FINAL

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ANCHOR QEA

Memorandum

To: Priest Rapids Coordinating Committee Hatchery Subcommittee | Document Date: May 21, 2024

From: Tracy Hillman, and PRCC Hatchery Subcommittee Facilitator

cc: Larissa Rohrbach and Natasha Winnacott, Anchor QEA

Re: Minutes of the April 18, 2024, PRCC Hatchery Subcommittee Meetings

An extra meeting of the Priest Rapids Coordinating Committee's Hatchery Subcommittee (PRCC HSC) was held in person at the Douglas PUD Auditorium on Thursday, April 18, 2024, from 9:00 a.m. to 4:00 p.m. Attendees are listed in Attachment A to these meeting minutes.

Long-Term

PRCC Hatchery Subcommittee

- Tim Taylor will conduct a White River (WR) spring Chinook Salmon population viability analysis using existing monitoring and evaluation data (Item II-C).

Near-Term (to be completed by next meeting)

PRCC Hatchery Subcommittee

White River Hatchery Program

- Tracy Hillman will contact Justin Yeager (NOAA Fisheries) to review materials on the relative importance of the WR spawning aggregate and invite him to attend the May meetings (Item II-B).
- Katy Shelby will contact Jeff Caisman to determine whether additional otolith samples could be collected from WR juvenile spring Chinook Salmon (Item II-B).
- Tracy Hillman will inquire about the status of the Northwest Fisheries Science Center's (NWFSC's) Upper Columbia Basin Habitat Assessment and Restoration Planning model (Item II-C).
- Mike Tonseth will inquire about data outputs and potential future uses of Mark Sorel's Wenatchee spring Chinook Salmon life-cycle model (LCM; Item II-C).
- Grant PUD staff will assemble data sources to answer the questions in Table 1 of the 2018 WR Memorandum and report (Item II-C).
- PRCC HSC members will consider the working list of competencies and selection criteria for expert panel members and start considering potential panel members (Item II-D).
- Todd Pearsons will work on a written charge for the expert panel including specific responsibilities, expectations, and ground rules for achieving their objectives (Item II-D).

Decision Summary

- None

Agreements

- None

Review Items

- Northwest Power Council's Independent Science Advisory Board (ISAB) competencies and requirements for expert panel members, distributed on April 23, 2024 (Item II-D)
- The most recent version of the *White River Broodstock Feasibility* document to be distributed after the meeting (Item II-E)

Other Relevant Documents

- PRCC Policy Committee Statement of Agreement 2013-01 on the WR Spring Chinook Salmon Mitigation (Item II-A)
- Memorandum regarding an *Update to the White River Spring Chinook Mitigation 2026 Decision Framework*, dated December 21, 2018 (Item II-A)
- Draft questions and answers from National Oceanic and Atmospheric Administration (NOAA) Fisheries, dated March 2020 (Item II-B)
- *The Upper Columbia Recovery Plan* (Item II-B):
  - https://www.fisheries.noaa.gov/resource/document/recovery-plan-upper-columbia-spring-chinook-salmon-and-steelhead
  - https://www.fisheries.noaa.gov/resource/document/2022-5-year-review-summary-evaluation-upper-columbia-river-spring-run-chinook
- The *ISAB review of Upper Columbia spring Chinook Salmon* (Item II-B):
  - https://www.nwcouncil.org/reports/review-of-spring-chinook-salmon-in-the-upper-columbia-river/

Finalized Documents

- None.

I. Welcome

Tracy Hillman reviewed a detailed agenda, captured below as subsections in the meeting summary.

The PRCC discussed how materials "in-progress" should be shared as the PRCC HSC representatives develop a more formal plan. The Habitat Conservation Plan Hatchery Committee (HCP-HC) and PRCC HSC primary email distribution list that is typically used for sharing draft materials will be used for sharing working documents by email. Documents will also be stored on the PRCC HSC SharePoint site.

II. PRCC HSC

A. White River Spring Chinook Salmon Hatchery Program

White River Decision Framework Memorandum

Tracy Hillman provided an overview of the memo from Elizabeth McManus to the PRCC dated December 21, 2018, regarding an *Update to the WR Spring Chinook Mitigation 2026 Decision Framework* (2018 WR Memorandum; Attachment B). According to the decision tree in the memorandum, the first question to answer is whether Wenatchee spring Chinook Salmon are meeting viable salmonid population (VSP) criteria. If yes, then monitor. If no, move to Question 2, which is whether the WR spawning aggregate is needed for the Wenatchee spring Chinook Salmon population to meet VSP criteria. If the answer is no, then monitor. If the answer is yes, then this will trigger an expert panel review. The expert panel would answer the question, "Would an adult-based supplementation program in the WR increase the probability of meeting VSP criteria?" If the answer from the expert panel is yes, then the decision path moves to Questions 4, 5, and 6, which relate to feasibility. If the answer is no at any point in the decision framework, the PRCC Policy Committee will need to consider different approaches to mitigation.

The discussion in the meeting focused on questions in the decision tree and supporting table in the 2018 WR Memorandum.

B. Steps 1 and 2: NOAA Input

NOAA Fisheries' Previous Responses to PRCC HSC Questions

Hillman reviewed a document dated January 27, 2020 (updated March 2020; Attachment C), in which Craig Busack and Dale Bambrick (NOAA Fisheries) summarized their responses to questions posed to them by the PRCC HSC on the importance of the WR program. The PRCC HSC discussed the responses from Busack and Bambrick to the following questions and identified additional information needs.

Is the WR spawning aggregate necessary to the Wenatchee spring Chinook Salmon population in regard to meeting VSP criteria?

A concern was raised that in theory, the recovery plan goals for Wenatchee spring Chinook Salmon can be adjusted, but currently, there is no mechanism in place to do that. The WR program can only be compared to the existing recovery goals and not some future hypothetical goals.

The recovery abundance target for the Wenatchee population is a 12-year geometric mean of ≥2,000 natural-origin returns (NOR), but the intent is that not all of those come from one or two spawning aggregates. Rather, to meet spatial structure criteria, the goal is that naturally produced spring Chinook Salmon will come from at least four of the five major spawning aggregates (Chiwawa River, Nason Creek, Little Wenatchee River, WR, and upper Wenatchee mainstem river) and one of the four minor spawning aggregates (Icicle, Chumstick, Peshastin, or Mission Creek).

The preliminary responses from NOAA Fisheries suggest that recovery can occur without the WR spawning aggregate, but that puts a lot of pressure on the success of the other aggregates to recover the overall population. The PRCC HSC discussed the following key points:

- The Little Wenatchee is a smaller aggregate, and it would be difficult to justify a focus on recovery of the Little Wenatchee aggregate ahead of the WR aggregate. In addition, it is unlikely the Little Wenatchee aggregate would ever recover without recovery of the WR aggregate.
- Habitat in the upper Wenatchee River does not appear to be suitable spawning habitat. There are virtually no natural-origin spawners there, and fish that do spawn there are overflow hatchery-origin returns (HOR) that have low productivity, and the progeny that do survive to adulthood tend to move up into other spawning areas. Therefore, the upper Wenatchee spawning aggregate does not seem to be the best place to focus restoration efforts.
- Focusing on recovery of the WR aggregate appears to have the greatest chance of recovering four of the five major aggregates, unless the recovery plan is changed. Current understanding is that NOAA Fisheries is not likely to reopen the recovery plan for revision. Ultimately, NOAA Fisheries will have to address the question about the importance of the WR spawning aggregate to the recovery of Wenatchee River spring Chinook Salmon.

The recovery plan states that the minimum number of naturally produced spring Chinook Salmon redds within each major spawning area will be either 5% of the total number of redds within the Wenatchee subbasin or at least 20 redds within each major area, whichever is greater. This criterion is intended to help meet the spatial structure component for recovery. The WR aggregate is closer to meeting the spatial structure criteria than the upper Wenatchee aggregate. The total escapement (HOR and NOR) for the mainstem Wenatchee River (including the upper Wenatchee River and Chiwaukum Creek) in 2022 was 24 fish, and they were all HOR. The average over an 8-year period was 100 fish per year. In 2023, there were eight total spawners; four were HOR and four were NOR. For years prior, spawners were heavily weighted toward HOR. The HOR fish spawning in the upper

Wenatchee River are from conservation programs, and although the hatchery programs help to maintain abundance, recovery is based on NORs.

A decision about whether to move forward with the WR hatchery is due in 2026, and it is not realistic to revise the recovery plan in this time period. If the recovery plan were reopened, it is possible that nothing about the importance of the WR aggregate would change. The designation of the upper Wenatchee as an aggregate might warrant change. The recovery plan allows for flexibility to consider actions other than a hatchery program to meet recovery targets for spawning aggregates.

If the WR genetic signature is lost, can recovery still be achieved?

NOAA Fisheries indicated that diversity and spatial structure are important, but achieving higher productivity and abundance is more important. Abundance is more important initially, and when there are critically low numbers, this outweighs the importance of genetics. Nevertheless, spatial structure and diversity are important. Because of homing fidelity, fish become genetically adapt to environmental conditions over time, and hopefully genetic diversity increases. Currently, little genetic differentiation exists among the aggregates, and it has likely narrowed in recent years based on findings in the 10-year Comprehensive Review.

