

Memorandum

To: Wells, Rocky Reach, and Rock Island HCP Hatchery Committees and Priest Rapids Coordinating Committee Hatchery Subcommittee Document Date: May 17, 2023

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

cc: Larissa Rohrbach, Anchor QEA, LLC

Re: Minutes of the April 19, 2023, HCP Hatchery Committees and PRCC Hatchery Subcommittee Meetings

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plan Hatchery Committees (HCP-HCs) and Priest Rapids Coordinating Committee's Hatchery Subcommittee (PRCC HSC) meetings were held virtually on Webex, on Wednesday, April 19, 2023, from 2:00 p.m. to 4:00 p.m. Attendees are listed in Attachment A to these meeting minutes.

Action Item Summary

Long-Term

Joint HCP-HCs and PRCC HSC

- 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 to be determined.)*
- 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 the Policy Committees (Item I-A). *(Note: This item is ongoing.)*
- Chelan PUD, Grant PUD, and WDFW will develop recommendations for reducing stress and mortality from disease for individual rearing groups at Eastbank Hatchery. (Item I-A) *(Note: This item is ongoing.)*

Near-Term (to be completed by next meeting)

Joint HCP-HCs and PRCC HSC

- All Committee members will review the 10-Year Comprehensive Report chapters to identify main points that should be included in the HCP-HCs and PRCC HSC-authored summary report, including potential changes to the Monitoring and Evaluation (M&E) Plan for PUD Hatchery Programs. (Item II-A)

Decision Summary

- None

Agreements

- None

Review Items

- The 10-Year Comprehensive M&E Report chapters, compiled by species, were distributed on March 2, 2023.

Finalized Documents

- None

I. Welcome

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

Tracy Hillman welcomed the HCP-HCs and PRCC HSC and reviewed the agenda. The agenda was approved without additional changes.

Meeting minutes from the March 15, 2023, meeting were reviewed and approved.

Action items from the HCP-HCs and PRCC HSC meeting on March 15, 2023, were reviewed.

(Note: Italicized text below corresponds to action items from the previous meeting.)

Long-Term

Joint HCP-HCs and PRCC HSC

- *Keely Murdoch and Mike Tonseth will obtain estimates of pre-spawn mortality from WDFW to update the retrospective analysis for Wenatchee spring Chinook Salmon (Item I-A). (Note: This item is ongoing; a presentation will be given in early 2023.)*
Murdoch said this item is ongoing.
- *Members of the HCP-HCs and PRCC HSC will provide feedback to the WDFW-revised version of questions on recalculation for Policy Committees prior to the next meeting (Item I-A). (Note: This item is ongoing.)*
Hillman said this item is ongoing.

Near-Term (to be completed by next meeting)

Joint HCP-HCs and PRCC HSC

- *All members of the HCP-HCs and PRCC HSC will review the 10-Year Comprehensive Review chapters focused on Objectives 1 and 2 and consider potential recommendations for changes to M&E actions. (Item II-A)*

This item will be discussed in today's meeting.

- *Mike Tonseth will inform the Rock Island/Rocky Reach (RI/RR) HCP-HC and PRCC HSC of WDFW's recommended options for the transfer or early release of brood year 2021 Wenatchee summer Chinook Salmon.*

Tonseth said a path forward was identified via email communication with the relevant Committees. Fish from the raceway with lower mortality rates were transferred to Dryden Pond for acclimation. The remainder were set aside to be transported and released directly into the Wenatchee River this week. This item is complete.

RI/RR HCP Hatchery Committee

- *Catherine Willard will discuss the early release of Wenatchee Chinook Salmon in relation to triggers for initiating spill at Rock Island Dam with the RI/RR HCP-Coordinating Committee representatives.*

Willard said she did talk with Lance Keller, Chelan PUD's RI/RR HCP-Coordinating Committee representative. Operation of the juvenile bypass was initiated on April 15. Willard said evaluation of what percentage of fish that passed through the bypass cannot be done until after the season is complete. Given the small number of fish that would be out-migrating due to current out-migration river conditions (i.e., low flows, low turbidity, and cold water temperatures), and the low numbers of fish Chelan PUD is seeing at the Rock Island Juvenile Bypass at this time, fish appear to be delayed compared to past years. This item is complete.

