

FINAL MEMORANDUM

To: Wells, Rocky Reach, and Rock Island
HCPs Hatchery Committees **Date:** May 23, 2016

From: Tracy Hillman, HCP Hatchery Committees Chairman

Cc: Sarah Montgomery, Anchor QEA, LLC

Re: Final Minutes of the April 20, 2016, HCP Hatchery Committees Meeting

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Hatchery Committees meeting was held at Chelan PUD headquarters in Wenatchee, Washington, on Wednesday, April 20, 2016, from 9:30 a.m. to 12:30 p.m. Attendees are listed in Attachment A to these meeting minutes.

ACTION ITEM SUMMARY

- McLain Johnson (Washington Department of Fish and Wildlife [WDFW]) will develop a timeline for conducting genetic sampling for HCP program species (Item I-A). *(Note: this item is ongoing.)*
 - Catherine Willard will draft a summary of the 5-Year Hatchery Monitoring and Evaluation (M&E) Review process (Item I-A). *(Note: this item is ongoing.)*
 - Kirk Truscott will send Okanogan program proportionate natural influence (PNI) and proportion of hatchery-origin spawners (pHOS) goals to Keely Murdoch for use in the Draft Hatchery M&E Plan Appendix 3 (Item II-A).
 - Craig Busack will send the draft Methow spring Chinook Program permits to the Hatchery Committees (Item II-A).
 - Keely Murdoch will revise Draft Hatchery M&E Plan Appendix 3 and send it to Sarah Montgomery by Wednesday, May 18, 2016, which she will forward to the Hatchery Committees for review (Item II-B). *(Note: Murdoch sent Appendix 3 to Montgomery on Monday, May 16, 2016, which she forwarded to the Hatchery Committees.)*
 - The Hatchery Committees will discuss Draft Hatchery M&E Plan Appendices 2 to 6 during the June 15, 2016 Hatchery Committees meeting (Item II-B).
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- Catherine Willard will send a Doodle poll to the Hatchery Committees in order to determine a date for visiting the Issaquah Salmon Hatchery (Item II-C). (*Note: Willard sent the poll to Sarah Montgomery, which she forwarded to the Hatchery Committees on April 25, 2016.*)
- The imprinting and homing workgroup will visit the Issaquah Salmon Hatchery on May 26, 2016 (Item II-C).
- Tracy Hillman will send his paper titled, “Assessment of Factors Limiting the Productivity of Summer Chinook Salmon in the Mid-Columbia River” to Craig Busack (Item II-D). (*Note: Hillman sent the paper to Busack on April 20, 2016.*)
- Mike Tonseth will discuss foregoing additional steelhead adult management at Tumwater Dam with Andrew Murdoch (WDFW; Item III-A).

DECISION SUMMARY

- The Hatchery Committees approved the Final 2016 Broodstock Collection Protocols via email on March 13, 2016. Sarah Montgomery distributed the document to the Hatchery Committees for approval on April 7, 2016, and the final version was distributed on March 14, 2016.

AGREEMENTS

- There were no agreements during today’s meeting.

REVIEW ITEMS

- Sarah Montgomery sent an email to the Hatchery Committees on May 16, 2016, notifying them that Draft Hatchery M&E Plan Appendices 2 through 6 are available for review before the Hatchery Committees June 15, 2016 meeting (Item II-B).

FINALIZED DOCUMENTS

- Sarah Montgomery sent an email to the Hatchery Committees on March 30, 2016, notifying them that the Final 2015 Wells HCP Annual Report is available for download from the Hatchery Committees Extranet site.
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- Sarah Montgomery sent an email to the Hatchery Committees on April 8, 2016, notifying them that the Final 2015 Rocky Reach and Rock Island HCP Annual Reports are available for download from the Hatchery Committees Extranet site.
- Sarah Montgomery sent an email to the Hatchery Committees on April 14, 2016, notifying them that the Final 2016 Broodstock Collection Protocols are available for download from the Hatchery Committees Extranet site.

I. Welcome

A. *Review Agenda, Review Last Meeting Action Items, and Approve the March 3, 2016, and March 16, 2016, Meeting Minutes (Tracy Hillman)*

Tracy Hillman welcomed the Hatchery Committees and asked for any additions or changes to the agenda. The following revisions were requested:

- Keely Murdoch added a discussion about the Yakama Nation (YN) Statement of Work (SOW) for Releasing Adult Pacific Lamprey in the Tumwater Dam Fish Ladder
- The U.S. Fish and Wildlife Service (USFWS) Consultation Update was removed because USFWS did not attend the meeting.

The Hatchery Committees reviewed the revised draft March 3, 2016, conference call minutes, and the revised draft March 16, 2016. Sarah Montgomery said there are several outstanding comments to be discussed. The Hatchery Committees discussed the outstanding comments and made revisions.

Hatchery Committees members present approved the draft March 3, 2016, conference call minutes, as revised. Hatchery Committees members present approved the draft March 16, 2016, meeting minutes, as revised.

Action items from the Hatchery Committees meeting on March 16, 2016, and follow-up discussions, were addressed (*note: italicized text below corresponds to agenda items from the meeting on March 16, 2016*):

- *McLain Johnson (Washington Department of Fish and Wildlife [WDFW]) will develop a timeline for conducting genetic sampling for HCP program species*
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(Item I-A).