Genetic targets were developed for the recovery plan based on Interior Columbia Basin Technical Review Team guidance. Among other things, those targets are intended to reduce out-of-basin contributions to the population. Out-of-basin effects were a major problem in the Wenatchee Basin due to the Grand Coulee Fish Maintenance program. There are also problems with operating a hatchery program in a small population (e.g., small effective population size).

The PRCC HSC originally asked these questions of NOAA Fisheries to help the PRCC HSC think through how to use all the information, and to think about the process as a whole. Seeking responses from NOAA Fisheries provides a road map for identifying data needs. Some members felt answers to these questions would help the PRCC HSC to provide the correct baseline information to the expert panel; however, other members did not want to provide the panel pre-decisional information.

Additional NOAA Fisheries Guidance Needed

It was noted that it is outside the role for the NOAA Fisheries' PRCC HSC representatives to respond to questions about adjustments to the recovery plan. It will be necessary to engage Justin Yeager, NOAA Fisheries Interior Columbia Basin Office Branch Chief, who can clarify answers to questions about meeting recovery plan targets and to determine whether NOAA Fisheries' position has changed since March 2020. Grant PUD requested that NOAA Fisheries provides a formal response to Questions 1 and 2 in Table 1 of the 2018 WR Memorandum.

If NOAA Fisheries' response to Question 2 in the 2018 WR Memorandum is that the WR spawning aggregate is not necessary for recovery of the population, potential alternatives to a WR hatchery program would be necessary, and some ideas were discussed including mitigation through continued supplementation in Nason Creek, supplementation in the Chiwawa River, habitat improvements in the upper Wenatchee River basin, or any combination of these. Another thought was to implement something temporary rather than something permanent. Some members raised questions about how such changes would affect the requirements for Grant PUD and signatories of the Priest Rapids Salmon and Steelhead Settlement Agreement and whether that would reopen the biological opinion (BiOp) for revision or amendment. All signatories approved the 2013 statement of agreement (SOA), but it is not clear whether that is sufficient for this BiOp. The SOA put a pause on implementing a program, but it did not say whether this hatchery program was ever needed. The PRCC HSC could recommend alternative mitigation strategies and the PRCC Policy Committee would have to evaluate the legal framework for making the recommended change, which could be codified in another PRCC Policy Committee SOA.

Timeline and Deliverables

Hillman will provide Yeager with the questions and responses provided by Busack and Bambrick and request that NOAA update or clarify their responses to the questions. Hillman will discuss the questions with Yeager and invite him to the next meeting. The PRCC would like a response from NOAA Fisheries by the May 15, 2024, meeting.

C. Step 3: Questions for an Expert Review Panel

Review 2018 WR Memorandum Table 1. Questions

The PRCC HSC discussed the list of questions in Table 1 of the 2018 WR Memorandum (Attachment B), with the associated data and information availability, identified who will compile the information, and discussed the timeline and deliverables. This information will be compiled for the expert panel.

The following areas of uncertainty around the potential data sources were discussed in greater detail.

Key Question 3a, Sub-Question 3.1

Work is needed to develop or identify a model for estimating capacity and supplementation potential. Since 2018, several habitat and life-history models have been developed or improved upon. The PRCC HSC discussed the various models for Wenatchee spring Chinook Salmon that may be useful and what should be provided to the expert panel.

There are now multiple models available: Jeff Jorgensen's LCM (NOAA Fisheries NWFSC), the NWFSC's Habitat and Restoration Planning (HARP) model, Mark Sorel's recently published LCM developed to consider a broader range of life-history types, and Michael Beakes' geomorphic model.

The group discussed whether to provide a model to allow the expert panel to test scenarios, or to provide the model outputs, and whether to provide information from multiple models. They discussed whether the documents provided should be resources that are already published and therefore more easily accessible, such as Sorel's model, and the status of the other potential resources. There was agreement around providing as much information as possible and that the PRCC HSC should not be a gatekeeper of which model should be used.

The group also discussed how each model was developed, the potential data availability, and the usefulness of model outputs, as follows:

- Jorgensen had worked with Washington Department of Fish and Wildlife (WDFW) on the earlier Wenatchee spring Chinook Salmon LCM. Jorgensen is working on the life-cycle component of the Upper Columbia HARP model. Jorgensen also worked with Sorel on estimating population parameters. Sorel's work built upon Jorgensen's earlier work to test scenarios of habitat improvement and habitat supplementation while considering habitat diversity.
- The HARP model is a habitat model that translates habitat conditions into fish numbers (capacity and productivity). This model can estimate current, potential, and changes in capacity/productivity associated with habitat restoration actions. The life-cycle component of the model can evaluate bottlenecks throughout the life cycle of the fish.
- A fish-based model is useful, but there are questions about how the habitat data from the Upper Columbia Basin are being translated into fish in the models, especially new data showing rearing in the mainstem Wenatchee and Columbia rivers, or how the entire mainstem hydrology and ocean survival are being considered in that HARP model. Juveniles from the WR are likely rearing in Lake Wenatchee, and some may rear in the Wenatchee and Columbia rivers.
- Additional information on juvenile migration patterns is available from smolt-trap data, and fish passive integrated transponder (PIT) tagged as fry/parr in tributaries and detected later downstream by the PIT-tag barge at the mouth of the Wenatchee River and at mainstem dams. Lance Campbell's (WDFW) otolith study showed mainstem Columbia River rearing, and he has requested that any incidental mortalities from the Wenatchee River smolt traps be sent to him for analysis. Katy Shelby will also reach out to Jeff Caisman to determine whether samples from the WR could be collected. Genetic reports for spring Chinook Salmon in the Wenatchee basin would be useful for the panel to review.

- Identification of limiting factors is a data gap. Low survival through Lake Wenatchee may be a limiting factor, and it may be due to predation, but it is unknow where most of the predation may be occurring, which predators prey the most upon juvenile Chinook Salmon, and the magnitude of predation rates. Anecdotally, many Northern Pikeminnow are observed in shoreline areas. Also, anecdotally, at the outlet of the lake when a smolt trap was operating there, WR fish were captured that were large, had a high condition factor, and had food in their stomachs, and it was presumed that they had overwintered in the lake. It has been assumed that while mortality is probably high in the lake, those that survive do well during downstream migration because of their size and condition. Carlos Polivka's (USFS) work likely informs that behavior in the lake.
- Sorel was able to model the Nason Creek aggregate but may lack information to model the WR aggregate, so a limiting life stage will be challenging to identify.
- A model developed by Grant PUD may be able to identify limiting life stages.
- Data are available on egg-to-fry survival from a study by Chris Johnson (WDFW).

The PRCC HSC then discussed what to provide the expert panel and whether to ask them to work with the models directly or to provide them with model outputs, as follows:

- Generally, most LCMs need to be run by the model developer. Thus, modelers may need to generate the metrics identified Table 1 and provide those outputs with documentation about how the model was developed, inputs, and assumptions. If a panel member is a skilled modeler, then they may be able to run the models. Shelby will reach out to Mark Sorel; at one time he was going to work on a Shiny App that would make his model user friendly.
- The PRCC HSC will need to identify the scenarios that need to be run for the expert panel.
- Each model will provide different outputs, so each should be provided to the expert panel with appropriate documentation to demonstrate the potential range and limitations in outputs.
- It will be important to identify information gaps.

The following next steps were identified:

- Grant PUD will develop a "charge" for the expert panel that describes exactly what they should provide feedback on.
- Grant PUD can assemble most of the information from monitoring and evaluation reports, screw-trap reports, egg-to-fry survival reports, and life-cycle modeling publications by next month. Sorel's model may already provide information on the WR aggregate.
- Hillman will find out when outputs from the HARP model will be available.
- Mike Tonseth will find out about the ability to use Sorel's model and the availability of metrics in his publications.

Key Question 3b, Sub-Question 3.2

The PRCC HSC discussed the interpretation of Question 3b, that is, what is the optimal program size for meeting VSP criteria? For this question, the panel would need to understand the current capacity and potential capacity of the WR. They would also need to understand the gap between the minimum population size to meet VSP criteria and the current and potential capacities of the system. Knowing the capacity of the system will help in the estimation of optimal program size. Grant PUD will provide smolt-to-adult return rates and estimates of capacity.

Other constraints were also discussed. For example, program size is limited by Grant PUD's No Net Impact mitigation obligations; however, the program size in the WR does not need to be the same as the mitigation obligations. Mitigation can be done by increasing production in other supplementation programs. There should be some evaluation of the benefit/cost of operating a small program.