II. Joint HCP-HCs

A. 10-Year Comprehensive Review Objectives 1 and 2

Tracy Hillman briefly reviewed the key conclusions from the presentation given in the March 15 meeting, which summarized whether each M&E Objective is being met and whether the study designs were sufficient to evaluate each M&E Objective.

Adult Abundance

Hillman explained that the analytical approach, the Before-After-Control-Impact (BACI) study design, was adopted in coordination with the Hatchery Evaluation Technical Team (HETT) to assess the effects of hatchery- supplementation on adult total abundance, natural-origin adults, natural-origin recruits, and adult productivity. He said that it is important to understand how control populations

were selected to be able to help explain what's happening in the treatment (supplemented) populations compared to the control populations. A document was prepared and appended to the M&E Plan (Appendix 6) that describes in detail how the HETT identified and selected control populations." Several HETT members invested a lot of work into identifying control populations. As a bit of background, Hillman summarized how control populations were selected. An initial set of 25 control populations were originally identified by the Columbia River Inter-Tribal Fish Commission (CRITFC). The HETT developed a three-step process to determine which of the 25 populations would be useful as control populations for the Upper Columbia River (UCR) as follows:

- From the CRITFC list, the HETT identified potential control populations with similar biological attributes to UCR populations (e.g., populations with similar run timing, juvenile life histories, and ocean distributions).
- Of those populations with similar biological attributes, the HETT then identified control populations with similar abundance trends and correlations to the supplemented populations before hatchery supplementation.
- Using a multi-criteria decision analysis tool, the HETT identified a final list of suitable control populations that met predetermined criteria.

Hillman then reviewed figures showing the relationships between control and treatment populations. He noted that Nason, Entiat, and Little Wenatchee spring Chinook Salmon are not true control populations because they exceeded a proportion of hatchery-origin spawners (pHOS) of 10%; (one of the predetermined criteria); however, they are un-supplemented populations, although hatchery fish stray into these populations, and they had similar trends with supplemented populations before supplementation occurred. The BACI analysis evaluated abundance and productivity before and during supplementation to test whether supplementation affected the supplemented populations. The calculated metric that describes these relationships is the BACI contrast, which shows the difference between supplemented and control populations before and during supplementation. The BACI contrast values are reported in the 10-Year Comprehensive Reviews with a p-value to indicate whether changes were significant. In addition, BACI contribution and BACI divergent metrics were calculated to further explain the relationships between control and supplemented population before and during supplementation. Hillman showed figures that illustrated different BACI contrasts and how the BACI metrics help interpret the figures. Hillman noted that the Comprehensive Report shows separate relationships between supplemented populations and each control population. However, the report also compares each supplemented population with all control populations pooled together in a single analysis. This required the use of mixed-model analysis of variance (ANOVA); at this time, only statistical results are presented without figures. Those figures can be generated if necessary. The combined analysis was recommended by the Independent Scientific Advisory Board (ISAB) after they reviewed the Hatchery M&E Plan. Since the completion of the Comprehensive Report, Hillman and Tim Taylor have developed a simpler model in R for analyzing the pooled data. This simpler mixed model was reviewed and approved by Dr. Carl Schwarz (ISAB statistician). It was

noted during the last meeting that the analyses are not far into evaluating the influence of reducing the size of some of the hatchery programs and implementing adult management measures (measures implemented during the first recalculation).

Rod O'Connor asked whether any of the Committee members have had time to process the information presented last month. Keely Murdoch indicated that she has been reviewing the information with Cory Kamphaus. Catherine Willard reminded Committee members that each species was summarized in separate chapters. She encouraged members to also review the differences in monitoring success between programs, not just between the species. The next step would be to review the program M&E Plan and determine whether there are steps that should be taken to improve the M&E approaches.

Murdoch said she agreed that a thorough effort was made to properly identify the control streams. She said one problem with the analysis is that it assumes nothing else has changed with the control and supplementation populations (apart from supplementation) during these periods; however, the hydro-system has changed. In the UCR, spill has actually been reduced or eliminated, whereas there has been an increase in spill in the federal system up to the 125% total dissolved gas cap. Hillman agreed and noted we are also learning more about subtle differences in run timing that exposes some populations (e.g., UC populations) to predation more than others. Hillman said the HETT also discussed the effects of natural disturbances such as wildfires possibly affecting populations unevenly, like the Secech River in Idaho. Nevertheless, the HETT concluded that a comparison between supplemented populations and un-supplemented populations or defined targets was necessary.