This item is ongoing. Johnson sent an email update to the Hatchery Committees on April 5, 2016, stating that their workgroup is drafting an updated timeline and they plan to have a draft for review by May 1, 2016.

- *Keely Murdoch will develop her draft, "Techniques to Improve Homing Fidelity for Chewuch and Twisp River Releases of Spring Chinook Salmon," into a study plan, and will coordinate with Chelan, Douglas, and Grant PUDs regarding feasibility*

(Item II-A).

This item is complete. Keely Murdoch sent the Draft Chewuch Homing Study Proposal to the Hatchery Committees on April 11, 2016.

- *Catherine Willard will draft a summary of the 5-Year Hatchery Monitoring and Evaluation (M&E) Review process (Item II-A).*

This item is ongoing.

- *Hatchery Evaluation Technical Team (HETT) members will update Draft Hatchery M&E Plan Appendices 2 through 6 and send revised versions to Sarah Montgomery by Thursday, February 4, 2016, which she will forward to the Hatchery Committees for review (Item II-E).*

This item is ongoing. Keely Murdoch said she is still working on Appendix 3 and has requested information about the Okanogan program to include in the appendix.

Kirk Truscott said he would send Okanogan program PNI and pHOS goals to Keely Murdoch.

- *Sarah Montgomery will send Draft Hatchery M&E Plan Appendices 2, 4, 5 and 6 to the Hatchery Committees for review (Item II-E).*

This item is complete. Montgomery sent the Appendices to the Hatchery Committees on March 18, 2016.

- *Tracy Hillman will distribute the paper, "Olfactory navigation during spawning migrations: a review and introduction of the Hierarchical Navigation Hypothesis," to the Hatchery Committees (Item I-A).*

This item is complete. Hillman sent the paper to Sarah Montgomery on March 16, 2016, which she forwarded to the Hatchery Committees that same day.

- *Sarah Montgomery will forward information received from Todd Pearsons regarding Grant PUD's website, which publically hosts M&E documents (Item I-A).*
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This item is complete. Montgomery forwarded Pearsons' emails to the Hatchery Committees on March 16, 2016.

- *A portion of the Hatchery Committees representatives will convene as a workgroup to discuss the logistics of a draft study plan for addressing imprinting and homing in the Methow basin (Item II-A).*

This item is complete. The workgroup met on March 23, 2016.

- *Sarah Montgomery will send a Doodle poll to the Hatchery Committees to convene a workgroup to discuss the logistics of a draft study plan for addressing imprinting and homing in the Methow basin (Item II-A).*

This item is complete. Montgomery sent the Doodle poll to the Hatchery Committees on March 17, 2016.

- *Tracy Hillman will call Kirk Truscott to discuss the imprinting and homing workgroup (Item II-A).*

This item is complete. Hillman and Truscott discussed the workgroup on March 21, 2016.

- *The Hatchery Committees will provide comments on WDFW's Draft (Version 2) Broodstock Collection Protocols to Mike Tonseth by March 25, 2016 (Item II-D).*

This item is complete.

- *Mike Tonseth will send the final draft Broodstock Collection Protocols to the Hatchery Committees for approval via email on or before April 12, 2016 (Item II-D).*

This item is complete. Tonseth sent the final draft Broodstock Collection Protocols to the Hatchery Committees on April 8, 2016, requesting an email vote by April 13, 2016.

- *Tracy Hillman will calculate carrying capacity for Chiwawa River spring Chinook salmon for discussion at the May 18, 2016, Hatchery Committees meeting (Item II-E).*

Hillman said this item is complete and will be discussed today.

- *Catherine Willard will provide an update on Blackbird Pond Acclimation passive integrated transponder (PIT)-tag data results at the April 20, 2016, Hatchery Committees meeting (Item III-A).*

This item will be discussed today.

II. Joint HCP-HC/PRCC HSC

A. NMFS Consultation Update (Craig Busack)

Craig Busack said he heard that Karl Halupka (USFWS) plans to have a final version of the Wenatchee River Steelhead Biological Opinion (BiOp) completed in May. Keely Murdoch asked if this would be a final draft for review or a final version. Alene Underwood said she had also asked Amilee Wilson about the state of the draft. Busack said he believes this will be a final version, and that Amilee Wilson (NMFS) thought that Chelan PUD's comments had been adequately addressed in the latest version of the BiOp. Todd Pearsons said he thought that Halupka was going to meet individually with parties to discuss the draft and the Incidental Take Statement (ITS). Tonseth said that WDFW has worked with USFWS on the draft BiOp, and that National Marine Fisheries Service (NMFS) has also worked with USFWS on the draft. Busack said NMFS is hoping the USFWS Wenatchee River Steelhead BiOp is completed soon because the NMFS Wenatchee River Steelhead BiOp is also near completion. Busack said Wilson received the NMFS Wenatchee River Steelhead BiOp from General Counsel, and General Counsel asked for a take surrogate for ecological interactions. He said Wilson has been working on developing a take surrogate, and the BiOp is very near completion. Tracy Hillman asked what a take surrogate is. Busack said take surrogates are used when there are effects of interest that cannot be measured directly. He said, for example, PNI and pHOS standards are take surrogates that are used instead of measuring the fitness of individual fish over time and correlating that with hatchery impacts.