Additional sideboards for the program size could be provided by asking questions related to later steps in the process, such as what an acceptable level of non-target impacts is to, say, Bull Trout. What if the alternatives proposed could never be permitted? Introducing that type of information would limit the responses from the expert panel by asking them to exclude options that could not ultimately be implemented. Some members felt that an expert panel should not be provided with those sideboards and that the expert panel should only answer the question in the decision tree. The 2013 SOA is clear that the expert panel is not the decision-making body. Rather, they are a recommending body. The permit limitations or facility and broodstock limitations are the task of the PRCC HSC and would be answered later. The PRCC HSC can take the panel's recommendations and decide to scale them based on logistics and whether the program can be permitted.

Grant PUD suggested that although the process is designed to be linear (i.e., decisions flow from one box in the decision tree to the next), there could be some feedback loops to provide sideboards around what could be permitted to inform the expert panel or the PRCC HSC about what could limit the implementation of recommendations. Grant PUD suggested that for the expert panel to provide their recommendation, the permitting agencies should provide input on whether certain actions, like compositing, could be permittable. Without this information, the panel may spend valuable time offering recommendations that are not permittable. Others felt that compositing is a management decision and that the expert panel should not be asked to make recommendations with side boards. If the program size recommended by the expert panel is so large that it requires compositing, that is useful information for the PRCC HSC, and NOAA Fisheries should be able to weigh in on whether that is feasible to permit. Their position on program sizing and compositing may be a moving target depending on information provided in each 5-year status review. There is a need to address the greatest limiting factor first, which at this time is abundance and productivity. A different number of

NOR spawners in the program could be estimated if compositing is allowed and information is needed about whether VSP goals can still be achieved in that scenario. Preliminary results from the spring Chinook Salmon relative reproductive success study (RRS) should inform this; HOR adults that spawn in the WR have similar relative reproductive success as NOR fish.

The expert panel will have to look at all VSP criteria, which are described in the recovery plan and its Appendix B. Evaluating the criteria in the recovery plan will force the panel to consider hatchery broodstock influence as part of maintaining natural levels of variation. If it becomes clear that compositing will be necessary to meet abundance targets, they will have to evaluate the diversity metrics in the recovery plan. This will help inform what type of program would be necessary or possible in the WR.

Sub-Questions 3.3 through 3.7

No other data gaps were identified.

Sub-Question 3.8

The panel will have to estimate population persistence, which could be answered with LCMs. All life histories could be considered. Here, Sorel's model may be useful because it evaluated different life-history characteristics.

Tim Taylor will use available data to develop a matrix population model to conduct a population viability analysis. This can be used to understand extinction risk and to forecast future scenarios.

Timeline and Deliverables

- Grant PUD will lead data assembly. The 10-year Comprehensive Review includes WR straying and genetic composition data.
- Mike Tonseth will contact Mike Hughes (WDFW) to determine whether results of the RRS are ready for use in this process (for the WR and other Wenatchee spawning aggregates).
- The expert panel will not be restricted from seeking out other supporting literature. The panel may request data from the PRCC HSC if they identify a data gap. Hillman and Rohrbach will maintain a record of what is being provided to the expert panel, including but not limited to the following resources:
  - The Upper Columbia Chinook Salmon and Steelhead Recovery Plan with references to specific sections
  - Appendix B from the recovery plan
  - NOAA Fisheries most recent 5-year status report
  - The ISAB review of Upper Columbia spring Chinook Salmon

- Publications and papers on Mark Sorel's model and other Wenatchee Basin models

Broodstock Collection Feasibility Risk Matrix

Based on discussions during the last meeting, Grant PUD provided a draft version of a broodstock collection risk matrix. The matrix was based on the draft broodstock feasibility report developed by Grant PUD. PRCC HSC members agreed this would be a good way to represent the relative risks and can be used for other aspects of the program in addition to broodstock collection.

Brood collection risk matrix
White origin (WO), Composite origin (CO)

Method	Sufficient Brood	NTTOC impact	Permittability	Relative Cost	Safety
Tumwater WO	Low	High	N,U	High	High
Tumwater CO	High	Low	N,U	Low	High
Weir WO	Low	Medium	N,U,A,W,C,C	High	Low
Tangle net WO	Low	Medium	N,U	Medium	Medium
Pound net CO, (Little Wenatchee)	Uncertain	Medium	N,U,A,W,C	Medium-High	Medium
Dryden WO	Low	High	N, U	High	High
Dryden CO	Medium	Low	N, U	Low	High

Sufficient Brood=likelihood sufficient numbers and types are collected (Low=low ability to collect sufficient brood), NTTOC impact=risk to other taxa from collecting brood (Low=low risk to impact other taxa), Permittability=likelihood of obtaining permits (N=NMFS, U=USFWS, A=ACOE, W=WDFW C=Chelan County, C=Cultural –agencies to provide content), Relative Cost=financial cost of implementation (Low=low cost), Safety=likelihood that action will be safe (Low=low likelihood of being safe)

The non-target taxa of concern (NTTOC) column would include other species and other spring Chinook Salmon spawning aggregates. In some cases, this could be basin-wide NTTOC versus NTTOC in the WR only. This could include the risk of compositing, which may have cumulative impacts on the adjacent spawning aggregates (Nason and Chiwawa). The Permittability column is also a mix of concepts, including genetic risk and the social dimension that arises during the process, such as permitting through Chelan County. The NTTOC and Permittability columns could be broken down further, but they are retained as-is for now to avoid over-complicating the table.

An additional row was added to consider broodstock collection at Dryden Dam.

D. Step 3: Logistics for Convening an Expert Panel Review

The PRCC HSC discussed the following alternative approaches for working with the expert panel:

- The PRCC HSC will define what the panel is being asked to do, present them with available information, and ask them what other information they will need to answer the questions.
- The panel could work together in a workshop, work in isolation, or a mix of the two approaches. The disadvantage of group work is one influential individual can shape the outcome; the advantage is that different disciplines can directly inform each other to achieve a better end product. The PRCC HSC decided to follow a "hybrid" approach to bring the group together at the beginning to share information, ask them to work independently, then bring them back together as a group to obtain their consensus recommendation.
- Information will be presented in a guidance document or kickoff workshop. A workshop could include presentations by modelers and allow for cross pollination between different disciplines (e.g., geneticists, hatchery experts, fish ecologists, or conservation biologists).
- The deliverable from the panel will be a write-up of their recommendations. The write-up should include their independent opinions (perhaps as an appendix) to document the variation in perspectives shaping that final opinion.

Define "Independent"

The PRCC HSC discussed criteria for defining independence and conflicts of interest for panel members. The Northwest Power Council's ISAB and Independent Science Review Panel (ISRP) were used as examples (Attachment D). The following criteria were discussed:

- Exclude HCP-HC and PRCC HSC members and people in any PRCC HSC member's chain of command.
- Avoid conflicts of interest, meaning any financial or other interest that conflicts with the service of an individual on the panel because it benefits them or someone close to them unfairly.
- Grant PUD favored including panelists from outside the Columbia Basin because of potential conflicts of interest, which is generally consistent with membership on the ISAB and ISRP. The Yakama Nation's position was that candidates should not be eliminated based on working in the Columbia Basin, and they would favor candidates who have a familiarity with sources of mortality and limiting factors for the Upper Columbia Basin evolutionarily significant unit (e.g., the hydrosystem and estuary), and potentially someone who has modeling knowledge. The PRCC HSC agreed that the panel could include members that work in the Columbia Basin.
- Conflicts of interest that could impair a person's objectivity or could result in an unfair competitive advantage are a possibility for participants who are seeking funding for their work in the Wenatchee River basin. For instance, entities that are funded by Grant PUD to conduct work in the Wenatchee River basin could be conflicted.

- The PRCC HSC will use the ISAB/ISRP criteria as guidance for selecting panelists and follow it as closely as possible as individual panelists are proposed.

Identify Panel Expertise and Size

Most panelists should be familiar with the Columbia River Basin. Although this is not a specific selection criterion for the ISAB, members must become familiar with the basin and the available materials. The group identified the following desired areas of expertise that will help guide the number of panelists needed:

- Population dynamics/quantitative ecology
- Life-cycle modeling
- Hatchery supplementation
- Population genetics
- Conservation biology (background in recovery plans)
- Systems ecology (e.g., understanding of species dynamics and interactions across their entire range)

Identify Qualifications

- ISAB/ISRP criteria for qualifications will be used as guidance and PRCC HSC members will recommend individuals who will be considered on a case-by-case basis.
- Retired people who have previously worked for agencies will be considered. Retired people must not have a direct conflict of interest and should possess a strong background on the issues. They also must have knowledge on the latest science.

Leading up to next month's meeting, the PRCC HSC will consider the ISAB/ISRP qualifications list and begin proposing potential panelists.

Todd Pearsons will prepare a written "charge" to set the expectations for the group, which will include the questions from the 2013 SOA, their responsibilities for participation, the ground rules for working as a group, and the number of workshops they will need to attend.

E. Steps 4, 5, and 6: Feasibility

Review Broodstock Feasibility Comments

Grant PUD received comments and responded to them in the document. Broodstock collection feasibility will be an ongoing topic in the future, so this document will evolve.

