FINAL

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ANCHOR QEA

Memorandum

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

Date: February 16, 2022

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

cc: Larissa Rohrbach and Sarah Montgomery, Anchor QEA, LLC

Re: Final Minutes of the January 6, 2022, HCP Hatchery Committees and PRCC Hatchery Subcommittee Meetings

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plan Hatchery Committees (HCP-HCs) and Priest Rapids Coordinating Committee's Hatchery Subcommittee (PRCC HSC) meetings were held by conference call and web-share on Thursday, January 6, 2022, from 1:00 p.m. to 4:00 p.m. Attendees are listed in Attachment A to these meeting minutes.

I. Welcome

A. Agenda, Announcements

Tracy Hillman welcomed the HCP-HCs and PRCC HSC and read the list of attendees (Attachment A). The meeting was held via conference call and web-share because of travel and group meeting restrictions resulting from the coronavirus disease 2019 pandemic.

All HCP-HCs and PRCC HSC representatives approved the agenda. Action items and meeting minutes from the previous HCP-HCs meeting will be discussed at the HCP-HCs regularly scheduled meeting next week on January 19, 2022. This meeting focused on hatchery production recalculation only.

II. Joint HCP-HCs and PRCC HSC

A. Hatchery Production Recalculation: Recalculation Data Summary

Tracy Hillman said the purpose of today's meeting is to continue discussing No Net Impact recalculation data sources and the approach that will be used in the sensitivity analysis. He reviewed progress to date, reminding everyone that the PUDs have distributed the following information that supports today's discussion:

- The draft statement of agreement (SOA) titled *Regarding the 2023 No Net Impact Hatchery Recalculation Dataset* (Draft 2023 Recalculation Data Sources SOA), was distributed on December 1, 2021 (this draft SOA will be the basis for individual SOAs for the PUDs).

- A revised version of the *2024–2033 Recalculation Data Summary (Version 10)* was distributed on December 21, 2021, for review by the Committees in preparation for this meeting (Attachment B).

Matt Cooper, Keely Murdoch, and Kirk Truscott provided comments to the *2024–2033 Recalculation Data Summary (Version 10)* via email prior to today's meeting.

Catherine Willard said that Cooper's suggested edits would be incorporated into the next version of the data summary and did not require further discussion.

Murdoch made several comments that required further discussion.

Natural-Origin Spawner Distribution

Keely Murdoch said this section on spawner distribution describes a process that was not actually used for allocating fish to hatchery facilities in the last recalculation effort. Appendix E, Table 1, of the 2013 recalculation notebook (*Recalculation of Mid-Columbia River Public Utility District Hatchery Production, 2014–2023, Chelan PUD Supporting Documents)* shows the actual proportion values that were used during the last recalculation. For most species and most projects, the spawner distribution was not actually used. For instance, Rock Island mitigation production for spring Chinook Salmon is 100% being met at Chiwawa Hatchery. Murdoch continued that Appendix E, Tables 2 and 3, show data that were used in the sensitivity analysis calculations. In the 2022 dataset, there needs to be agreement on what proportion of that production is going to each facility to run the BAMP calculations and the sensitivity analysis. The math doesn't work using a spawner distribution instead of the proportions of the actual facilities where those fish will be allocated. In the 2022 dataset (Version 10), Table 9 is actually Table 1 out of the 2013 recalculation notebook. For most projects, it will probably be the same as in 2013. However, the summer Chinook Salmon mitigation allocation is a concern. During the last recalculation, proportions were agreed on to be met in the Wenatchee and Methow Subbasins and Chief Joseph Hatchery (CJH), and there were many reasons those proportions differed from the spawner distributions. For instance, to meet the Total Maximum Daily Load (TMDL) at Dryden Pond. To calculate the BAMP correctly, the current hatchery allocations should probably be used instead of spawning distributions.