Hillman said the BACI analyses are available only for adults. There are no control data for juveniles. In addition, there are no pre-supplementation data available for juveniles. Thus, the analyses compared juvenile production estimates with pHOS and found few relationships between juvenile production and pHOS.

Murdoch said she and Kamphaus have some thoughts on M&E implementation. Their largest concern is with Objective 1, which they do not believe is an appropriate objective as written. The hatchery programs can add hatchery fish to the spawning grounds using the best science available at the time, and we have documented that hatchery fish are spawning, and producing surviving offspring. However, habitat, hydro, and estuary/ocean conditions also affect adult abundance, and the hatchery program doesn't control those things. Unless population abundance is limited by the number of natural-origin returns (NORs), the hatchery program cannot otherwise influence natural-origin productivity. The HCP was written such that unless we implement all the components under the HCP together (e.g., hatcheries, hydro, and habitat), we will not be successful in improving productivity of the populations. An All-H or all life-stage objective approach is needed to more

closely evaluate those components. Murdoch said that unless Objective 1 is reframed, the effectiveness of the hatchery programs cannot be adequately evaluated.

Willard agreed and said the way the question was written makes it difficult to evaluate. The way it's written is to ask whether the supplementation programs have changed the abundance in the supplemented programs. The comprehensive reviews, however, do not state that the hatchery programs are not working, and maybe it's the phrasing of this question that makes it difficult to evaluate.

Tom Kahler said that, in reviewing the chapters, the first need is to determine how to prepare a Committee-authored summary report on this greater 10-Year Comprehensive Review effort. For instance, how do we report what the Committees want to say about Objective 1 in the summary report? Hillman said we are doing the following: 1) working to identify what the take-home messages are from the Comprehensive Reports; 2) working to obtain the information to include in the Committee-authored report; and 3) tracking any potential changes needed to the M&E Plan.

Kahler reminded everyone that there are executive summaries, which differ from the discussion sections because they are greatly reduced and primarily focused on summarizing results. The executive summaries would be a great start to the Committee-authored report, and it would be useful for the Committee members to review them and identify whether they have concerns about what's in them or identify any additional information that should be included. Hillman projected the spring Chinook Salmon executive summary as an example of how results were summarized in the reports.

Hillman asked Tonseth whether there are issues that concern him. Tonseth said that he is still working to digest all the information and has had internal conversations regarding controls versus supplemented populations and whether or not conditions outside the UCR tributaries have changed enough to affect the treatments, controls, or both and to what degree. The data being analyzed are largely reflective of past management practices, prior to a major recalculation in 2011, and implementation of new adult management approaches. Although another recalculation was completed in 2022, the change in numbers was not as dramatic and is not likely to be as dramatic in the future. In that first recalculation, some of the changes were as high as a 50% reduction in numbers of juveniles produced. Tonseth said he has a concern that every 10 years there will be an adjustment to the production levels of the programs, but even when the original M&E plan was drafted, there was no conversation about how we can make comparisons across recalculated periods. How can we understand whether the hatchery programs are having a positive or negative effect on the natural population?

Hillman showed the BACI spreadsheets, which are available for all Committee members on Douglas PUD's Extranet, that show the data broken out by recalculation periods as an interrupted time series. These data can be evaluated with the BACI analysis and using the ANOVA model, but the

difficulty will be in interpreting the statistical results. It is still based on the assumption that little is changing in the control streams; over a 30- to 50-year period it is likely there will be changes that will be independent of supplementation programs.

Tonseth said that, especially for spring Chinook Salmon, the prevalence of additional life-history types is being recognized, e.g., fall parr moving into the Columbia River mainstem before the major spring outmigration. The complete story about productivity is only evident if one looks at the full life cycle and multiple life-history types; by just looking at hatchery components, we never observe a positive effect of supplementation. For the listed programs, we really want to start seeing a positive effect and not just a lack of negative effects, otherwise we will continue for 100 years without achieving recovery.

