitoring the recovery of ESA listed salmon and steelhead populations including **unbiased** estimates of spawner abundance (Crawford and Rumsey 2011).

## Proposed Model

WDFW has incorporated the best available science into a multi-faceted comprehensive steelhead monitoring program that address status and trend, hatchery management, harvest, and hydro-operation concerns. Spawner escapement estimates not only incorporate statistical uncertainty, but the interannual variability associated with changes in migrations patterns, spawning distribution, and pre-spawn mortality. This type of interannual variability is only expected to increase with climate change. While the proposed method presented to the HCP HC incorporated some of the very same statistical approaches and data from WDFW research, results presented were preliminary and it was unclear how the model would **improve** the current monitoring approach (i.e., accuracy or precision) or address any of the questions to those described above. Furthermore, the proposal only addressed the Wenatchee population, and it is unclear if or how spawner abundance estimates for the other three populations would be estimated.

*Chelan PUD appreciates the efforts by WDFW and other partners to develop methods used to estimate spawner abundance in the Wenatchee Sub-basin. The proposed Chelan PUD BRANCH model is building on the past efforts. The current model and the proposed model both utilize similar methodology (i.e., multi-state mark-recapture data) to generate spawner escapement estimates in the tributaries. The main difference between the current model and the proposed model is how spawner escapement estimates are generated in the mainstem of the Wenatchee River. The current model uses the program DABOM to analyze the PIT-tag based mark-recapture data to generate total escapement in the Wenatchee Sub-basin. Observer efficiency corrected spawning ground survey data is used to estimate the number of spawners in the mainstem and then subtracted from the total escapement estimate. The proposed model uses the program BRANCH (developed by the University of Washington to analyze mark-recapture data) to estimate total escapement in the Wenatchee Sub-basin. The mainstem total escapement estimates are then corrected for overwinter mortality using radio-telemetry based estimates (Fuchs et al. 2021).*

*The proposed model generates hatchery- and natural-origin spawner escapement estimates for the Wenatchee Sub-basin which is the same as the current model. All applicable special conditions of Section 10 Permit 18583 will be met with the output of the proposed model. All monitoring and evaluation questions in the “Monitoring and Evaluation Plan for PUD Hatchery Programs” (Hillman et al. 2019) can also be evaluated (see below how Q5.2.1 is currently and will continue to be addressed). Chelan PUD is required to generate spawner escapement estimates for the Wenatchee Sub-basin only. The current model can still be used to generate spawner abundance estimates for the other three populations.*



Chelan PUD agrees that the “observer efficiency model” does reduce bias; however, bias is not eliminated nor are the estimates more precise than the proposed model. The following information is provided from the “Estimates of Wenatchee Steelhead Redds and Spawners (Sees 2011-2021) and demonstrates where bias is still present in the spawner escapement estimates using the current model:

- 1) For spawning ground surveys, the mainstem Wenatchee River is broken into “Index” and “Non-Index” reaches. Index reaches are surveyed weekly and non-index reaches are surveyed once during peak. There are five non-index reaches and five index reaches resulting in 41% (22 miles of 54 total miles) of the mainstem Wenatchee River being surveyed for redds one time. Surveying 41% of the river one time is likely to result in missing redds which would result in mainstem Wenatchee River spawner estimates that are biased low.
- 2) The current model estimates prespawn mortality by taking the total escapement estimated with PIT-tags for the Wenatchee Sub-basin (including tributaries) and subtracting spawners in addition to fish removed for broodstock, adult management and recreational harvest. Due to the uncertainty in both the escapement and spawner estimates, some years there are more spawners than total escapement resulting in a negative prespawn mortality estimate (n=6 negative estimates of prespawn mortality; Figure 1). Conversely, if zero redds were observed in an area (zero cannot be expanded with the observer efficiency model), but total escapement was estimated as greater than zero for a reach, the prespawn mortality estimate is likely biased high (i.e., 75% to 100% prespawn mortality; Figure 1).