Busack said, for the Methow spring Chinook consultation, NMFS has developed draft permits. He said one confusing thing about the current draft is that YN should not have been included as an authorized agent under the Methow Hatchery permit, because they will receive their own permit. He said if an entity hires YN, they would be covered in the same way as other contractors. Busack said NMFS historically has issued one 1196 permit covering the different PUD programs, and NMFS would prefer to continue issuing permits in that manner. He said review processes are very complicated and making a separate permit for Chelan PUD would cause delay. Underwood said she is surprised to hear that NMFS drafted one permit covering the different PUD programs, because Chelan PUD's desire to have its own permit is consistent with how they applied for coverage (with WDFW as a co-permittee), and has been known and requested for the duration of the consultation process.

Busack said that would cause a delay in issuing the permit. He said NMFS is also undergoing a new National Environmental Policy Act (NEPA) process for the Methow program permits. Truscott asked to whom Busack distributed the draft 1196 permits. Busack said he initially sent them to the permit parties, but he would send the next draft to the Hatchery Committees.

Busack welcomed Emi Kondo (NMFS) to the meeting via phone, and said Kondo is a NMFS attorney working on the NEPA process for the Methow permits. Kondo said NMFS is waiting for approval from General Counsel and leadership, but tentatively planning to complete an Environmental Assessment or Environmental Impact Statement. Kondo said NMFS is tentatively planning to complete the NEPA process in July 2016. Pearsons asked whether the permit would be issued before or after the NEPA analysis is completed. Kondo replied that the permit will likely be issued when the analysis is complete. Busack said NMFS cannot issue permits until USFWS has finished their permitting process for the same programs in the Methow basin. Pearsons asked if USFWS still plans to write a memorandum documenting Halupka's gap analysis, which states that the existing coverage for bull trout is adequate. Busack replied yes, based on his last conversation with Halupka.

Busack said the Chelan Hatchery and Genetic Management Plan (HGMP) is currently under review and open to public comment. He said, for Methow summer steelhead, a NEPA process is already underway; however, it cannot be completed until the proposed action with respect to gene flow is clarified. A management framework was developed in 2013, but Busack feels it is inconsistent with the approach being taken for spring Chinook salmon, so it likely needs to be modified. Once this is done, the NEPA process covering Methow steelhead can be continued. Truscott stated that a different HGMP provides coverage for the Okanogan steelhead program.

Busack said NMFS would like to include the existing programs at Chief Joseph Fish Hatchery in the Tribal Resource Management Plan (TRMP) program, because the existing coverage for Chief Joseph Fish Hatchery (FH) expires soon. Truscott said the CCT are still in discussions about the inclusion of Chief Joseph FH into the TRMP, and CCT would not want to delay

the issuance of a BiOp for the TRMP by including the Chief Joseph FH programs. He said the changes to the HGMP would be that fewer fish are released than in the original HGMP.

Regarding the Mitchell Act lawsuit, Busack said NMFS is being sued for funding hatchery programs without having Endangered Species Act (ESA) coverage for the funding itself. He said NMFS is developing a BiOp to cover the funding of the Mitchell Act programs. He said, to his knowledge, the only connection to Upper Columbia programs is that hatcheries in the lower Columbia River support the mid-Columbia coho salmon programs, but all coho salmon programs have explicit ESA coverage. He said NMFS hopes to have the BiOp completed by August 2016 so that they can disperse funds to the programs.

Busack said the Puget Sound early-run winter steelhead consultation has been signed, and fish have been released. He added that NMFS has hired four new staff to work on consultations such as the ones he described during this update.

B. HETT Update (Sarah Montgomery)

Sarah Montgomery said she distributed Draft Hatchery M&E Plan Appendices 2, 4, 5, and 6 to the Hatchery Committees on March 18, 2016, for review. She said Keely Murdoch is working on Appendix 3. Keely Murdoch said she would gather more information about the Okanogan program, with a target completion date of May 18, 2016. The Hatchery Committees will review Appendices 2 through 6 during the June 15, 2016, meeting.

C. Draft Chewuch Homing Study Proposal (Keely Murdoch)

Keely Murdoch said the imprinting and homing workgroup met on March 23, 2016. She said they primarily discussed a study plan for embryonic imprinting and briefly discussed methods for implementing a sequential imprinting study. She said the attendees were herself, Greg Mackey, Tom Kahler, Catherine Willard, Mike Tonseth, Jason Wahls (WDFW), Trista Welsh-Becker (WDFW, now at USFWS), and Charlie Snow (WDFW). She said Mackey and Kahler also discussed the draft study plan with Andrew Dittman (National Oceanic and Atmospheric Administration) via phone prior to the workgroup meeting. Keely Murdoch shared a document titled, "Draft Chewuch Homing Study Proposal" (Attachment B), which Sarah Montgomery distributed to the Hatchery Committees on April 11, 2016. She said the workgroup agreed that the treatment would be confined to the Chewuch River,

and the Twisp River would remain untreated and serve as a control, meaning that the entire study would be a before-after control-impact (BACI) study. She said the treatment would consist of applying Chewuch River water from the eye-up throughout feeding stages. She said the fish will be incubated in isobuckets with a recirculating system, so that one truckload of water is estimated to last 1 week. In addition, she said there would be a chiller to control water temperatures. Keely Murdoch said, based on information from Welsh-Becker, ultraviolet (UV) sterilization will likely be used to disinfect the water. UV treatment is known to change water chemistry, but research by Dittman suggests the imprinting signal may be retained. Mackey said many of these methods are based on a study being performed at the Issaquah Salmon Hatchery, which the Hatchery Committees plan to visit in order to observe its system and facility.