O'Connor said, to summarize comments so far, Murdoch noted that the Objective 1 question may be phrased incorrectly, and Tonseth has identified that a time series with changes in supplementation levels every 10 years could be a challenge to work with. One of the conclusions of the report was that, given the tools at hand, there was not a lot of contrast between population comparisons. For evaluating productivity in Objective 1, one of the limitations of the BACI was that there is not sufficient contrast between control and supplemented streams. One suggestion brought by Hillman was potentially using an in-basin reference population. O'Connor asked how that could improve contrast between populations. Hillman said having an UCR control population may not improve the contrast of a supplemented effect, but it would eliminate some of the concerns associated with current control populations experiencing different mainstem environments. Hillman said he is more familiar with Intensively Monitored Watersheds where large treatments are needed to detect treatment effects. In other words, a major change in supplementation would likely be needed to improve the contrast between supplemented and control populations. Murdoch agreed and said using an UCR control stream might resolve the problem of control streams being affected by different variables than supplementation streams, but it doesn't change the issue that understanding at which life-stage productivity is limited is needed to know what is limiting natural production in these tributaries. Unless adult abundance is limiting natural production, we won't be able to improve natural production.

Kahler said that, regarding the recalculation of production numbers, the initial production numbers were based on an assumption of per-dam mortality that was higher than what was observed. Unless there are a major change in ocean productivity affecting smolt-to-adult returns or dramatic changes in the hydro-system per-project survival rates, there are not likely to be big adjustments to production numbers in the future. We would not expect to reduce production unless there is a major concern with relative reproductive success or we are bumping up against the carrying capacity of the system, and there is a way to release the system from that carrying capacity. We should see generally stable production going forward and are unlikely to observe some recalculation effect.

Hillman agreed and said that adult abundance incorporates all agents of mortality on the life cycle of the fish, and Objective 1 tries to tease out the influence of just one of those agents. In the comprehensive reviews, where we try to determine the effects of supplementation, we always have to answer the question, "Compared to what?" Conclusions drawn from those comparisons need to be taken carefully. Hillman shared a timeline that identified some of the changes in the hatchery programs that have occurred over time in the Wenatchee sub-basin. All the changes identified likely affected adult returns to some degree, but we are unable to tease out the effects of each action separately. At best, we pool all actions and try to evaluate the effects of the amalgamation of all actions implemented. Regardless of how Objective 1 is restructured, there will be a need to monitor adult returns by origin and there will always be questions about what factors are affecting the returns. We may need a different tool for analyzing the returns, e.g., state-space models. Tonseth said these timelines are too narrowly focused on changes to the hatchery programs and do not show the major changes to hydro-system operations or habitat improvements. In the next evaluation, there is perhaps a need to evaluate a much larger picture to identify what the limiting life stage may be for one population or another.

Hillman noted that several members of the Committees worked with Mark Sorel (WDFW) on his Wenatchee spring Chinook Salmon population model, which accounted for survival from juvenile through adult return and accounted for multiple life-history types. Hillman suggested a tool like that could be used to evaluate the entire life cycle of the fish but noted that the analysis could become very complicated. Tonseth said he supports ways to incorporate whatever tools are available to model the various scenarios that may exist. The National Oceanic and Atmospheric Administration Northwest Fisheries Science Center staff (led by Tim Beechie) is preparing the Habitat Assessment and Restoration Planning model for the whole UCR Basin. This may be a useful tool and will include a hatchery component.

Kahler noted that Objectives 1 and 2 of the M&E Plan are the productivity indicators. The others are monitoring indicators that inform what is observed in the productivity indicators. The species-specific summary reports include all the chapters and executive summaries. When reviewing the productivity indicators (Objectives 1 and 2), it is interesting to note that the monitoring indicators are not offering much explanatory information for what was observed with the productivity indicators. The possible exception could be the genetics monitoring, but that information provides a tenuous link to adult numbers. Hillman agreed and said that suggests things that are not being monitored or are occurring outside the basin are having relatively large effects on adult abundance; there is not as strong of a link between the productivity indicators and the monitoring indicators.

Hillman showed Table 1 of the M&E Report, which identifies the objectives, indicators, and targets. For instance, for productivity, the target is to cause no decrease in adult productivity and to increase in adult abundance of natural-origin spawners.

Juvenile Productivity

Hillman said that for juvenile productivity, there are no data for the period before hatchery supplementation and no control population data. Correlative relationships were developed between indicators like pHOS and the juvenile indicators. The chapter authored by Buchanan and others addresses this; there were no strong conclusions.