Moreover, the premise that visual surveys can be corrected to eliminate bias is simply not true unless there is certainty that redds are actually visible. The level of effort applied to redd surveys or the experience of an observer will not improve the accuracy of redd count if the redds are not visible at all (e.g., because of water depth, discharge or other factors). Previous attempts to estimate observer error have focused on differences between observers with different levels of experience counting the same set of visibly detectable redds (Murdoch et al., 2018). While this approach may be useful for estimating relative differences in observer efficiency and correcting for the differences, it does not provide any certainty that the absolute accuracy of visually enumerated redd counts is unbiased nor does it support the efficacy of visual counts in habitats with poor visibility. Spring flows in the Wenatchee mainstem create poor visibility and there is no reason to assume visual surveys are the best method to enumerate spawners unless there is some evidence that all redds are truly visible by an observer. Peak steelhead spawning typically occurs the last week of April through the first week of May (Hillman et al. 2022) when the 98-year median daily flow of the Wenatchee River is 4,000 cfs. Steelhead spawning ground surveys occur between March 1 through May 30<sup>th</sup> when the 98-year median flow ranges between 800 cfs to 6,000 cfs. This is in comparison to when summer Chinook spawning ground surveys are conducted (October 1 to November 15) and the 98-year median flow ranges between 500 to 1,100 cfs (USGS 2022).

Murdoch et al. (2018) did not address the possibility that some redds are not visible by an observer in the Wenatchee River with a major assumption: “It was assumed that redds found during census surveys were an accurate unbiased count of the total number of redds in each reach”. In short, the appropriateness or effectiveness of visual redd counts has never been fully evaluated in the Wenatchee but the method was relied upon historically because other methods that did not require visual observations (i.e., PIT-based estimates) were not possible. Continuing to conduct visual surveys because they were used historically or are part of an “integrated comprehensive adult steelhead monitoring program” perpetuates the untested assumption that they are accurate and unbiased.

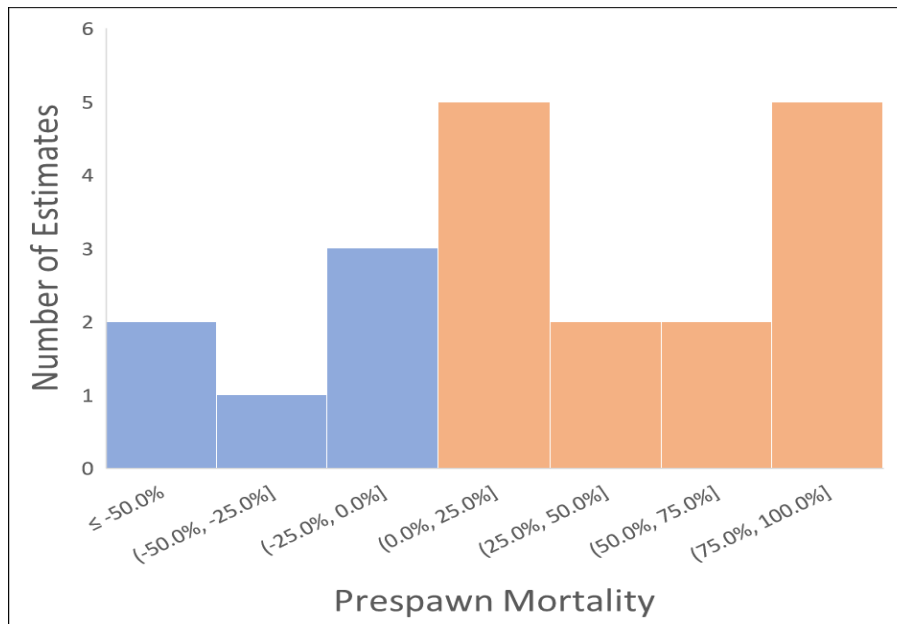


Figure 1. Prespawn mortality estimates for hatchery- and natural-origin steelhead by reach (above and below Tumwater) for 2015-2021 (excluding 2020 when spawning ground surveys were not conducted). Prespawn mortality estimates used in previous reports have ranged from -1,350% to + 99.4% with a mean of -44% ( $\pm 315\%$  SD).