Some comments were difficult to address at this time, such as those related to compositing or weir operation. The initial draft was based on the 2018 WR Memorandum, which did not consider compositing. The feasibility approach should start to address these issues, but whether that is acceptable to regulatory agencies would come later in the process. The WR population would be treated as an individual spawning aggregate, knowing that the assumptions of past permit conditions, which expire in 2016, may not apply in the future. However, those provide a starting point based on what was known about the population.

The following broodstock collection methods were discussed (beyond trapping at Tumwater Dam):

- Pound nets could be used in the river (WDFW has documentation online on using pound nets in rivers).
- Merwin traps could be used in the lake at the WR confluence (similar to fyke nets). There is a risk of capturing a lot of Sockeye Salmon with these nets, although Sockeye Salmon tend to hold in the lake and run into the WR later. There will likely be encounters with Bull Trout and other fish species during broodstock collection. A side benefit may be effectively capturing predators.
- An electronic weir could be used (this would likely require high water conductivity).

Grant PUD will distribute the draft broodstock feasibility report showing revisions and responses to comment later in the process when the feasibility discussion is more appropriate.

III. Administration

A. Next Meetings

The next meetings of the PRCC HSC will be held on May 15 and 16, June 20, and July 17, 2024, in person at Douglas PUD with virtual links.

Next steps include the following:

- Develop a schedule backing up from when information is needed by NOAA Fisheries to evaluate the permit. The permit expires in July 2026. A Hatchery Genetic Monitoring Plan (HGMP) will be needed even for additional production in the Nason program to cover the program for monitoring. Typically, HGMPs are needed about 1 year before the permit expiration so they can be reviewed by the PRCC HSC and then NOAA Fisheries. NOAA Fisheries will need to provide feedback on these milestones if an extension is sought.
- The expert panel will need to be convened in early 2025 to meet the 2013 SOA deadline of completing the tasks by 2026, assuming it will take the expert panel 1 to 2 months to complete their assignment.
- More specific tasks relative to the scope and timeline will be discussed in the May meeting.

IV. Attachments

Attachment A	List of Attendees
Attachment B	2018 WR Memorandum
Attachment C	2020 Questions for NOAA Fisheries
Attachment D	Independent Expert Scientific Review – WR and the ISAB/ISRP

Attachment A
List of Meeting Attendees

Name	Organization
Natasha Winnacott	Anchor QEA
Larissa Rohrbach	Anchor QEA
Tracy Hillman	BioAnalysts, Inc.
Rod O'Connor‡	Grant PUD
Deanne Pavlik-Kunkel°	Grant PUD
Todd Pearsons‡°	Grant PUD
Tim Taylor	Grant PUD
Katy Shelby°	Washington Department of Fish and Wildlife
Mike Tonseth*‡	Washington Department of Fish and Wildlife
Matt Maxey*‡°	U.S. Fish and Wildlife Service
Emi Melton*‡°	National Marine Fisheries Service
Keely Murdoch*‡	Yakama Nation
Cory Kamphaus*‡	Yakama Nation
Kirk Truscott*‡	Confederated Tribes of the Colville Reservation

Notes:
* Denotes HCP-HCs member or alternate
‡ Denotes PRCC HSC member or alternate
° Joined remotely

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Memorandum

To: Denny Rohr, PRCC Facilitator

From: Elizabeth McManus, PRCC-HSC Facilitator

Copy: PRCC HSC, Tracy Hillman

Date: December 21, 2018

RE: Update to the White River Spring Chinook Mitigation 2026 Decision Framework.

Dear Denny – thank you for the request from the PRCC to "review the 'Report to the PRCC' and provide an update to reflect any changes that may have occurred, plus include any additional new data and information they feel to be applicable." The purpose of this memo is to summarize PRCC HSC discussions to date on this topic.

The HSC has reviewed and discussed the memo several times. They have not reached resolution on what updates are needed.

My impression is that Subcommittees members agree that most of the original memo is still current, relevant, and unchanged. There are several technical updates to Table 1 and text in the memo describing Table 1, which the Subcommittee also likely could reach agreement on.

The Subcommittee is not in agreement on a number of other issues. These seem to center around the extent to which spatial estimates of spring Chinook mortality and estimates of predation in Lake Wenatchee are necessary to evaluate whether to start a hatchery program on the White River, and the extent to which information on what factors and mechanisms in Lake Wenatchee are limiting the WR spawning aggregate are needed to determine whether hatchery-based mitigation is appropriate. These differences seem related to different perspectives on when and how the potential to consider alternatives to hatchery mitigation in the future should be factored into data gathering now.

Committee discussions on this are continuing. I understand that discussions among the joint fisheries parties are ongoing, and they may be able to provide additional input on their individual or shared perspectives in the new year. Grant PUD also could provide input on its perspective.

I hope this is helpful to you. The HSC welcomes any follow up questions or direction. As of January 2019 the HSC will have a new facilitator. Please direct any response after January to Tracy Hillman (tracy.hillman@bioanalysts.net). I have attached the latest working draft of an updated memo; *please note that the track changes in the working draft were still under discussion and have not necessarily been agreed to by all parties*.

Very best wishes for a happy and productive new year.

February 2016 Original Report to the PRCC – Working Draft Updates (December 2018)

Report to the PRCC on the White River Spring Chinook Mitigation 2026 Decision Framework

Purpose and Background

The purpose of this document is to summarize the activities of the Priest Rapids Coordinating Committee - Hatchery Subcommittee (PRCC-HSC) toward the work outlined in Statement of Agreement 2013-01 (SOA 2013-01), approved by the Priest Rapids Coordinating Committee on February 8, 2013 (Attachment 1). SOA 2013-01 states:

> *7) By 2026, the PRCC HSC will assess the need to restart a White River spring Chinook hatchery supplementation program by assembling all relevant technical information and overseeing an independent scientific review. The independent scientific review will consist of a panel of subject matter experts selected by the PRCC HSC who will address specific critical questions developed by the PRCC HSC. The expert panel will address the critical questions but will not have decision-making authority over the future of the White River spring Chinook program. Prior to initiating the independent scientific review, the PRCC will review and approve the framework and structure of the review. Once the framework and structure of the scientific review is approved by the PRCC, the review should be complete within one year.*

Shortly after the PRCC approved SOA 2013-01 and transmitted it to the PRCC-HSC, PRCC-HSC members began discussing the information that would be needed to inform an independent scientific review of a White River spring Chinook hatchery supplementation program, with a view towards ensuring (as much as possible) that needed information is on track to be assembled in time to inform the evaluation and, if gaps exist, highlighting those for the PRCC's consideration and for the development of funding proposals.

This document will be updated periodically as new data become available.

Decision-Making Framework

The PRCC-HSC began by developing a decision-making framework (decision tree), to describe the types of questions that likely would be addressed in an independent evaluation. While the content of the independent evaluation will be reviewed and approved by the PRCC and the evaluators in the future, it was necessary to think through likely elements so that data needs could be assessed. The PRCC-HSC decision tree is shown in Figure 1. It describes the initial decision-making steps (boxes 1 and 2), the expert review panel step (box 3), and a subsequent feasibility analysis (boxes 4 – 6).

Data Table

The PRCC-HSC developed a table listing each question in the decision tree, associated data needs, data sources, funders, and potential funders for data that is not currently being collected (Table 1). Throughout 2015 the PRCC-HSC populated this table by drawing on their own expertise as well as that of their respective organizations. PRCC HSC members noted that some of the programs/projects that will supply data likely necessary to inform the expert review panel's review are either ongoing or scheduled for funding and implementation, while other programs/projects are not currently funded. Per its role as a technical advisory committee, the PRCC-HSC makes no assumptions regarding funding sources for unfunded projects or data needs.

Data sources that will likely be needed, that provide the bulk of data likely needed in the assessment, and that seems on track to be funded and available in 2026 include:

- NMFS stock status reports
- GPUD hatchery monitoring and evaluation reports
- White River migrant data reports
- Relative reproductive success study reports

As part of these deliberations the PRCC-HSC discussed two emerging lifecycle models of the White River Spring Chinook spawning aggregate. One model, prepared by Grant PUD, combines existing life-stage estimates. The other model is the Wenatchee Spring Chinook Life Cycle Model (LCM) , under development by NMFS and WDFW. It is part of the Interior Columbia Livfe Cycle Model, a multi-agency effort lead by NOAA fisheries. The LCM is a structured stochastic model developed to allow test scenarios related to salmon recovery and management actions. The LCM includes population and production area (spawning and rearing) scales of evaluation. There are multiple modules that can run customized or status quo scenarios and evaluation how hatcheries, freshwater habitat, and other factors (e.g., predation rates, climate change, hydro system alterations, harvest) can affect VSP parameters. , is a prospective model expanded matrix model that builds on the ICTRT model (ICTRT and Zabel 2007) and Shiraz model (Honea et al. 2009; Jorgensen et al 2009). More information on the LCP is here. [Link: https://www.nwcouncil.org/fish-and-wildlife/fw-independent-advisory-committees/independent-scientific-advisory-board/review-of-noaa-fisheries-interior-columbia-basin-life-cycle-modeling-draft-report]

While the Subcommittee is in overall agreement that some understanding of the White River Spring Chinook spawning aggregate lifecycle, and related lifecycle limiting factors, likely will be necessary to support the 2026 evaluation, they are not yet in agreement on which particular life cycle model should best be used or the extent to which, if at all, information to evaluate alternatives to hatchery-based mitigation should be addressed as part of the modeling effort. Because there are different perspectives on how the model should be used, there also are differences on what data are needed and where there are gaps. All parties agree that wWith respect to the NMFS/WDFW lifecycle model, the following model components data gaps have not been developedidentified: [By who?]