Murdoch said the document is still in its draft stages, and specifically needs work in the analytical section on how homing and straying data will be analyzed. Tracy Hillman suggested the study plan reference Appendix C of the 5-year Hatchery M&E Report, which describes methods for analyzing BACI study design.

Keely Murdoch said the timeline for the implementation of the embryonic imprinting study has been pushed back 1 year (starting in brood year [BY] 2017) to allow time to make and test the incubation system, as well as time for planning any infrastructure modifications.

Mackey said it would be important to run trials with hatchery-by-hatchery fish before using wild broodstock, so that wild-by-wild fish from endangered broodstock are not placed into a new system that has not been fully tested. He said they foresee using a UV treatment system, a chiller, and a filtering system for larger pathogens like the one at Issaquah Salmon Hatchery. Tonseth said another option for conducting facility testing would be to use an unlisted stock as a surrogate, such as eggs from Winthrop National Fish Hatchery. Keely Murdoch said time could be saved if the system were tested with hatchery-by-hatchery steelhead in the spring of 2017, in which case the system would be running smoothly in time to implement the study for BY 2017 spring Chinook salmon. She said that would provide 1 year to make any necessary infrastructure changes. Tonseth said the timing of making infrastructure changes is likely the biggest limitation to starting the study in 2017.

Todd Pearsons said that time should be allowed to work out bugs in the system, because this is pioneering work, and it will likely be challenging. He said one of the lessons learned from the size-target study was that it took a few years for fish culture staff to get the system and methodology running smoothly. He said there are ecological issues and uncertainties that will be worthwhile to work out before the study begins using wild-by-wild eggs. For example, the effects of the UV system on water chemistry are unknown, and it is possible that something in the UV treatment process would cause a fish to detect a difference in treated water compared to control water, thus affecting the imprinting signal. Also, it is unknown whether water should be UV treated throughout the entire study, or just when pathogen risks are highest (like from the beginning of the study to the eyed-egg stage). Busack said there is vulnerability from an ESA perspective in using wild-by-wild eggs, and that hatchery-by-hatchery spring Chinook salmon should at least be used to test the system first. Pearsons replied that using hatchery-by-hatchery spring Chinook salmon at a production scale could create issues in meeting PNI objectives. Keely Murdoch emphasized that the work described in this study plan is not entirely pioneering. Rather, incubation methods are already being implemented at Issaquah Salmon Hatchery, which the Hatchery Committees have already learned from and plan to visit in order learn more. Keely Murdoch said as long as there are no glitches during the incubation process, the worst-case scenario in using Methow Composite wild-by-wild fish is that they mostly return to the Methow River, which is already occurring. She said she does not see a need to test the incubation system at full production scale with Chinook salmon, and testing with steelhead in the spring should be sufficient.

Mackey said he calculated that the average rate at which fish released into the Chewuch did not home back to the Chewuch is 32 percent. He said the target from the M&E plan is 5 percent, so the study would ideally result in a change in the stray rate of 27 percent. He said the magnitude of this change is very large, with the desired change nearly the size of the mean itself. He conducted a quick two-tailed power analysis to estimate the number of years it would take to detect a certain effect size and found that it would take at least 4 years to detect a change in the mean stray rate of 27%. He said these results should be reviewed and discussed further, but using at least five brood cohorts might be a good starting point. Busack

said a 5 percent stray rate might not be a realistic target value for the Methow basin, and management targets should be defined before the study is undertaken. He said the Hatchery Committees should discuss what degree of improvement is meaningful from a management perspective.

Keely Murdoch said the imprinting and homing workgroup will visit the Issaquah Salmon Hatchery, which rears Kokanee, but if they visit in the spring, there may not be eggs on station. Mackey said it is important to see how the facility is plumbed regardless of whether or not they have eggs on station. Willard said she will send a Doodle poll to the Hatchery Committees in order to determine a date for visiting the Issaquah Salmon Hatchery.

D. Carrying Capacity Estimates (Tracy Hillman)

Tracy Hillman shared a presentation titled, “Carrying Capacity: Chiwawa Spring Chinook” (Attachment C). *(Note: Sarah Montgomery distributed the presentation to the Hatchery Committees following the meeting on April 21, 2016.)* Hillman said the purpose of this presentation is to share carrying capacity estimates for Chiwawa River spring Chinook salmon, and get feedback from the Hatchery Committees about how he should estimate carrying capacity for other programs to include in Appendix 1 of the Draft Hatchery M&E Plan. A summary of the presentation and questions and comments are included in the following sections.