Based on the information shared during the HCP HC meeting WDFW is also providing specific comments below:

- The proposed model is essentially a subset of the existing patch occupancy model, using the exact same PIT tagged fish but only focusing on detection sites within the Wenatchee. The only major difference is that the proposed method applies a fixed overwinter survival estimate to the number of steelhead in the mainstem Wenatchee, while the existing method utilizes redd counts to estimate spawners in the mainstem.
  - As demonstrated in 2020, when no redd counts were available, the existing method can also utilize the estimated overwinter survival from Fuchs et al. (2021) to estimate mainstem spawners (See 2021).
  - However, while this may be a suitable alternative in the face of missing redd data (e.g., extreme environmental conditions or pandemic) it is doubtful that it provides more accurate estimates, especially as we move farther away from when that radio telemetry study was conducted (2015-2016). Assuming that overwinter survival remains fixed and constant through time is similar to the historical method of assuming movement rates and prespawn mortality were constant (i.e., biased estimates). WDFW has made great advances in moving away from such assumptions in our current methods.

The proposed model does use a fixed overwinter survival rate that was determined by an extensive radio telemetry study (Fuchs et al. 2021) for the years 2015-2016. The overwinter survival estimate is only

applied to total escapement in the mainstem Wenatchee River (fish that escaped in the tributaries are assumed to have zero prespawn mortality for both the current model and the proposed model). From 2014-2021, 20% of the redds were located in the mainstem Wenatchee River (Hillman et al. 2022 (in draft)). We conducted a sensitivity analysis to evaluate how different values of overwinter mortality rates affect the Wenatchee sub-basin spawner escapement estimate using the following parameters:

- a. We used a small (600) and large (2,000) total escapement estimate for comparison.
- b. We assumed 20% of the adults spawned between the lower Wenatchee PIT array and the lower Nason PIT array.
- c. We corrected the sub-basin wide escapement by 0.15, 0.20, 0.30, and 0.40 overwinter mortality rates. Keefer et al. (2008) estimates 18% loss in reservoirs and 38% loss in tributaries.

Using the described parameters, there was a six fish loss per 5% increase in mortality under a low run (600 fish) and 20 fish loss per 5% increase in mortality under a high run (2,000 fish) (Figure 2).

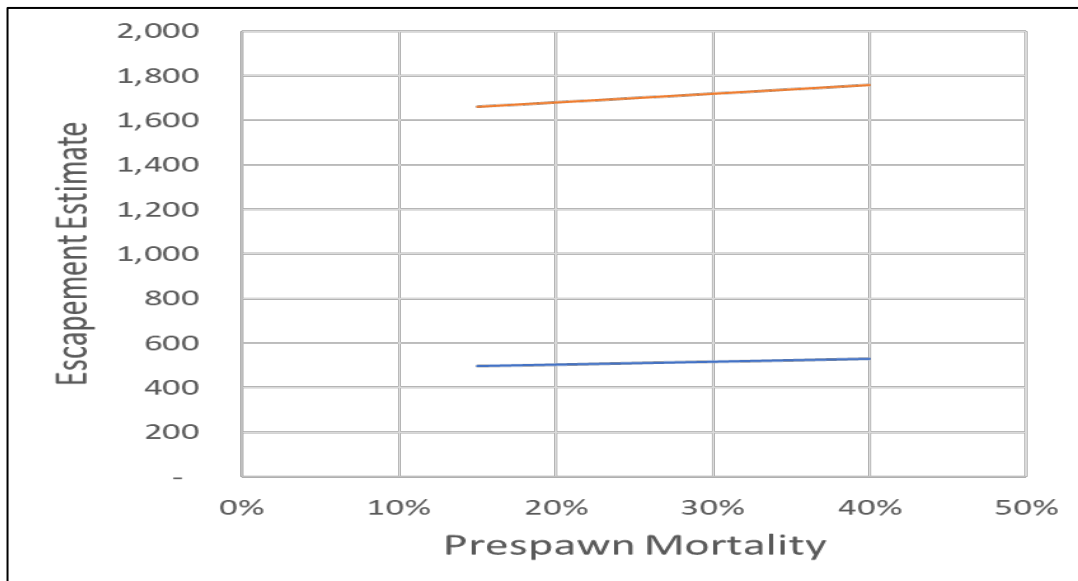


Figure 2. Prespawn mortality sensitivity analysis for a small (600) total escapement estimate and a large (2,000) total escapement estimate.