- White River spawning habitat capacity (and trends)
- Parr tagging and parr abundance estimates Summer parr abundance
- Over-winter survival in the White River

Conclusion and Next Steps

The PRCC-HSC has concluded that the primary~~majority of~~ information it believes likely will be needed to inform an evaluation of the White River Spring Chinook hatchery program in 2026 (i.e., spawner and juvenile abundance) is currently on track to be collected, analyzed, and available to inform decisions when needed. As already funded / anticipated data gathering continues, differences about the details of lifecycle modeling which have not now been fully resolved should become clearer and may reach resolution. PRCC-HSC members acknowledge that data, modeling, programmatic, or other factors are likely to change before the expert review panel is convened in 2026 and as such the PRCC-HSC will update the decision tree and data table as needed to reflect these changes. It is possible that funding proposals to address data gaps identified in this document will be developed and submitted to the PRCC for consideration of NNI account funding. Funding proposals may also be developed and submitted to other funders such as BPA, UCSRB, NMFS, WDFW, or others.

Figure 1: White River Decision Tree

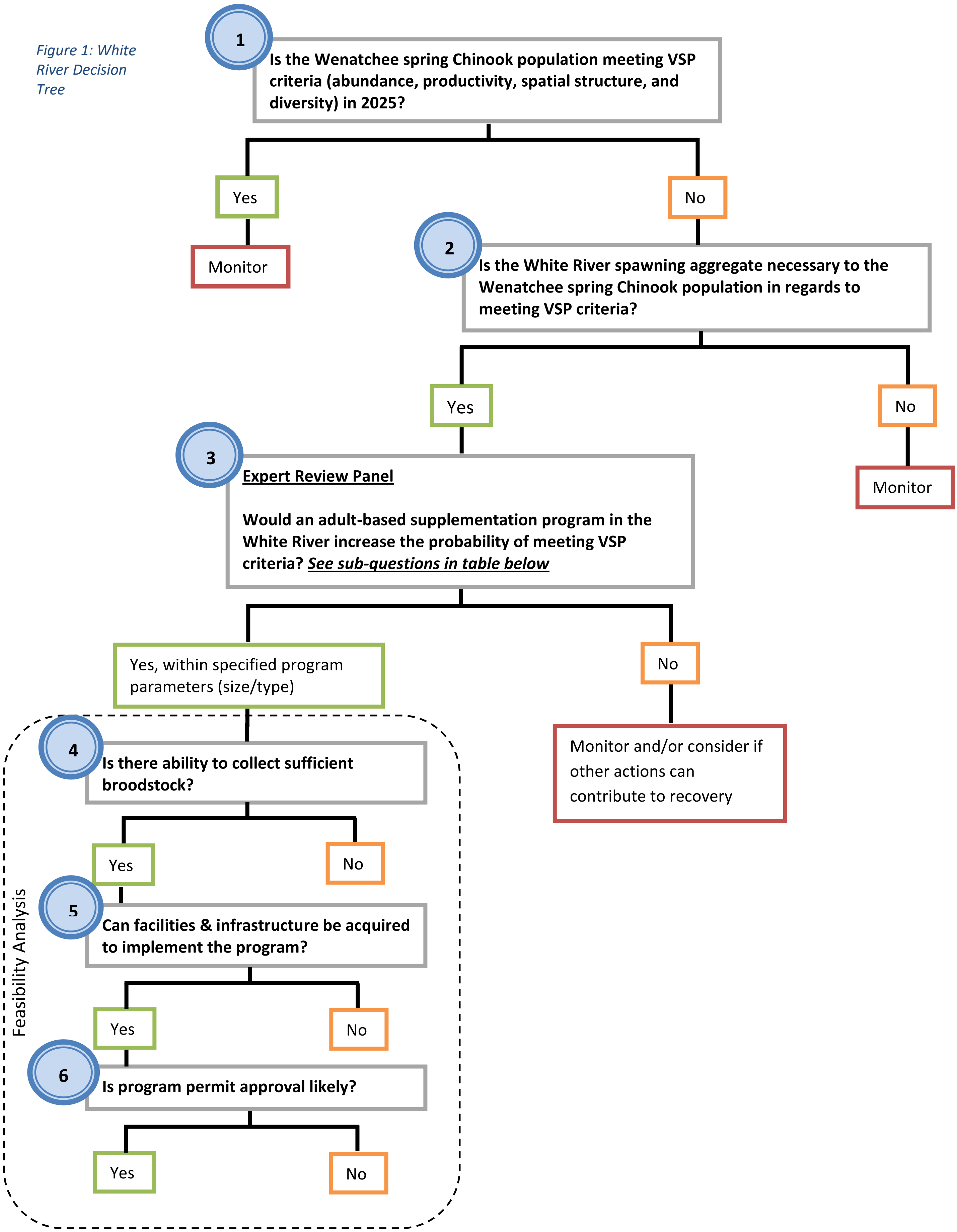

Table 1: White River Questions and Data

Box #	A. Key Question	B. Sub-Questions	C. Data Needs	D. Data Sources	E. Work Needed	F. Staff or funding source
1	**Is the Wenatchee spring Chinook population meeting VSP criteria (abundance, productivity, spatial structure, and diversity) in 2025**?		VSP criteria	• NMFS Stock Status Report updated every 5 years[1] • GPUD M&E report • RRS?[2]	Compete and Review reports	NMFS staff work
2	**Is the White River spawning aggregate necessary to the Wenatchee spring Chinook population in regards to meeting VSP criteria?**		White River VSP data relative to Wenatchee spring Chinook VSP population data	• NMFS Stock Status Report updated every 5 years	[This will be a NMFS interpretation of how the White River spawning aggregate contributes to VSP criteria and recovery]	NMFS staff work
3	**a. How, if at all, would an adult-based supplementation program in the White River increase the probability of meeting VSP criteria?** **b. What is the optimal program size for meeting VSP criteria?**	**3.1** What is the available capacity, limiting life-stage, and limiting factor in the White River? What is the trend?	• Spawning capacity • Rearing capacity • Other life stage capacity • Limiting life stage • Limiting factor	• GPUD hatchery M&E report • Screw trap report • Egg-fry survival work • Life Cycle Model[3]	Continue planned field work and reporting; Spawning habitat capacity surveys	GPUD *Note: Other potential funders for work not conducted by GPUD (e.g., spawning habitat capacity): BPA* *UCSRB* *NMFS* *WDFW* *NNI*
		3.2 How many additional NO adults could reasonably be expected by operating an adult-	• Capacity estimates • SAR estimates	Capacity estimates from row above, life	Develop model using capacity &	GPUD staff

[1] Make sure genetic information is communicated in a manner relevant to the question.
Also: Note potential data correction issue to address carcass recovery bias

[2] November 2018 update: BPA cut funding for the RSS work by $100,000. This will delay completion of the study; it is not clear if the study will be complete by 2026 at the new funding level.

[3] November 2018 update: the HSC has requested an update on the status of the Wenatchee Spring Chinook Life Cycle Model; we were unable to schedule the update prior to completion of this memo, and the update may prompt additional updates to the data needs and status table.

		based supplementation program for the WR spawning aggregate?		cycle modeling[4], and SAR data from GPUD hatchery M&E report	supplementation potential	
		3.3 What is the relative reproductive success (RRS) of hatchery fish in the Wenatchee Basin?	RRS estimates from pedigree study	RRS report available in 2022	Continue RRS study and reporting	Funded by BPA and PUDs
		3.4 Did the White River captive brood program or Chiwawa hatchery strays contribute to natural origin production?	RRS from above PHOS vs. productivity NOR abundance trends relative to references	• RRS report[5] • GPUD M&E report	Continue RRS study and GPUD hatchery M&E monitoring Consider alternative WR survey methods	Funded by BPA and PUDs
		3.5 Do supplementation programs in Chiwawa and Nason Creeks contribute to NO abundance in the respective basins?	RRS from above PHOS vs. productivity in their respective basins NOR abundance trends relative to references	• RRS report[6] • PUD M&E reports	Continue RRS study and PUD hatchery M&E monitoring	Funded by BPA and PUDs
		3.6 Is supplementation likely to improve N_e?	Geneticist opinion	• RRS report[7] • PUD M&E reports	Review or assessment of genetic experts	Consult WDFW, NMFS, Tribal geneticists
		3.7 How is genetic differentiation among wild fish changing over time?	Genetic variables in GPUD M&E plan	• GPUD M&E reports • RRS[8]	Continue RRS study and GPUD hatchery M&E monitoring	Funded by GPUD and BPA
		3.8 What is the probability of persistence of the WR spawning aggregate for all life histories (fall and spring emigrants) without hatchery intervention? [Not clear whether separate analysis will be done for each life-history or is the idea that the analysis	Life stage survival	• Ongoing M&E in the basin • Life cycle model[9]	Assemble data and conduct modeling	GPUD *Note: Other funding sources may be needed depending upon which life-cycle model is used*