Murdoch said the problem with Objective 2 is the analysis as it is currently performed only includes one life-history pathway, and it became apparent through reviewing Mark Sorel's work, it may not actually be the predominant pathway, and the current approach ignores the importance of life-history diversity. Sorel showed that the more fish that are on the spawning grounds, the more frequently these other life histories are observed. Sorel showed that as spawner density increases, there is a positive density-dependent relationship with subyearling production and a negative relationship with yearling production.

Murdoch said, if all life-history types were included in the calculation of juvenile productivity, the relationship may be positive. There is a need to include all the life-history types in this analysis and develop some metric of life-history diversity. The productivity out of these tributaries is probably a lot higher than what we are reporting based on a single life-history pathway. Hillman said he has looked at stock-recruit curves of the total number of emigrants from each subbasin and then only using the age-1 smolt migrants. Density dependence is observed with the smolts and parr, but very little density dependence is observed with the total number of emigrants. Even when there were low numbers of redds, there were some fish leaving the subbasin as subyearlings. Murdoch said Sorel's work also showed environmental effects that trigger the fish to leave early as well.

Murdoch said the productivity estimates will influence management objectives to determine the right escapement levels at Tumwater Dam. Those decisions were made in the past based on an adult-to-adult model. If all life histories are included, we may reach a different escapement goal.

Hillman said the 10-Year Comprehensive Review showed there was little to no relationship between pHOS and juvenile productivity. Kahler pointed out this is another chapter where there was not an ability to detect whether there was an effect of pHOS on juvenile productivity because of lack of contrast in the data, which creates the question of whether this should be monitored using the approaches offered. Hillman said, unlike with adults, there is nothing to compare juvenile productivity to.

Murdoch said, in theory, more NORs would lower pHOS on the spawning grounds— maybe that in itself will make a difference to some degree. Tonseth said this is probably an objective that should be discussed for making changes. Hopefully the barge arrays will provide a much more complete picture of river utilization by different life histories, for instance, to what degree do fall migrants use the Wenatchee River versus the mainstem Columbia River and their migration timing through those

areas. O'Connor suggested a rigorous power analysis be done on whatever different metric is identified to determine whether we will be able to detect an effect.

Next Steps

The Committee members agreed, in preparation for the next meeting, to identify the key conclusions from the executive summary and discussion sections and to identify key issues that will help determine what changes may be made to the M&E Plan. The members agreed to come to the next meeting with a list of the important points that need to be included in the Committee-authored report, determine whether they agree or disagree with the key points of the discussion sections, and inform Hillman and Larissa Rohrbach of topics the group should discuss. PUD staff agreed to review the documents through the perspective of what could be done differently.

Hillman suggested members share their compilations with him and Rohrbach, who will compile the issues for discussion in the next meeting. Hillman will reach out to Kirk Truscott, Brett Farman, and Bill Gale or Charles Frady to confirm their participation.

III. Administration

A. Next Meetings

The next HCP-HCs and PRCC HSC meetings will be held on Wednesday, May 17; Wednesday, June 21; and Wednesday, July 19, 2023, in person at the Douglas PUD Auditorium. Virtual access will also be available for those who cannot attend the meeting. The meetings will start at 10:00 a.m.

IV. Attachments

Attachment A: List of Attendees

Attachment A
List of Attendees

Name	Organization
Larissa Rohrbach ^o	Anchor QEA, LLC
Tracy Hillman ^o	BioAnalysts, Inc.
Scott Hopkins ^{*o}	Chelan PUD
Catherine Willard ^{*o}	Chelan PUD
Betsy Bamberger ^o	Douglas PUD
Tom Kahler ^{*o}	Douglas PUD
John Rohrbach ^o	Douglas PUD
Rod O'Connor ^{**‡o}	Grant PUD
Deanne Pavlik-Kunkel ^o	Grant PUD
Tim Taylor ^o	Grant PUD
Brett Farman ^{**‡o}	National Marine Fisheries Service
Nathan Buck ^{‡o}	Wanapum
Alf Haukenes ^o	Washington Department of Fish and Wildlife
Katy Shelby ^o	Washington Department of Fish and Wildlife
Mike Tonseth ^{**‡o}	Washington Department of Fish and Wildlife
Keely Murdoch ^{**‡o}	Yakama Nation
Bill Gale ^{**‡o}	U.S. Fish and Wildlife Service
Charles Frady ^o	U.S. Fish and Wildlife Service

Notes:

- * Denotes HCP-HCs member or alternate
- ‡ Denotes PRCC HSC member or alternate
- o Joined by Webex