- The proposed model does not separate hatchery and wild spawners, which is a potential issue for two reasons. The first is that hatchery and wild fish may move through and survive within reaches differently. For example, once above Tumwater, hatchery fish may be much more likely to move to the Chiwawa because that is where the hatchery is while wild fish may have a different distribution across the various tributaries in the upper Wenatchee. The second issue is that reporting on wild and hatchery spawners is a key component of monitoring the wild population. Merely reporting total spawners will not satisfy the requirements for status and trend monitoring, population viability analysis and assessment of progress towards recovery goals.

As mentioned in during the July 20<sup>th</sup> Hatchery Committee meeting, the next iteration of the proposed model, will separate natural- and hatchery-origin spawners.

- The proposed model groups hatchery and wild fish together across two years from the Fuchs et al. (2021) study to generate an estimate of overwinter survival. This assumes that hatchery and wild fish suffer the same overwinter mortality. Although Fuchs et al. (2021) found no statistically significant differences in overwinter survival in the mainstem Wenatchee between hatchery and wild fish, or between two years, the sample size was limited.

*The Fuchs et al. paper (2021) did provide estimates for hatchery and natural-origin survival and we plan to apply the two different overwinter survival estimates to the mainstem Wenatchee total escapement estimates in the next iteration of the model.*

- Both models assume that fish are on a one-way journey to their spawning grounds, which means that for fish detected in multiple tributaries their detection histories must be “cleaned” before running the model. WDFW has developed a software package to help identify which detection histories must be cleaned and provide the biologist all the information necessary (e.g., dates and locations of observations) to determine where that fish spawned, as well as a suggestion based on the last upstream detection of that fish. The proposed model essentially assigns a fish to the first spawning tributary it is detected in after March 14, regardless of movements detected before or after that date.

*Our model does not assume that fish are “on a one-way journey to their spawning grounds;” we apply conditional statements to account for fish detected in multiple tributaries (and overshoots), particularly outside of the spawning period, to reflect the most likely spawning tributary. We are able to refine or incorporate additional conditional statements to account for time cutoffs and directional patterns to best reflect the most likely spawning tributary. This is the application of quantitative, repeatable approaches that best reflect professional judgement.*

*We contend that with the current model, the qualitative approach used to assign final tributaries may be accurate for a given year, but it has several shortcomings:*

- *The method is not repeatable (as currently documented) by independent reviewers.*
- *There is no way to account for potential biases within and among reviewers.*
- *The reviewer may change as personnel change.*

*With that said, a next step to validate the “data processing” step of the proposed model is to apply conditional statements to reflect professional judgement and compare the results between the current model and the proposed model.*

- The proposed model excludes repeat spawners. While repeat spawners may be a small percentage of the run, excluding them may violate some of the mark-recapture assumptions in the proposed model (not a completely representative sample), providing biased results. The patch occupancy model currently in use does not exclude repeat spawners, but only uses their detections if they were caught in the trap at Priest Rapids during that year’s migration, becoming part of the valid list of tags for that year.

*As mentioned in during the July 20<sup>th</sup> Hatchery Committee meeting, the next iteration of the proposed model, will include repeat spawners (which accounted for less than 0.05% of detection in our preliminary results).*

- The proposed model does not fully account for known removals at Dryden dam or Tumwater dam.

Although there has not been a sport fishery on steelhead in the Wenatchee for several years, that is another potential source of known removals that are not accounted for in the proposed model. This omission will lead to biased results.

*As mentioned during the July 20<sup>th</sup> Hatchery Committee meeting, we did account for all known removals at Tumwater and Dryden (i.e., broodstock collection and adult management). Based on a comment from the HC, we have removed estimated recreational harvest based on values reported in the Annual Hatchery M&E Report (Hillman et al. 2022).*

- The current monitoring approach only requires redd surveys in the Wenatchee River are also used to monitor spawn timing (**Q5.2.1**). While spawning timing data is not currently collected by origin, redd surveys provide a method for detecting shifts in spawning timing that could warrant a more detailed examination based on origin. The proposed method would create a data gap and because spawning timing in the hatchery environment is so different from the natural environment and often require hormones to accelerate maturation these data would likely be inadequate for monitoring purposes through time.