Background (Slides 1-5)

The definition of carrying capacity varies depending on which model or method one uses. “Habitat capacity” is the number of individuals or biomass the resources of a given area can support through the most unfavorable period of the year, also called the maximum environmental load. “Population capacity,” on the other hand, is the maximum equilibrium population size estimated using population models such as the logistic equation or some stock-recruitment models, which defines an upper limit to population growth as density increases. Both types are considered carrying capacity. Fish experience bottlenecks during their life cycle, which limit population size. For example, fish may experience streamflow and temperature problems during summer rearing. Fish that pass through a summer

bottleneck may not fill winter habitat due to the mortality in the summer. In this case, the winter period is recruitment limited.

Population Regulation (Slides 6-7)

Carrying capacity can most easily be estimated when population growth is density-dependent. Population growth is affected by mechanisms whose effectiveness increases as population size increases. For example, if the number of parr per spawner decreases with increased number of total spawners, a density-dependent factor is likely occurring and regulating the population.

Methods for Estimating Carrying Capacity (Slides 8-10)

Hillman's methods for estimating carrying capacity focused on stock-recruitment models. Hillman used three types of stock-recruitment models: Ricker, Beverton-Holt, and Smooth Hockey Stick. The Ricker model curve peaks and then decreases, which is appropriate for when organisms exhibit scramble competition for a resource, and thus, all suffer if the resource is limiting. For example, ocean-type Chinook salmon data often fit a Ricker curve because spawning habitat becomes limiting, and the overall population decreases. The Beverton-Holt and Smooth Hockey Stick curves both increase then flatten out. With the Beverton-Holt curve, one cannot estimate the number of spawners needed to fully saturate the habitat due to the asymptotic nature of the curve, whereas using the Smooth Hockey Stick model, which does reach a maximum, one can estimate the maximum number of spawners. Hillman said the Beverton-Holt and Smooth Hockey Stick model fit the Chiwawa River spring Chinook salmon data equally well, because they represent a situation where fish compete for a limiting resource (contest competition), which is often appropriate for tributary rearing of salmonids.

Results (Slides 11-16)

Hillman said for the population carrying capacity of Chiwawa Spring Chinook salmon parr, he found the models best fitting the data were the Beverton-Holt and Smooth Hockey Stick models. For habitat carrying capacity, which was estimated using quantile regression and estimating 90 percent reference intervals, he said there is variability among the models. For comparison, he also included results from a quantile regression forest model (QRFM) used by

Integrated Status and Effectiveness Monitoring Program (ISEMP), which calculated the quantity and quality of habitat in the Chiwawa basin. The estimates of habitat carrying capacity are higher than population carrying capacity.

Hillman said confidence intervals in the models tighten over time because more data give a better estimate for the alpha and beta parameters in the models. He said the estimates of carrying capacity do not vary much after approximately 20 years of data are used in the models.

Hillman said, for the population carrying capacity of Chiwawa Spring Chinook salmon smolts, the three models all fit the data approximately equally well. That is, theoretic information criteria (AICc) was unable to identify a best-fitting model. Similar to the data for parr, habitat carrying capacity estimates are higher than population carrying capacity estimates.

Hillman said carrying capacity estimates for smolts vary more than parr likely due to variable winter conditions. He said more years of data are required to stabilize the parameters in the models when there are more life stages included in the analyses. He said the Ricker model fit the data best over time (highest r-squared value), so it is possible that scramble competition is occurring for winter habitat.

Hillman said it was difficult to fit the models to the Chiwawa spring Chinook salmon adult data because ocean conditions primarily affect adult recruitment. He noted that adding parameters to the models that describe ocean conditions could increase the precision of the estimates. He suggested that management decisions be made based on parr and smolt carrying capacity estimates because the results are more related to in-watershed conditions.

Summary (Slides 17-18)

In summary, Hillman said carrying capacity estimates for Chiwawa spring Chinook smolts are on average about half the size of the estimates for parr. He suggested the movement of parr into the Wenatchee River during the winter partially affects the estimates. Hillman said the Ricker model is probably not the best model to use for estimating carrying capacity for

parr. Both the Beverton-Holt and Smooth Hockey Stick explained most of the information in the parr data.

Hillman said estimating carrying capacity for Chiwawa spring Chinook salmon parr, smolts, and adults took a long time, and not all programs have comparable datasets. He said adult data need to be included in the 5-year report, but for estimating carrying capacity within basins, he requested guidance from the Hatchery Committees on how to move forward.

Hillman asked if there are other dataset for parr. Mackey said there are 2 years of parr data for Twisp River spring Chinook salmon. Hillman said he could estimate carrying capacity for spring Chinook salmon and summer Chinook salmon for some programs, but steelhead will be difficult. Mackey said the only other data for the Methow is from screw traps to estimate basin-wide spring Chinook salmon carrying capacity. Tonseth said there is likely not enough available data to estimate carrying capacity for steelhead. Mackey asked if it would be reasonable to replicate the Chiwawa River snorkel methods in other streams to verify that other streams exhibit similar fish densities and then use the Chiwawa River estimate of carrying capacity based on the amount of habitat found during surveys to extrapolate carrying capacity for other streams. Hillman said that would be possible and has performed the calculations for other systems in the past. Mackey said it would only be reasonable if the Chiwawa River has similar densities to other streams.