Catherine Willard said she met with Murdoch and Mike Tonseth prior to this meeting to better understand this concern. Willard shared a presentation and walked through the issues (Attachment C). Willard agreed with Murdoch that the proportions need to be updated. To calculate adult equivalents using the BAMP, we need to know what smolt-to-adult return (SAR) to apply to the adult equivalents, and one way to do this is to know what tributaries these adult equivalents come from. The "2013 Recalculation Handbook" states that the natural-origin fish would be distributed in accordance with 1) the relative proportion of adult spawners in tributaries with PUD hatcheries, or 2) based upon the previous allocation of hatchery production agreed to in the HCPs. Both methods for distributing natural-origin fish were used during the last recalculation. For instance, all the Rock Island spring Chinook Salmon adult equivalents were allocated to Chiwawa Hatchery. For Rocky Reach, all the spring Chinook Salmon adult equivalents (including 26 Entiat Subbasin spring Chinook Salmon) were allocated to the Methow Hatchery. Allocating natural-origin summer Chinook Salmon was not as straight forward last time. Willard showed the proportions that were allocated to each hatchery for Rock Island and Rocky Reach dams following the final allocation from the last recalculation (Appendix C). Summer Chinook Salmon adult equivalents from the Okanagan Subbasin went to CJH, Wenatchee Subbasin went to Dryden Pond, Methow Subbasin went to CJH, and Chelan River production went to Chelan Falls Hatchery for Rocky Reach only (not Rock Island because it was a new facility). For the 2022 recalculation, spring Chinook Salmon would be allocated similarly as in the last recalculation; however, some decisions are needed to allocate summer Chinook Salmon adult equivalents from the Entiat and Methow Subbasins. Willard said the dataset could be approved without these tables and these decisions could be made during the preparation of the implementation plan.

Kirk Truscott asked if the adult equivalents are based on the most recent data for spawning proportions. Willard answered yes.

Greg Mackey explained Douglas PUD’s coverage for Wells Dam, noting these questions are not an issue for their mitigation.

Todd Pearsons said he has compared the allocation of Priest Rapids Dam (PRD) mitigation between the rearing facilities and spawning ground distributions. For spring Chinook Salmon, there are no major differences. The summer Chinook Salmon are a bit different. Using the previous method, a lower percentage was allocated to the Okanogan Subbasin, and a higher percentage allocated to the Methow Subbasin, based on rearing facility as opposed to basing allocations on the natural spawning distribution. The steelhead are allocated to the Okanogan Subbasin, which does not match their spawning distribution, but resulted from a decision that Chelan PUD would deal with the Wenatchee steelhead production, Douglas PUD would deal with Methow steelhead production, and Grant PUD would deal with the Okanogan steelhead production. The summer Chinook Salmon is the species that is the most problematic for Grant PUD.

Murdoch said she appreciates the presentation. It appears that in the last recalculation, for the Rock Island summer Chinook Salmon mitigation, 60% were allocated to Dryden Pond and 40% were allocated to CJH. She asked whether Chelan PUD is now proposing that some fish would go to Chelan Hatchery? Willard said Wenatchee summer Chinook Salmon adult equivalents would go to Dryden Pond. Chelan River summer Chinook Salmon adult equivalents would go to Chelan Hatchery and the HC would need to decide whether the Entiat and Methow summer Chinook Salmon at Rock Island would go to Dryden or Chelan Falls and whether the Entiat and Methow summer Chinook Salmon at Rocky Reach go to Chelan Falls or CJH.

Murdoch said she could agree not to include the final allocation in the data summary but does not want the issue to be forgotten because it is very important to get these correct. Murdoch suggested that unless parties want to make drastic changes to the hatchery allocation for Grant PUD, they should use the proportions that were used in the last recalculation that were agreed to by all the parties as the new starting point.

Truscott said he would need to think about Grant PUD's allocation of summer Chinook Salmon above Rock Island and Rocky Reach dams. It would be ideal for the mitigation for impacts to natural-origin returns (NOR) to be more in-kind and in-place unless there is a more compelling reason to deviate from the natural spawner distribution. For example, if the number of fish to be allocated to Dryden Pond exceeded TMDL limitations. Truscott noted that the Rock Island and Rocky Reach summer Chinook Salmon mitigation allocation was not based on spawning distribution last time. What is being proposed is a redistribution of Chelan PUD's summer Chinook Salmon mitigation. Willard clarified that potential redistribution would only be for the Entiat and Methow summer Chinook Salmon adult equivalents and the Committees need to decide if they should be allocated to CJH, Dryden Pond, or Chelan Falls. There are different things to consider, including the Dryden Pond TMDL and SARs for the various acclimation facilities; acclimation facilities with higher SARs would produce more adult returns. Chelan has no preference one way or another for these two stocks. Chelan PUD is not requesting approval for a given choice at this time, but everyone should review and agree to the choices made for spring Chinook Salmon as well. Pearsons said he will prepare a similar table showing potential allocation of summer Chinook Salmon among Grant PUDs programs.

Murdoch said, regarding the greater proportion of NORs in the Okanogan Subbasin, perhaps allocating more fish to CJH is disadvantageous. If most fish are allocated where most of the fish are already, it perpetuates a cycle and the Wenatchee and Methow subbasins are typically not fully seeded (though Murdoch said she is not implying the Okanogan Subbasin is overseeded). The alternative would be to allocate more fish where they are needed, which is a management decision.