*The following is the monitoring question for Question 5.2.1 from Hillman et al. 2019:*

*Is the timing of spawning similar for conservation hatchery and natural-origin fish?*

*Hatchery- and natural-origin spawn timing is evaluated at instream PIT-tag arrays located within the spawning tributaries in the Wenatchee sub-basin (Shelby et al. 2021). The use of PIT-tag interrogations is the only method that will allow evaluation of similarity of spawn timing of hatchery- and natural-origin steelhead.*

## References

- Crawford, B.A., and S.M. Rumsey. 2011. Guidance for monitoring recovery of Pacific Northwest Salmon and Steelhead listed under the federal endangered species act. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Portland, OR.
- Fuchs, N. T., C. C. Caudill, A. R. Murdoch, and B. L. Truscott. 2021. Overwintering distribution and postspawn survival of steelhead in the Upper Columbia Basin. *North American Journal of Fisheries Management* 41 (3):757-774.
- Hillman, T., M. Miller, K. Shelby, M. Hughes, C. Moran, J. Williams, M. Tonseth, C. Willard, S. Hopkins, J. Caisman, T. Pearsons, and R. O'Connor. 2022. Monitoring and evaluation of the Chelan and Grant County PUDs hatchery programs: 2021 annual report. Report to the HCP and PRCC Hatchery Committees, Wenatchee and Ephrata, WA.*
- Hillman, T., T. Kahler, G. Mackey, A. Murdoch, K. Murdoch, T. Pearsons, M. Tonseth, and C. Willard. 2019. Monitoring and evaluation plan for PUD hatchery programs: 2019 update. Report to the HCP and PRCC Hatchery Committees, Wenatchee and Ephrata, WA.*

Hillman, T., T. Kahler, G. Mackey, A. Murdoch, K. Murdoch, T. Pearsons, M. Tonseth, and C. Willard. 2017. Monitoring and evaluation plan for PUD hatchery programs: 2017 update. Report to the HCP and PRCC Hatchery Committees, Wenatchee and Ephrata, WA.

*Keefer, M. L., C. T. Boggs, C. A. Peery, and C. C. Caudill. 2008. Overwintering distribution, behavior and survival of adult summer steelhead: variability among Columbia River populations.*

Murdoch, A. R., C. J. Herring, C. H. Frady, K. See, and C. E. Jordan. 2018. Estimating observer error and steelhead redd abundance using a modified Gaussian area-under-the-curve framework. *Canadian Journal of Fisheries and Aquatic Sciences* 75:2149–2158.

Murdoch, A. R., See, K., and Truscott, B. L. 2022. Abundance and migration success of overshoot steelhead in the Upper Columbia River. *North American Journal of Fisheries Management*.

See K. 2021. Estimates of Wenatchee steelhead redds in 2020. Pages 604-607 in T. Hillman and 12 co-authors. Monitoring and evaluation of the Chelan and Grant County PUDs hatchery programs. Wenatchee, WA.

See K. and B. Truscott 2022. Evaluating differences in dam counts. Report to Chad Jackson WDFW Regional Program Manager. March 2022.

*Shelby, K. K., T. W. Hillman, and C. C. Willard. 2021. Adult migration and spawn timing of steelhead in the Wenatchee and Methow Sub-basins. Report to the HCP and PRCC Hatchery Committees, Wenatchee and Ephrata, WA. August 2021.*

*United States Geological Service. 2022. USGS Current Conditions for USGS 12457000 WENATCHEE RIVER AT PLAIN, WA. [https://waterdata.usgs.gov/nwis/uv?site\\_no=12457000](https://waterdata.usgs.gov/nwis/uv?site_no=12457000)*

Waterhouse, L., J. White, K. See, A. R. Murdoch, and B. X. Semmens. 2020. A Bayesian nested patch occupancy model to estimate steelhead movement and abundance. *Ecological Applications* 30:e02202.