Hillman said he would estimate carrying capacity for spring Chinook and summer Chinook salmon using all three models and will work with Mackey to acquire the appropriate data for the Methow River.

Hillman asked the Hatchery Committees how they plan to use these results and Appendix 1. He said the data change yearly, so it could be a methodology section. Busack said ocean variability is important to consider in the stock-recruitment analyses; for example, coho salmon returns have been low recently despite the availability of habitat. Hillman said he presented a paper on summer Chinook salmon stock-recruitment modeling to the Coordinating Committees that addressed the effects of ocean conditions on productivity.

Hillman will send the paper to Busack. He said the Adaptive Management Implementation Plan (AMIP) life cycle modeling group might also be a good resource for this discussion.

Mackey said Appendix 1 is included in the Draft Hatchery M&E Plan so there is a convenient and acknowledged source of carrying capacity information that can be used for reporting and identifying management strategies. He said, for example, it can be used to determine if too many or too few spawners are returning. Mike Tonseth said one management goal is to optimize the number of spawners, which can be accomplished through adult management. He said adult management already biases the number of spawners by prioritizing gene flow management over filling the habitat to carrying capacity. Hillman said harvest levels and adult management can be incorporated into the analyses. Truscott said the estimates may destabilize due to the changes in the last 2 years with adult management. Tonseth said water conditions in 2015 may also widen the variance on carrying capacity estimates. Hillman added that major rain-on-snow events act as density-independent effects.

Hillman said he and Andrew Murdoch will continue to draft Appendix 1 using this feedback, with a focus on methodology with some populations as examples. He said the methods will likely change over time.

Todd Pearsons said carrying capacity estimates can also be used to assess how fish should be divided into conservation and safety-net programs. He suggested compiling a table with carrying capacity estimates that the Hatchery Committees can review to inform hatchery programs. Hillman said he is producing tables for spring Chinook salmon in the Chelan PUD and Grant PUD annual reports, so one can track estimates of carrying capacity over time. He said this cannot be done for every stock, and smolt estimates would need to be adjusted for fish that migrate out of a watershed and survive downstream. Hillman said he was surprised at the relatively low carrying capacity estimates for the Chiwawa River basin, because there appears to be a lot of high-quality habitat. He said he thinks the system is nutrient-limited, and high flows also affect the number of fish in the system.

Kirk Truscott asked if hatchery-origin and natural-origin fish spawned in the same locations and proportions, would population capacity be higher. Hillman said he thinks it is possible. The upper river is fully seeded during high spawner escapements; however, changes in abundance and distribution occur in tributary streams with changing spawner abundance. He said density of fish does not vary much within multiple channels with logjams over time, because these habitat types are preferred habitat for juvenile spring Chinook. Densities in less preferred habitat and in tributaries changes considerably with spawning escapement. Regarding the geographic distribution and correlated habitat used by hatchery fish, Keely Murdoch asked if the density-dependence signal could be caused by years in which hatchery fish are more numerous on spawning grounds. Hillman said that is possible. He indicated that there are studies that have shown strong density dependence within tributaries when ocean conditions are poor, because hatchery adults return to the same location instead of colonizing vacant habitat.

III. Yakama Nation

A. SOW for Releasing PIT-Tagged Pacific Lamprey in Tumwater Dam Fishway

Keely Murdoch shared a document titled, “SOW for Releasing Adult Pacific Lamprey within Tumwater Dam Fish Ladder” (Attachment D). *Note: Montgomery distributed the document to the Hatchery Committees on April 19, 2016.*

Keely Murdoch welcomed Ralph Lampman (YN) to the meeting, and said he is a Pacific lamprey biologist. Lampman said lamprey are not currently present above Tumwater Dam, and YN recently planted several adult lamprey upstream of Tumwater Dam in March 2016. He said YN proposes to release lamprey in the fish ladder to study how they navigate through the fishway. He said the proposal includes releasing 30 fish divided into three release locations: near the entrance; in the middle of the fishway near the PIT-tag array; and above the PIT-tag array between the counting station and the PIT-tag array. Keely Murdoch said the purpose of this SOW is to determine where problems may be occurring in the fishway, and it is being presented to the Hatchery Committees due to potential implications for spring Chinook salmon data collection at Tumwater Dam. Specifically, a PIT-tagged lamprey stuck to the array for an extended period could cause tag collision.

Alene Underwood said the SOW includes moving lamprey off of the PIT-tag array if one becomes stuck. She asked who is monitoring for this, and what actions would be taken. Lampman said YN would share the identification number of PIT tags, and would monitor data periodically. Keely Murdoch said PIT- tag data at Tumwater Dam are already being monitored very closely for spring Chinook salmon because there are delay targets that, if exceeded, trigger the opening of the ladder for free passage. She said it would be noted relatively quickly if a lamprey were stuck on an array for this reason. She said removing the lamprey from the array might be done best by coordinating with WDFW, which has staff members on site at Tumwater Dam more regularly than YN. Underwood said she agrees that monitoring for spring Chinook salmon delay would likely mean that a lamprey attached to an array would be detected; however, she said there is a gap between when lamprey are proposed to be released in the fishway and when spring Chinook salmon arrive at Tumwater Dam. Catherine Willard said YN could set up an email alert in the PIT Tag Identification System (PTAGIS) to notify them if a tag is detected in a specific location.