Brett Farman and Matt Cooper said they are still thinking about this decision but appreciate the discussion. Cooper noted that regarding a management decision to put fish where they are most needed, facilities are typically not very flexible in scaling production unless aggressively planning new acclimation sites, though he is not opposed to what is being discussed. Bill Gale agreed with Farman and Cooper.

The Committees agreed that the dataset can be prepared for approval without the allocation tables.

Smolt-to-Adult Return Data Sources

Keely Murdoch said her comments regarding Tables 10 and 11, which summarize the SAR data to be used, stemmed from a conversation with Mike Tonseth. The Committees agreed to split the years between passive integrated transponder (PIT)-tag-based and coded wire tag (CWT)-based SAR and to alternate years. This approach worked well for some species (like spring Chinook Salmon) but did not work well for summer Chinook Salmon, which has blocks of one data type or the other in the dataset. In some years, PIT-tag-based SARs were just not available, for instance, for Chelan Falls summer Chinook Salmon, there are 5 years of PIT-tag-based SARs, then 4 years of CWT-based SARs. Murdoch suggested breaking up these blocked data to make the years alternate where it is possible and asked why the data couldn't alternate in some cases. Todd Pearsons said the reason why they could not be alternated is described in the text. The coin flip determined which method would be used in the first year; however, for some locations, for instance, at Carlton Pond, there were no PIT-tag-based SAR estimates for that first year. The PUDs tried to intersperse the PIT-tag-based estimates where data were available. Pearsons stated they were 1) trying to have equal representation of the methods, 2) trying to intersperse or alternate methods as much as possible, 3) trying to balance the number of years of PIT-based data and CWT-based data, and 4) were limited by data availability. Catherine Willard said the PUDs really did try to alternate methods based on the Committees' request.

Murdoch said she feels the alternation is more important than randomly choosing to start with one method versus another, which is not biologically relevant. The dataset could be balanced by backing it up one year and making it a round 10 years. Pearsons said the issue would still exist because PIT-tag data did not exist in the earlier years. Murdoch suggested that in datasets where there are 9 years, one of the PIT-tag-based years could be swapped with CWT data. Pearsons suggested that for any program where there are not an equal number of years, a mean between PIT-based SAR and CWT-based SAR could be calculated for 1 year. Thus, there would be 4.5 years of PIT-based SARs and 4.5 years of CWT-based SARs, and the blocking issue would be addressed. Kirk Truscott suggested inserting the averaged year where it would break up the blocking of CWT-based and PIT tag-based years. The Committees agreed to the averaging approach for programs where only 9 years of data are available (Carlton, Dryden, and Chelan Falls); the PIT-tag-based and CWT-based SARs would be averaged for year 2013. No PIT-tag data are available for the Similkameen.

Steelhead Smolt-to-Adult Return

Kirk Truscott noted that SARs for steelhead are reported to Bonneville Dam (BON) versus to each PUD project. Willard stated that the reason the SARs for steelhead are not reported at the specific projects is because losses due to harvest between BON and upstream dams are not available to make adjustments. Chelan PUD's Annual Hatchery Monitoring and Evaluation Report reports steelhead SARs to BON and so do most agencies. Truscott asked whether it would be possible to use conversion rates from BON to PRD to estimate harvest. Todd Pearsons asked whether Truscott was suggesting all the losses from BON to PRD would be considered harvest? Mike Tonseth said known strays to other tributaries (for instance, the Snake River) would need to be subtracted, but it could be a rudimentary way to derive harvest estimates. Tom Kahler asked whether Tonseth meant by subtracting fish that have strayed, they would be deleted from the calculation. Tonseth said yes, but he said he would need to think the idea through a bit more. Keely Murdoch said this would be a good idea to consider. During the last recalculation, steelhead SAR estimates relied on the elastomer tags based on the sampling that occurred at PRD only, or maybe also hatcheries and tributary traps. So, SARs were at least brought as far upstream as PRD last time. Tonseth said there may have been some sampling at Wells Dam that factored into the calculation, and maybe also at Dryden Dam. Tonseth agreed that if the SAR calculations were brought to PRD with PIT tags, that would be more like what was done in the last recalculation. Pearsons asked Kahler if what Tonseth has suggested is feasible. Kahler said yes, he calculates returns to BON and conversion rates to all the Upper Columbia Basin tributaries except for the Okanogan River. It is a bit complicated with broodstock collections, but it is technically feasible, and he has the data for return years 2004 through 2020. Truscott asked if the conversion rates from BON to PRD is 90%, and the calculation is made to add 10% back as "harvest," wouldn't the result be 100% of the BON SAR? Tonseth agreed and said the SAR back to BON may be the best that can be done. Truscott said using the BON SAR would represent an inflated SAR that does not account for losses other than harvest. Kahler said most of the loss is between BON and McNary Dam (MCN). Once fish ascend past MCN, there are very high conversion rates. Tracy Hillman asked whether a SAR at MCN could be used instead of at BON. Pearsons said the spatially explicit estimate of harvest is still unknown. Tonseth and Kahler said the number of fish that stray into tributaries is negligible; very few are lost, and their fate is not necessarily known. Hillman said estimates of contributions to fisheries is mainly based on creel surveys upstream of PRD, but he noted that in the Upper Columbia Salmon Recovery Board (UCSRB) Harvest Background Summary[1] document, harvest between BON and MCN ranges from 5% to 17% on the composited A-run steelhead per year. Murdoch asked to think about this more and read about how this was done in the last recalculation. Tonseth said the best Lower Columbia harvest data are based on catch-record cards, but these are not parsed out by population or stock. There may be a way to derive this through parentage-base tagging sampling in the future, but that analysis is not currently in place.