**Attachment E**

**Presentation: Chelan PUD's Summary of Responses to WDFW's Comments on the Proposed Change to  
Wenatchee Steelhead Escapement Modeling**

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# Tributary Spawner Escapement Estimates

Current Model	Proposed Model
PIT-tag based mark-recapture data analyzed with DABOM	PIT-tag based mark-recapture data analyzed with BRANCH
Assumes 0.0% prespawn mortality for fish escaped to the tributaries	Assumes 0.0% prespawn mortality for fish escaped to the tributaries

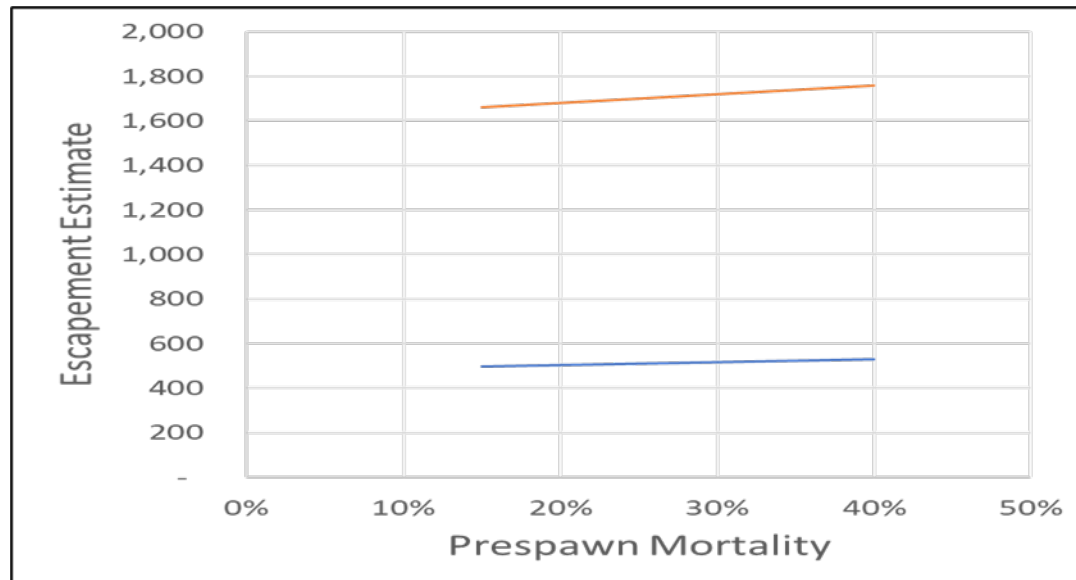


# Mainstem Spawner Escapement Estimates

Current Model	Proposed Model
PIT-tag based mark-recapture data analyzed with DABOM to generate mainstem total escapement estimate.	PIT-tag based mark-recapture data analyzed with BRANCH to generate mainstem total escapement estimate.
Any fish removed for broodstock, recreational harvest and adult management are removed from the total escapement estimate.	Any fish removed for broodstock, recreational harvest and adult management are removed from the total escapement estimate.
Mainstem spawner escapement=mainstem total escapement-spawners (determined by redd counts)	Mainstem spawner escapement=mainstem total escapement corrected for prespawn mortality (Fuchs et al. 2021)

# Proposed Model Pre-spawn Mortality

- 22.5% hatchery-origin; 14.5% natural-origin (Fuchs et al. 2021)
- Sensitivity analysis
  1. We used a small (600) and large (2,000) Wenatchee Sub-basin escapement estimates.
  2. We corrected 20% of the sub-basin wide escapement by 0.15, 0.20, 0.30, and 0.40 prespawn mortality rates (Keefer et al. (2008) estimates 18% loss in reservoirs and 38% loss in tributaries).
  3. We assumed 20% of the adults spawned in the mainstem Wenatchee River.



Using the described parameters, there was a six fish loss per 5% increase in mortality under a low run (600 fish) and 20 fish loss per 5% increase in mortality under a high run (2,000 fish). The fish lost per 5% overwinter mortality represents 1% of the population.