Kirk Truscott asked how feasible it is to move a lamprey off of one of the arrays. Mike Tonseth replied that it is not very feasible because the arrays are located at the top of the ladder below the grating, and depending on where the lamprey is in the fishway, it could be difficult to remove it from the array, especially during high flows. Tonseth said the fishway is shut down when flows exceed 10,000 cubic feet per second (cfs), and with the robust snowpack in 2015/2016, it is possible that lamprey could be trapped in the fishway if it is closed due to high flows. He said YN should look at the hydrograph forecast to ensure that when lamprey are released, flows greater than 10,000 cfs are not expected. Tracy Hillman commented that April is the peak time for steelhead movement and asked if that might be an issue for this proposal. Tonseth said the potential issue would be tag collision due to a lamprey stuck on an array, but it would be unlikely to have a lamprey stuck on both arrays at the same time; therefore, detection of migrating steelhead is not expected to be an issue. Lampman said, because the arrays are in areas of fast-moving water, he doubts a lamprey would stick to an array for very long, and noted that lamprey are more active at night.

Tonseth said he has more concern that a lamprey would go into the collection chamber. Underwood asked if WDFW are operating the trap nonstop for adult management. Tonseth replied yes. Underwood said the ladder itself would not be open past the last gate, so examining how lamprey want to exit the fish ladder would not be possible because they would have to use the Denil fishway. Tonseth said, because steelhead migration may peak early this year, it is possible that the ladder could be fully opened if WDFW have collected enough steelhead for adult management by a certain date. Lampman said he spoke with Andrew Murdoch, who said that the number of steelhead passing Tumwater Dam has recently decreased. Tonseth said that may make it appropriate to open up the fishway for full passage and not operate the trap until spring Chinook salmon arrive, so lamprey movement throughout the entire fishway can be monitored. He said video monitoring will also be active.

Underwood asked on what date YN proposes to release the lamprey. Lampman said, ideally, the fish would be released in the next 2 weeks (April 21 to May 5, 2016). Tonseth suggested YN monitor the hydrograph forecast in case the fishway needs to be shut down for structure protection. Keely Murdoch asked Lampman if Bob Rose (YN) has put this topic on the Coordinating Committees agenda for their April 26, 2016, meeting. She said the Hatchery Committees are not the decision body for this SOW, rather the Coordinating Committees should discuss it, due to its implications for passage of Plan species. She said the Hatchery Committees should discuss it and record any concerns about broodstock collection. Willard said Chelan PUD has collected all of the steelhead broodstock they need for 2016, so they do not have concerns about the proposed actions affecting broodstock collection. Tonseth said the only implications the Hatchery Committees need to consider are to adult management. Tonseth said WDFW could open the trap if adult management for steelhead can justifiably be shut down. Keely Murdoch said it is also important to learn how lamprey navigate the trap, because it is often in operation. Tonseth said lamprey cannot enter the Denil fishway, so it would be best to look at the entire fishway structure first, and later study how lamprey could pass while the trap operates. Underwood suggested lamprey perhaps could find an alternate route through the grates.

Keely Murdoch said lamprey are an important non-target taxon, and PIT-tag detection risks are worth implementing this study. Truscott said PIT-tag detection risks are his main concern, and 30 lamprey would be densely distributed in the short ladder system, if they do stay in the ladder for an extended period. He said if lamprey stick to one of the arrays, it may be impossible to calculate delay, which would affect broodstock collection for plan species. Tonseth said he does not expect to see significant numbers of spring Chinook salmon present at Tumwater Dam until early June, which, if lamprey are released in the fishway before mid-May, provides a relatively long period for the fish to exit the fishway. Truscott asked how YN plans to remove the lamprey from the arrays if one does stick on. Lampman said a pole could be used to nudge the fish off of the array, but he does not expect to see a lamprey stick to an array for very long anyway, from his experience. Lampman said that because lamprey usually spawn in May or June, he does not expect any lamprey to overwinter on the array.

Tonseth said the Hatchery Committees should acknowledge that if a lamprey is stuck on the array, it could inhibit the ability to monitor for spring Chinook salmon delays. Underwood said she agrees, and said fishway attendants could lift grates to potentially access lamprey stuck on arrays, but she would need to run this concept by the safety personnel at Tumwater Dam. Tonseth said he would talk to Andrew Murdoch about foregoing additional steelhead adult management at Tumwater Dam.

IV. Chelan PUD

A. Blackbird Pond acclimation PIT tag data results (Catherine Willard)

Catherine Willard said she presented these results to the Icicle Chapter of Trout Unlimited, and Kirk Truscott requested she share the presentation with the Hatchery Committees. Willard shared a presentation titled, “Blackbird Pond Acclimation PIT Tag Data Results” (Attachment E). *(Note: Sarah Montgomery distributed the presentation to the Hatchery Committees following the meeting on April 20, 2016.)*

Willard said there are structural issues at Blackbird Island, so improvements may be needed if the facility is to continue to be used. A summary of the presentation and questions and comments are included in the following sections.