Truscott asked that for harvest in the Lower Columbia River, isn't there an annual technical report prepared by the Technical Advisory Committee that estimates harvest rates for all anadromous fish? Hillman said yes, but only for A-run or B-run steelhead as a composite, not by population. Truscott asked if the Committees thought the Upper Columbia distinct population segment would have such a different run time than the A-run that the A-run harvest estimate would not be applicable to all the Upper Columbia runs? Hillman said they could consider applying the harvest rate from the A-run to the steelhead PIT-tag detection records. The data are based on return year not on brood year, and

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[1] Maier, Greer, 2020. *Upper Columbia Salmon Recovery Board Harvest Background Summary*. Upper Columbia Salmon Recovery Board. June 2020. Available at: https://www.ucsrb.org/science-resources/reports-plans/reports/.

brood year is what is used for SARs, making their use additionally complicated. Murdoch asked if an average harvest rate could be used for the entire period? Hillman said there is a value that was reported in the UCSRB harvest review report that could be used assuming the return year harvest rate can be applied to the brood years of interest. Tonseth said the brood years for those PIT-tagged fish are known, and if you know the age structure of the PIT-tagged fish that return to BON for each return year, a brood year-specific harvest rate could be generated based on the proportion of 1-salt and 2-salt fish returning. Two return years would have to be analyzed to estimate a specific harvest rate for a given brood year. Kahler said he has done this type of analysis based on PIT tags. There are some 3-salt and 4-salt fish returning, and many of those are repeat-spawners so one has to decide whether to count them in a given return year (i.e., first return year, second return year, or both). Tonseth said an assumption is that harvest rates between the various age-class returns is equal. Murdoch said it seems like a good idea and should be considered further. Pearsons said in the UCSRB harvest review, there is a large difference between just harvest rate and harvest rate plus unaccounted for loss, which presents a problem. This may not be as straightforward as we've been discussing. Tonseth said an overall average applied across years could work but may not work if harvest is very low in low run years. Greg Mackey said if there is an average or composite harvest that is acceptable, it could be applied to the average SAR (rather than making the calculation for every year, which would impose more opportunity for mismatched and spurious data due to using cohorts for SAR and annual numbers for harvest). The question is whether it is a fairly accurate number. Murdoch said that number may not be perfectly accurate but returns to BON is also not an accurate estimate of SAR.

Kahler agreed to prepare an analysis before the next meeting to determine whether harvest could be added back into SARs calculated at the projects. He will prepare an average conversion rate to each project by return year for fish from the Methow, Entiat, and Wenatchee basins based on PIT-tag detections.

Adult Counts

Kirk Truscott's comments on the draft dataset were then reviewed.