# Current Model Pre-spawn Mortality

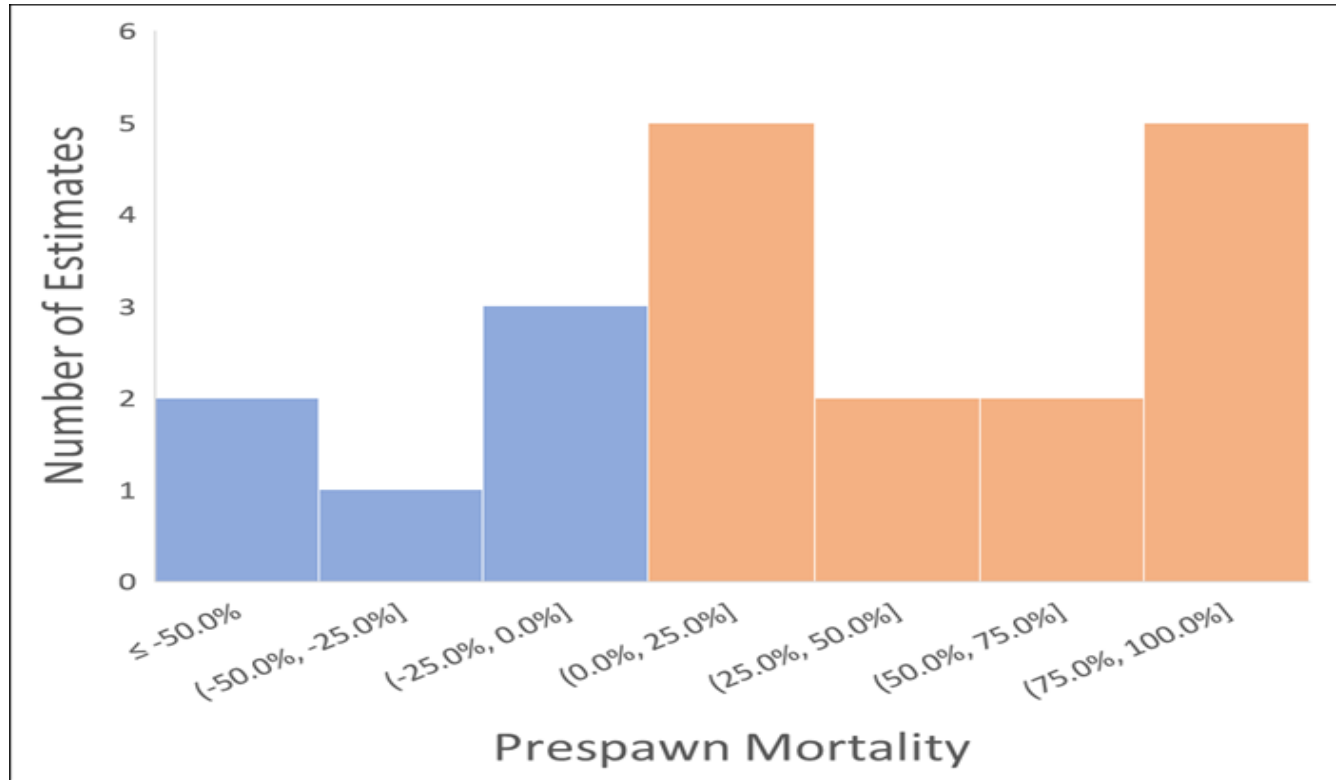


Figure 1. Pre-spawn mortality estimates for hatchery- and natural-origin steelhead by reach (above and below Tumwater) for 2015-2021 (excluding 2020 when spawning ground surveys were not conducted). Pre-spawn mortality estimates used in previous reports have ranged from -1,350% to + 99.4% with a mean of -44% ( $\pm$  315% SD).

# Current Model

## Pre-spawn Mortality

- Negative pre-spawn mortality=more spawners than total escapement.
  - Example (Hillman et al. 2020; Appendix E):
    - Estimated total hatchery-origin escapement below Tumwater=2 fish
    - Estimated total hatchery-origin spawner escapement below Tumwater =29 fish
    - -1,350% prespawn mortality