[4] See footnote 3
[5] See footnote 2
[6] See footnote 2
[7] See footnote 2
[8] See footnote 2
[9] See footnote 3

		will not be limited to spring smolts?]				
4	**Is there ability to collect sufficient broodstock?**		Abundance of spring Chinook by spawning aggregate at Tumwater Dam	• GPUD M&E reports	Assemble data and conduct modeling	GPUD staff work
5	**Can facilities & infrastructure be acquired to implement the program?**	What new infrastructure is needed? What capacity is available at existing facilities?	Assess suitable land for sale in the WR	• Real Estate Listings	Assess suitable land for sale in the WR	GPUD staff work
6	**Is program permit approval likely?**		Chelan County regulations in SMP	• Chelan County regulations in SMP • ESA permit status	Research regulation and talk to Chelan County Staff, provide comments on SMP updates (e.g., provide definition of aquaculture)	GPUD staff and other interested parties

Attachment 1: PRCC – Policy Committee Statement of Agreement 2013-01 Upper Wenatchee River Basin Spring Chinook Mitigation – White River

Priest Rapids Coordinating Committee – Policy Committee
Statement of Agreement
White River Spring Chinook Mitigation

Approved On February 8, 2013 by the Priest Rapids Coordinating Committee – Policy Committee

Statement: The Priest Rapids Coordinating Committee - Policy Committee (PRCC PC) agrees that given the technical, scientific, and political challenges the planned alternative of implementing a 74,556 hatchery smolt supplementation program on the White River is not feasible at this time. In order for Grant PUD to meet its Wenatchee spring Chinook salmon mitigation for the period from BY 2013 through BY 2026, the PRCC PC agrees to the following:

1) Grant PUD will complete the White River Captive Brood Program with the last release in 2016 and the last monitoring of captive brood fish in the natural environment in 2019. Grant PUD will not be responsible for any artificial propagation activities in the White River through BY 2026;

2) Grant PUD will continue to implement the Monitoring and Evaluation (M&E) plan for the White River (2020-2026), which was developed by the PRCC HSC and reviewed and approved by FERC on February 7th, 2012 and is currently being updated by the PRCC HSC. Finalization of this update is anticipated in spring 2013. Grant PUD agrees that the PRCC HSC would be responsible for adapting the M&E program to new information. Grant PUD may need to seek FERC approval per license Article 401(b) prior to implementation. Additional data collection beyond that collected as part of the Grant PUD-funded hatchery M&E plan is not the obligation of Grant PUD but may be funded via other sources such as the PRCC's Habitat and No Net Impact accounts, Salmon Recovery Funding (SRF) Board, and/or Bonneville Power Administration;

3) Grant PUD will build the Nason Creek Acclimation Facility to accommodate up to 275,000 smolts;

4) Grant PUD Wenatchee spring Chinook mitigation requirements will be met via a combined total of 223,670 spring Chinook between the Nason Creek Program and the White River Captive Brood Program through 2016. For example, the current target for Nason Creek is 150,000 smolts, while the target for White River is 75,000 smolts. In the near-term, it is expected that the White River Program will produce in excess of 75,000 smolts while Nason Creek may experience shortfalls as that program develops. During this timeframe, up to 75,000 White River smolts will be credited to Grant PUD's overall Wenatchee spring Chinook production requirement of 223,670;

5) Grant PUD will meet its Wenatchee spring Chinook mitigation post 2016 (2017-2026) via the Nason Creek Program. In the event shortfalls in meeting production at Nason Creek are identified, Grant PUD will, in consultation with the PRCC HSC, develop strategies to address these shortfalls through hatchery production or other alternatives as agreed to by the PRCC HSC;

6) The disposition of White River and non-Nason Creek natural origin adults encountered during broodstock collections at Tumwater and/or other locations will be the responsibility of the Joint Fisheries Parties that are signatories to the Section 10 permit for the Nason Creek spring Chinook program;

7) By 2026, the PRCC HSC will assess the need to restart a White River spring Chinook hatchery supplementation program by assembling all relevant technical information and overseeing an independent scientific review. The independent scientific review will consist of a panel of subject matter experts selected by the PRCC HSC who will address specific critical questions developed by the PRCC HSC. The expert panel will address the critical questions but will not have decision-making authority over the future of the White River spring Chinook program. Prior to initiating the independent scientific review, the PRCC will review and approve the framework and structure of the review. Once the framework and structure of the scientific review is approved by the PRCC, the review should be complete within one year.

8) Implementation of this agreement is contingent upon National Marine Fisheries Service issuance of an ESA Section 10 permit for the Nason Creek spring Chinook program prior to 2013 broodstock collection.

Attachment 2: Excerpts from: NOAA Technical Memorandum NMFS-NWFSC-42, *Viable Salmonid Populations and the Recovery of Evolutionarily Significant Units*, June 2000

http://www.westcoast.fisheries.noaa.gov/publications/protected_species/salmon_steelhead/vsp_2000.pdf

Four parameters form the key to evaluating population status. They are: abundance, population growth rate, population spatial structure, and diversity. NMFS focuses on these parameters for several reasons. First, they are reasonable predictors of extinction risk (viability). Second, they reflect general processes that are important to all populations of all species. For example, many factors influence abundance, (e.g., habitat quality, interactions with other species, harvest programs, etc.). Many of these factors are species- or ESU-specific. By focusing on abundance, we can seek general conclusions about an ESU's extinction risk even in the absence of detailed, species-specific information on all of the factors that influence abundance. Third, the parameters are measurable.

Viable Population Size Guidelines

1. A population should be large enough to have a high probability of surviving environmental variation of the patterns and magnitudes observed in the past and expected in the future. Sources of such variation include fluctuations in ocean conditions and local disturbances such as contaminant spills or landslides. Environmental variation and catastrophes are the primary risks for larger populations with positive long-term average growth rates.

2. A population should have sufficient abundance for compensatory processes to provide resilience to environmental and anthropogenic perturbation. In effect, this means that abundance is substantially above levels where depensatory processes are likely to be important (see Critical Guideline 1 as follows) and in the realm where compensation is substantially reducing productivity. This level is difficult to determine with any precision without high quality long-term data on population abundance and productivity, but can be approximated by a variety of methods.

3. A population should be sufficiently large to maintain its genetic diversity over the long term. Small populations are subject to various genetic problems, including loss of genetic variation, inbreeding depression, and deleterious mutation accumulation, that are influenced more by effective population size than by absolute abundance.

4. A population should be sufficiently abundant to provide important ecological functions throughout its life-cycle. Salmonids modify both their physical and biological environments in various ways throughout their life cycle. These modifications can benefit salmonid production and improve habitat conditions for other organisms as well. The abundance levels required for these effects depend largely on the local habitat structure and particular species' biology.

5. Population status evaluations should take uncertainty regarding abundance into account. Fish abundance estimates always contain observational error, and therefore population targets may need to be much larger than the desired population size in order to be confident that the guideline is actually met. In addition, salmon are short-lived species with wide year-to-year abundance variations that contribute to uncertainty about average abundance and trends. For these reasons, it would not be prudent to base abundance criteria on a single high or low observation. To be considered a VSP, a population should exceed these criteria on average over a period of time.

Critical Population Size Guidelines

1. A population would be critically low if depensatory processes are likely to reduce it below replacement. The specific population levels where these processes become important are difficult to determine, although there is theory on mate

choice, sex-ratios, and other population processes that may be helpful in placing a lower bound on safe population levels. In general, however, small-population depensatory effects depend largely on density rather than absolute abundance. A species life-history and habitat structure play large roles in determining the levels at which depensation becomes important.

2. A population would be critically low if it is at risk from inbreeding depression or fixation of deleterious mutations. The most important genetic risks for very small populations are inbreeding depression and fixation of deleterious mutations; these effects are influenced more by the effective breeding population size than by absolute numbers of individuals.

3. A population would be critically low in abundance when productivity variation due to demographic stochasticity becomes a substantial source of risk. Demographic stochasticity refers to the seemingly random effects of variation in individual survival or fecundity that are most easily observed in small populations. As populations decline, the relative influences of environmental variation and demographic stochasticity changes—with the latter coming to dominate in very small populations.

4. Population status evaluations should take uncertainty regarding abundance into account. Fish abundance estimates always contain observational error and therefore population targets may need to be much larger than the desired population size in order to be confident that the guideline is actually met. In addition, salmon are short-lived species with wide year-to-year abundance variations that contribute to uncertainty about average abundance and trends. For these reasons, it would not be prudent to base abundance criteria on a single high or low observation. To be considered critically low, a population would fall below these criteria on average over a short period of time.