Background (Slides 1-4)

Willard said, historically, steelhead were reared at Eastbank Hatchery, then Turtle Rock Island Fish Rearing Facility, and then truck-planted in the release locations. She said Chelan PUD worked with Trout Unlimited to start acclimating steelhead at Blackbird Pond to provide a Wenatchee sub-basin acclimation site prior to the Chiwawa Acclimation Site being built. Trout Unlimited provides the water right, and WDFW operates the pond. Currently, approximately 25,000 steelhead are acclimated in Blackbird Pond. Blackbird Pond is a flow-through side channel from the Wenatchee River, and Trout Unlimited's objective was to create more steelhead fishing opportunity in the Wenatchee River in the area near Blackbird Island. Steelhead were first reared in Blackbird Pond in 2010.

Results (Slides 5-8)

Juvenile survival to McNary Dam is compared for Blackbird Pond releases versus combined truck-plant releases in Slide 5. In 2010, the first year of acclimation at Blackbird Pond, juvenile survival was lower compared to the combined truck-plant releases, which Willard attributed to predation and water quality issues in operating the new facility. Mike Tonseth commented that one issue was steelhead aggregating at the outfall area of the intake, causing entrainment. In 2011, survival from the Blackbird Pond releases was significantly greater than the combined truck-plant releases. In 2012, the first year of overwinter acclimation at Chiwawa Acclimation Facility (AF), survival from the truck-plant releases was comparatively low, which could be attributed to new release methods and locations from Chiwawa AF. In 2013, 2014, and 2015, survival from Blackbird Pond releases and combined truck-plant releases were not significantly different.

Date of transfer to the Blackbird Pond AF is significantly associated with juvenile survival to McNary Dam. Juvenile survival is higher for fish that are transferred to the pond at a later date.

There are 3 years of available data for assessing smolt-to-adult returns to Blackbird Pond compared to combined truck-plant releases. In 2010, combined truck-plant releases had a higher smolt-to-adult return rate. In 2011, there was no significant difference in

smolt-to-adult return rates between Blackbird Pond releases and the combined truck-plant releases. In 2012, Blackbird Pond had a higher smolt-to-adult return rate. These differences in return rates mimic the differences in juvenile survival to McNary Dam for the same years, and Willard attributed the differences to the same factors.

One of the purposes of acclimating steelhead at Blackbird Pond is to reduce stray rates to non-Wenatchee River sub-basin streams. There is no significant difference in stray rates between Blackbird Pond and combined truck-plant releases for 2010 or 2011. Stray rates were lower for fish released in 2012 for both fish final acclimated in Blackbird Pond and truck releases compared to releases from 2010 and 2011. Tonseth said a shift from in-basin to out-of-basin acclimation affected stray rates from the Chiwawa River in 2012.

Questions and Comments

Tracy Hillman asked how these results affect the future of Blackbird Pond. Willard said there are structural issues with the intake screen, which would take significant investments and a permitting process. She said the Hatchery Committees should begin to consider the costs and benefits associated with Blackbird Pond. She said the facility was built before steelhead were moved to the Chiwawa AF, but it does provide a location to keep potential residual non-migrant fish. Tonseth said Blackbird Pond could also be used to extend the hybrid volitional release currently taking place at Chiwawa AF. He said, if fish have not emigrated by the end of the volitional time period, they could be moved to Blackbird Pond to extend the volitional release period; then, if the fish have still not emigrated by the end of June, the gate would be closed and they would be kept at Blackbird Pond as residualized fish. Kirk Truscott asked how extensive the required modifications would be. Willard replied that the bank is eroding at the location of the intake screen, which would require a major fix. She said major costs will include permitting and fixing the intake, and minor costs would include items such as fixing the pump system.

V. HCP Administration

A. Next Meetings

The next Hatchery Committees meetings are on May 18, 2016 (Douglas PUD), June 15, 2016, (Chelan PUD), and July 20, 2016 (Douglas PUD).

VI. List of Attachments

Attachment A	List of Attendees
Attachment B	Draft Chewuch Homing Study Proposal
Attachment C	Carrying Capacity: Chiwawa Spring Chinook
Attachment D	SOW for Releasing PIT-Tagged Pacific Lamprey within the Tumwater Dam Fish Ladder
Attachment E	Blackbird Pond Acclimation PIT Tag Data Results

Attachment A
List of Attendees

Name	Organization
Tracy Hillman	BioAnalysts, Inc.
Sarah Montgomery	Anchor QEA, LLC
Alene Underwood*	Chelan PUD
Catherine Willard*	Chelan PUD
Greg Mackey*	Douglas PUD
Todd Pearsons†	Grant PUD
Deanne Pavlik-Kunkel†	Grant PUD
Craig Busack*†	National Marine Fisheries Service
Emi Kondo °	National Marine Fisheries Service
Bill Gale*‡	U.S. Fish and Wildlife Service
Mike Tonseth*	Washington Department of Fish and Wildlife
Keely Murdoch*	Yakama Nation
Ralph Lampman ‡	Yakama Nation

Notes:

* Denotes Hatchery Committees member or alternate

† Joined by phone

‡ Joined by phone for YN discussion item

° Joined by phone for NMFS Consultation Update