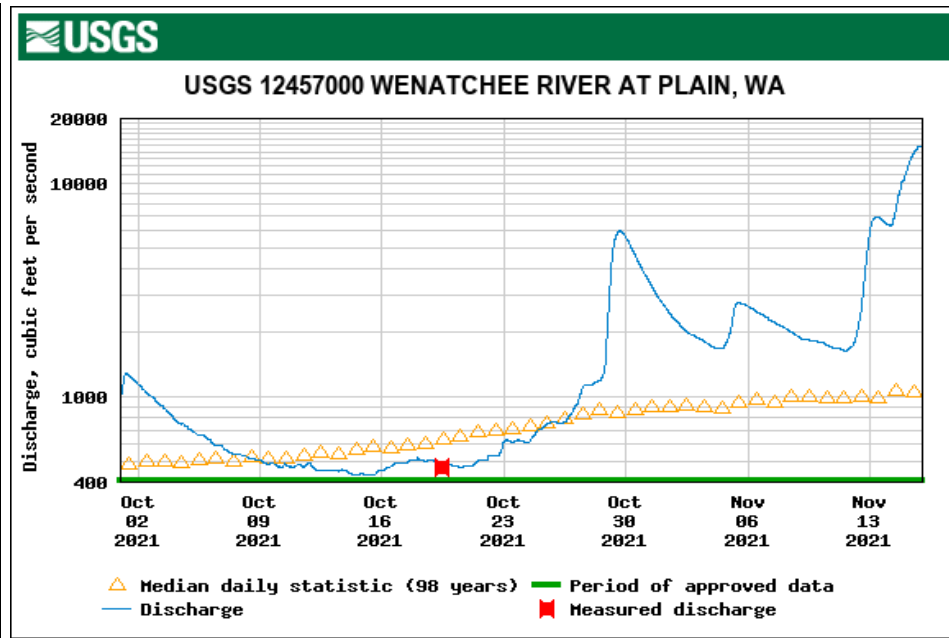
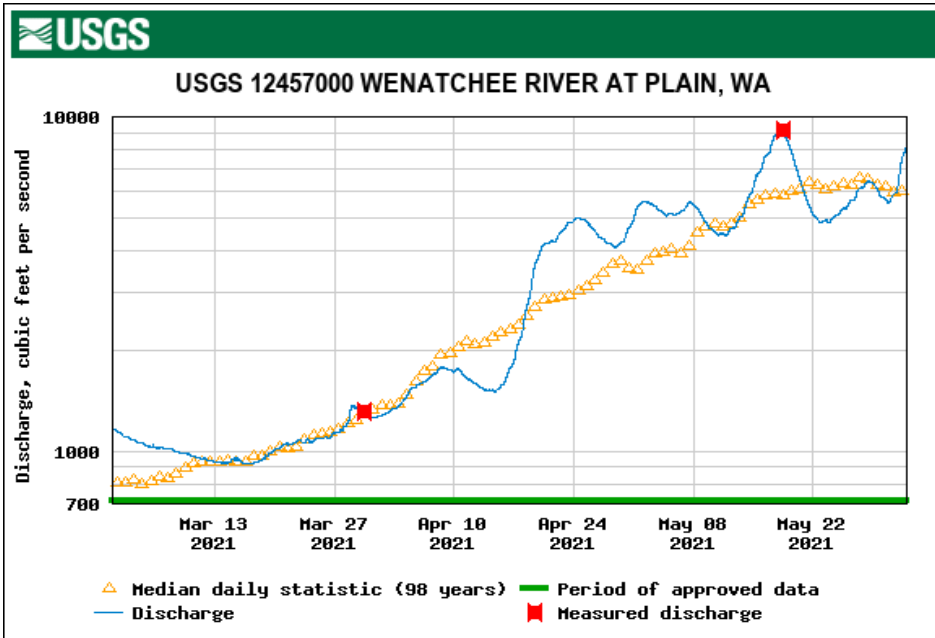
# Current Model

## Pre-spawn Mortality

- High (75%-99%) pre-spawn mortality
- Example (Hillman et al. 2022; Appendix E):
  - Estimated total hatchery-origin escapement below Tumwater=62 fish
  - Estimated total hatchery-origin spawn escapement below Tumwater =0 fish
  - =99.4% prespawn mortality

# Redd Surveys

- Spring flows create poor visibility



# Redd Surveys

- Observer efficiency model corrects bias for redds that are visible.
- Five index reaches and five non-index reaches
  - 41% of the mainstem Wenatchee River is surveyed once during peak spawning

# Conclusion

- Addresses all Section 10 Permit 18583 and “Monitoring and Evaluation Plan for PUD Hatchery Programs” (Hillman et al. 2019) requirements including Q5.2.1 (Shelby et al. 2021).
- The next iteration of the model will include:
  - Estimates of hatchery- and natural-origin spawners
  - Applied estimates of hatchery- and natural-origin overwinter survival estimates from Fuchs et al. 2021
  - Repeat spawners
  - Recreational harvest