Population Growth Rate and Related Parameters Guidelines

1. A population's natural productivity should be sufficient to maintain its abundance above the viable level. A population meeting or exceeding abundance criteria for viability should, on average, be able to replace itself. That is, spawner: spawner ratios or cohort-replacement ratios should fluctuate around 1.0 or above. Natural productivity is typically measured as the ratio of naturally- produced spawners born in one broodyear to the number of fish spawning in the natural habitat during that broodyear; population abundance estimates at other life-history stages may also be used, provided such estimates span the entire life cycle (e.g., smolt to smolt estimates).

2. A viable salmonid population that includes naturally spawning hatchery fish should exhibit sufficient productivity from naturally-produced spawners to maintain population abundance at or above viability thresholds in the absence of hatchery subsidy. In a strict sense, this guideline suggests that the mean Natural Return Ratio (NRR) for a viable population should fluctuate around 1.0, indicating negligible hatchery influence on the population. In a practical sense, the requirement that a viable population be demographically independent of a hatchery population suggests that a viable population's mean NRR not be less than approximately 0.9, but this estimate neglects other issues related to the influence of hatchery fish on natural production. A viable population should not exhibit a trend of proportionally increasing contributions from naturally spawning hatchery fish.

3. A viable salmonid population should exhibit sufficient productivity during freshwater life-history stages to maintain its abundance at or above viable thresholds—even during poor ocean conditions. A population's productivity should allow it both to exploit available habitat and exhibit a compensatory response at low population sizes. When spawner abundance is below the long-term mean, there should be a corresponding increase in per capita smolt production, even though such an increase may not suffice to offset declines in marine survival.

4. A viable salmonid population should not exhibit sustained declines in abundance that span multiple generations and affect multiple broodyear-cycles. "Sustained" declines are those that continue longer than the typical lag in response associated with a population's generation time. Thus, sustained declines differ from rapid transitions between one stable level and another (e.g., changes in abundance related to large-scale, low frequency environmental forcing such as those related to oceanic regime shifts). They also differ from short-term, severe perturbations in abundance, such as those related to strong El Niño events that are followed by relatively rapid recovery.

5. A viable salmonid population should not exhibit trends or shifts in traits that portend declines in population growth rate. Changes in such traits, such as size and age of spawners, that affect population growth rate are often more easily and precisely quantified than are changes in abundance and thus, may provide earlier indication of declining population growth rate. For example, reduced size of mature individuals in a population may indicate reduced fecundity, lessened ability to reach spawning grounds, a decreased capacity for constructing redds that are deep enough to resist bed scour, or other factors that contribute to reduced production of offspring. Likewise, increasing age-at-return may reduce a population's intrinsic productivity by exposing adults to greater pre-reproductive spawning risk.

6. Population status evaluations should take into account uncertainty in estimates of population growth rate and productivity-related parameters. To estimate long-term trends and spawner- recruit ratios, it is important to have an adequate time series of abundance. Unfortunately, such time series, when they exist at all, are often short, contain large observational errors, or both. These constraints may greatly limit the power of statistical analyses to detect ecologically significant trends before substantial changes in abundance have occurred.

Spatial Structure Guidelines

1. Habitat patches should not be destroyed faster than they are naturally created. Salmonid habitat is dynamic, with suitable habitat being continually created and destroyed by natural processes. Human activities should not decrease either the total area of habitat OR the number of habitat patches. This guideline is similar to the population growth rate criterion—i.e., a negative trend has deterministically negative affects on viability—though the relationship between decreasing number of patches and extinction risk is not necessarily linear.

2. Natural rates of straying among subpopulations should not be substantially increased or decreased by human actions.

This guideline means that habitat patches should be close enough together to allow appropriate exchange of spawners and the expansion of the population into under- used patches, during times when salmon are abundant (see Guideline 3). Also, stray rates should not be much greater than pristine levels, because increases in stray rates may negatively affect a population's viability if fish wander into unsuitable habitat or interbreed with genetically unrelated fish.

3. Some habitat patches should be maintained that appear to be suitable or marginally suitable, but currently contain no fish. In the dynamics of natural populations, there may be time lags between the appearance of empty but suitable habitat (by whatever process) and the colonization of that habitat. If human activity is allowed to render habitat unsuitable when no fish are present, the population as a whole may not be sustainable over the long term.

4. Source subpopulations should be maintained. Some habitat patches are naturally more productive than others. In fact, a few patches may operate as highly productive source subpopulations that support several sink subpopulations that are not self-sustaining. Protecting these source patches should obviously be of the highest priority. However, it should be recognized that spatial processes are dynamic and sources and sinks may exchange roles over time

5. Analyses of population spatial processes should take uncertainty into account. In general, there is less information available on how spatial processes relate to salmonid viability than there is for the other VSP parameters. As a default,

historic spatial processes should be preserved because we assume that the historical population structure was sustainable but we do not know whether a novel spatial structure will be.

Diversity Guidelines

1. Human-caused factors such as habitat changes, harvest pressures, artificial propagation, and exotic species introduction should not substantially alter variation in traits such as run timing, age structure, size, fecundity, morphology, behavior, and molecular genetic characteristics. Many of these traits may be adaptations to local conditions, or they may help protect a population against environmental variation. A mixture of genetic and environmental factors usually causes phenotypic diversity, and this diversity should be maintained even if it cannot be shown to have a genetic basis.

2. Natural processes of dispersal should be maintained. Human-cased factors should not substantially alter the rate of gene flow among populations. Human caused inter-ESU stray rates that are expected to produce (inferred) sustained gene flow rates greater than 1% (into a population) should be cause for concern. Human caused intra-ESU stray rates that are expected to produce substantial changes in patterns of gene flow should be avoided.

3. Natural processes that cause ecological variation should be maintained. Phenotypic diversity can be maintained by spatial and temporal variation in habitat characteristics. This guideline involves maintaining processes that promote ecological diversity, including natural habitat disturbance regimes and factors that maintain habitat patches of sufficient quality for successful colonization.

4. Population status evaluations should take uncertainty about requisite levels of diversity into account. Our understanding of the role diversity plays in Pacific salmonid viability is limited. Historically, salmonid populations were generally self-sustaining, and the historical representation of phenotypic diversity serves as a useful “default” goal in maintaining viable populations.

Questions for Craig Busack:

Craig Busack

January 27, 2020

Here are responses to the questions that were posed to me at the 1/15 committee meeting. These answers will undoubtedly differ somewhat from what I said at the meeting, as per the email message I sent to the committee last week. Long story short, I can offer opinions/perspectives on all these, but decision-making authority on many lies within the Interior Columbia Branch Office (ICBO), the local head of which is Dale Bambrick, not with the Sustainable Fisheries Division, of which Brett and I are members.

1. Is the White River spawning aggregate necessary to the Wenatchee spring Chinook population in regards to meeting VSP criteria? ***This has been discussed many times within the agency, including Mike Ford and Tom Cooney. The short answer is no, but it will help achieve the 4 of 5 spawning aggregate goal. And the goal is just that. The recovery plan presented the best thinking on the matter at the time. If, over time, it appears that some of the goals are unachievable, or achieving them poses greater risk to the species than achieving them, goals can be adjusted,***

2. What is the NOAA Science Center's most recent view on the importance of the White River spawning aggregate? ***I contacted Mike Ford for the most recent information. He said his most recent information was Chiwawa-White Fst=.0049, Chiwawa-Nason Fst=.0025, and wild-hatchery in that area Fst=.0025. So White is more different than the general baseline level of Fst, but these are very small Fst levels. To the extent that the distinctiveness of White River is due to adaptation to the environment it occupies, this distinctiveness could be regained if it were to be lost.***

   I'd like to also point out that the genetic distinctiveness (or lack thereof) of the White River spring Chinook spawning aggregate has been discussed many times within the PRCC HSC, including at least one panel discussion by geneticists from CRITFC, NOAA, and WDFW. I recommend the committee refer to the records of these past discussions in the minutes

3. If the White River and Little Wenatchee spawning aggregates are important to recovery and both suffer from the same limiting factors, how will NOAA address recovery without one or both aggregates? ***I'm not going to answer this directly because the ensuing discussion focused more on the issue of the Wenatchee River spawning aggregate not really existing. If this were the case, the current spatial distribution specs in the recovery plan now seem much more onerous (i.e., is it now that all 4 real spawning aggregates are needed?) How to deal with this, including the possibility of a revision to the recovery plan, is something you should take up with Dale. See answer to # 1 above. In addition, I think the question is better worded as "how MIGHT NOAA address recovery….." We are a long haul away from recovery for UCR spring-run Chinook salmon. It is nevertheless hard to imagine that we would not consider delisting if all three populations are meeting abundance and productivity goals and most major spawning areas meet recovery criteria. We do not at this time know how productive the White and Little Wenatchee major spawning areas might eventually be. Measures to improve local habitats***

and reduce mortality within the migration corridor continue and may eventually contribute significantly to the abundance and productivity within these MSA.

4. How important is the White River aggregate to the overall genetic diversity of Wenatchee spring Chinook?
   a. How much within-population genetic variation is needed for recovery? I know of no set *quantitative standards for diversity for any ESU or DPS.* ***My experience in recovery discussions, including assessing population VSP levels is that everything has to be evaluated in the context of everything else (i.e. it is relational, not absolute). However, this question is more appropriate for Dale, assisted by NWFSC geneticists.*** *Agreed. See earlier comments.*
   b. Given the degree of escapement by other within basin aggregates into the White River, is there evidence to suggest that the White River aggregate is still genetically distinct? ***See answers to earlier questions (particularly question #2) above also refer back to minutes from previous discussions.***
5. If the White River genetic signature is lost, can recovery still be achieved? ***As I said earlier, recent discussions at NOAA have concluded yes.***
   a. If so, how do we achieve recovery without the White River genetic signature? ***Again, this is technically outside my lane, so again, it would be wise to contact Dale. However, I also recommend looking at the recovery plan. I have not studied it in detail, but I think there is lack of emphasis on White River specifically. It is unclear that there is at present much of a White River signature. We believe it is more likely that such a signature would become more pronounced if this MSA is not supplemented with hatchery fish. As for how we might achieve recovery, I think this has more to do with distribution of spawning than a genetic signature, but see answers 1 and 3.***
6. Would NOAA support a composite broodstock hatchery program for the White River? ***Depends on the details of that program, but at this point it is not clear what the benefits would be. While it can be argued that a larger spawning population is a good thing in that it reduces genetic drift, allowing natural selection to be more efficient, compositing would likely erase the White River genetic signature. It also seems that given the low production potential of the White River basin, the value of the program is open to question. At this time, we do not think a supplementation program would benefit the MSA or move us any closer to recovery.***
7. If White River spring Chinook are not genetically distinct from other Wenatchee spring Chinook aggregates, what would be NOAA's view on White River supplementation? ***Same as #6, but genetic concerns would be less. The White River spawning aggregate is distinct; the question is how high a value to place on this low level of distinctness.***
8. If HORs do not contribute to NORs, would adding another supplementation program in the Wenatchee contribute to recovery? ***Maybe, maybe not. Key to recovery is sustainability of natural production, not how many NORs you can create by augmenting spawning grounds with hatchery fish. Exactly how the hatchery programs contribute to recovery is a question best asked of the ICBO. We would expect to be in on that discussion, but in a supporting role.***

In the ensuing discussion, it became clear that a larger issue is the general recovery benefits of supplementation programs, other than as a buffer against extinction. My own opinion is that supplementation programs only really solve problems when populations are critically low; you can't permanently get more natural production out of a system without increasing the productivity and capacity of that system. I concur. I'd rather conquer, but I'll settle for concur.

Independent Expert Scientific Review - White River and the ISAB/ISRP

Working DRAFT 4/18/2024

SOA 2013-01, bullet 7, Features of the panel

- "By 2026, the PRCC HSC will assess the need to restart a White River spring Chinook hatchery supplementation program by assembling all relevant technical information and overseeing an independent scientific review. The independent scientific review will consist of a panel of subject matter experts selected by the PRCC HSC who will address specific critical questions developed by the PRCC HSC. The expert panel will address the critical questions but will not have decision-making authority over the future of the White River spring Chinook program. Prior to initiating the independent scientific review, the PRCC will review and approve the framework and structure of the review. Once the framework and structure of the scientific review is approved by the PRCC, the review should be complete within one year."
- *Features of the panel: 1) independent, 2) scientific, 3) expert, 4) review*

Independent Scientific Advisory Board

- “The Independent Scientific Advisory Board (ISAB) serves the National Marine Fisheries Service (NOAA Fisheries), Columbia River Indian Tribes, and the Council by providing independent scientific advice and recommendations regarding scientific issues that relate to the respective agencies' fish and wildlife programs.”

ISAB criteria for membership

1) High achievement in a relevant scientific discipline which may include biology, ecology, fisheries, hydrology, river geomorphology, statistics, wildlife ecology, ocean and estuary ecology, fish husbandry, genetics, social and economic sciences, and other relevant disciplines.
2) A strong record of scientific accomplishment documented by contribution to the peer-reviewed literature or other evidence of creative scientific accomplishment.
3) High standards of scientific integrity, independence and objectivity.
4) Ability to forge creative solutions to complex problems.
5) Interest in and ability to work effectively in an interdisciplinary setting.

ISAB Members (as of 4/3/2024)

1. Courtney Carothers, Ph.D., Professor, Department of Fisheries, College of Fisheries and Ocean Sciences, **University of Alaska Fairbanks**
2. Patrick Connolly, Ph.D., **Retired**, Emeritus Lead Research Fish Biologist at the **United States Geological Survey's Columbia River Research Laboratory in Cook**, Washington
3. John Epifanio, Ph.D., recently **retired** as Principal Scientist with the Illinois Natural History Survey and as a Research Professor with the **University of Illinois**; now based in Portland, Oregon
4. Dana Infante, Ph.D., Professor and Associate Director of AgBioResearch, **Michigan State University** (also serves on ISRP)
5. James Irvine, Ph.D., **Emeritus** Research Scientist, Fisheries and Oceans, Canada, **Pacific Biological Station, Nanaimo, British Columbia**
6. Yolanda Morbey, Ph.D., Associate Professor, Department of Biology, **Western University, Ontario, Canada**
7. Chair: Thomas Quinn, Ph.D., Professor of Aquatic and Fisheries Sciences at the **University of Washington** (also serves on ISRP)
8. Kenneth Rose, Ph.D., France-Merrick Professor in Sustainable Ecosystem Restoration at Horn Point Laboratory of the **University of Maryland** Center for Environmental Science (also serves on ISRP)
9. Vice-chair: Desiree Tullos, Ph.D., P.E., Professor at **Oregon State University**, Biological and Ecological Engineering Department
10. Ellen Wohl, Ph.D., Professor of Geology and University Distinguished Professor, Department of Geosciences, **Colorado State University**, Fort Collins (also serves on ISRP)
11. Michael Young, Ph.D., **Emeritus** Research Fisheries Biologist, **Rocky Mountain Research Station**, U.S. Forest Service, Missoula, Montana

ISRP (as of 4/3/2024)

1. Chair: Richard Carmichael, M.S., **Consulting Fisheries Scientist**, formerly Program Director Northeast-Central Oregon Fish Research and Monitoring, Oregon Department of Fish and Wildlife
2. Patrick Connolly, Ph.D., **Retired,** Emeritus Lead Research Fish Biologist at the **United States Geological Survey's Columbia River Research Laboratory in Cook**, Washington
3. Kurt Fausch, Ph.D., Professor of Fisheries and Aquatic Sciences, Department of Fish, Wildlife, and Conservation Biology at **Colorado State University**
4. Vice-chair: Kurt Fresh, M.S., **formerly** Program Manager for the Estuary and Ocean Ecology Program at the **Northwest Fisheries Science Center**, NOAA Fisheries
5. Dana Infante, Ph.D., Professor and Associate Director of AgBioResearch, **Michigan State University** (also serves on ISAB)
6. Josh Korman, Ph.D., President of Ecometric Research and an Adjunct Professor, Institute of Ocean and Fisheries, **University of British Columbia**
7. Yolanda Morbey, Ph.D., Associate Professor, Department of Biology, **Western University**, Ontario, Canada
8. Thomas Quinn, Ph.D., Professor of Aquatic and Fisheries Sciences at the **University of Washington** (also serves on ISAB)
9. Kenneth Rose, Ph.D., France-Merrick Professor in Sustainable Ecosystem Restoration at Horn Point Laboratory of the **University of Maryland** Center for Environmental Science (also serves on ISAB)
10. Thomas Turner, Ph.D., Professor of Biology and Associate Dean for Research at the **University of New Mexico**
11. Ellen Wohl, Ph.D., Professor of Geology and University Distinguished Professor, Department of Geosciences, **Colorado State University**, Fort Collins (also serves on ISAB)

ISAB and ISRP membership affiliations

	ISAB	ISRP	Combined
University	8 (1 retired)	8	16
Research Station	3 (all retired)	2 (all retired)	5
Consultant	0	1	1
Total	11	11	22

ISAB and ISRP membership characteristics

	ISAB	ISRP	Combined
Ph.D.s	11	9	20
Non Columbia Basin Primary Focus??	10	9	19
Out of WA state	9	8	17
Total	11	11	22

Conflict of interest (ISAB)

- "Conflict of interest" means any financial or other interest which conflicts with the service of the individual because it 1) impairs the individual's objectivity or 2) could create an unfair competitive advantage for any person or organization.

ISAB conflict of interest form

Disclosure. By April 1 of each year, ISAB members will submit a completed "Disclosure of Personal Involvements" form to the Conflict of Interest Committee. Within the year, members are required to update this information if necessary. Disclosure information includes:

- Financial interests
- Research support
- Agency or group affiliations
- Public statements and positions
- Other circumstances or information

Disclosure information should identify any connection between the individual and programs or activities of the NPPC, NMFS, BPA, regional fishery managers and Indian Tribes, Northwest energy interests or other users of the Columbia River.

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