Truscott noted that average adult counts by species by project shown in Table 5 shows fewer fish at upstream projects than downstream projects, as one would expect. However, in the adult NOR counts by species by project broken out by year, in some years upstream projects had higher counts than lower projects. In some years there was a substantial difference (for instance, summer Chinook Salmon from PRD to Rock Island Dam and Rocky Reach Dam to Wells Dam in 2015). Todd Pearsons said counts at any one of the dams are not perfect, and for Chinook Salmon, parsing the run types by nadir is going to generate some of these errors year to year. He showed the summer Chinook Salmon adult counts for years with a large magnitude difference between PRD and Rock Island Dam, where there are no major tributaries for fish to turn off from the mainstem Columbia River. The takeaway is that no one year is going to be error-free, but averaging out the years helps to wash out those differences that are in one direction in some years and the other direction in other years. Catherine Willard added that in an email Truscott provided numbers that included both fall and summer Chinook Salmon counted at Wells Dam, and only summer Chinook Salmon counted at PRD. If the fall Chinook Salmon are added back in at PRD, the discrepancies were smaller, though there are still a few discrepancies. Truscott said he understands that counts are not perfect, though he is not sure he agrees with Pearsons' comment that the error is random and washes out with averaging, or whether some of the error is due to fish falling back downstream to migrate toward the Snake River. Pearsons said one of the questions he asked when assembling the data is whether the conversion rates from Rock Island to Rocky Reach makes sense, and if they do, it should give some confidence that these are good numbers. Truscott said it is even more puzzling to get a higher number at Rock Island in years when there was harvest allowed between PRD and Rock Island. Mike Tonseth said Washington Department of Fish and Wildlife acknowledges these discrepancies and that, because they are responsible for implementing fisheries, those discrepancies at PRD in particular really confound management actions for fisheries and adult management. In 2021, for some of the species, the difference was as high as 50%, and it was hard to manage and plan with that large of a discrepancy from PRD to Rock Island. Truscott said one other pattern that showed up was the spring Chinook Salmon from PRD to Rock Island. There is only one year in which the numbers make sense, and it seems like there should be more consistency. The Committees representatives agreed this issue cannot be resolved.

Unavoidable Project Mortality

Kirk Truscott said, in reference to a comment regarding Table 7 (unavoidable project mortality), Todd Pearsons explained in a voicemail (to Truscott) that to estimate subyearling Chinook Salmon project mortality for the contribution to the No Net Impact fund, the PRD Salmon and Steelhead Settlement Agreement directs them to use the steelhead project survival minus 3.6%. . Reducing project survival for hatchery production would cause Grant PUD to mitigate twice for that component. Therefore, it used 7% per project as it's mortality.

Dataset Update Summary

The following changes will be made to the dataset before it can be approved.

- For Carlton, Dryden, and Chelan Falls, the PIT-tag-based and CWT-based SAR would be averaged for the year 2013.
- All parties will consider the approach to calculating SAR for steelhead. Tom Kahler will prepare conversion rates to each project by return year for fish from the Methow, Entiat, and Wenatchee basins based on PIT-tag detections.
- Tables 8 and 9 on allocation of production to each hatchery will be removed from the dataset for data set approval while the program-specific details will be determined later.

- Catherine Willard said the survival rates for Rock Island Dam in Table 7 will be updated based on results of the survival study done in 2021.

The PUDs will prepare a Version 11 of the dataset by the end of next week in preparation for the next regular HCP-HC and PRCC HSC meeting on January 19, 2022.

B. Draft 2023 Recalculation Data Sources SOA

Regarding whether the draft 2023 Recalculation Data Sources SOA could be approved, Catherine Willard said an outstanding issue is the Yakama Nation's (YN's) proposal to agree to the PIT-based SAR data only if the PUDs would agree to including mitigation for inundation in the sensitivity analysis, which needs further discussion, because that would potentially change the dataset.

Keely Murdoch said she was not necessarily proposing adding it to the SOA. She proposed this jump ahead to the sensitivity analysis as a means to solve two issues at the same time, but that does not need to be included in this SOA unless people think it needs to be. Willard asked if the YN is only agreeing to the use of PIT-tag-based SAR provided that mitigation for inundation, Column G of the sensitivity analysis, is agreed to now. Murdoch said the YN still believes the CWT-based SAR should be used in the BAMP. By agreeing to the hybrid CWT and PIT-tag method for calculating SARs, the YN is accepting a reduced level of mitigation, even though they believe every fish killed during passage through the projects should be mitigated. She agrees that a PUD would not have to mitigate for its own fixed inundation fish but should replace the other PUDs' inundation fish that are killed by their projects. The YN seeks to ensure that mitigation is not further reduced by not including mitigation for inundation fish in the final mitigation. Todd Pearsons said a counter proposal was made to include the fixed inundation compensation for summer Chinook Salmon but not steelhead. Murdoch said she has talked about this counter proposal to Tom Scribner (YN) who was favorable, but she has not yet talked to Donella Miller (YN) or David Blodgett (YN).

Tracy Hillman asked if the parties felt that agreeing to this SOA would be with the knowledge that it would be linked to mitigation for losses of fixed inundation fish. Mike Tonseth said yes and echoed the YN position. Kirk Truscott said the issue with the hybrid SAR approach is whether or not the PIT-tagging process and methodologies tag enough fish and are representative of the run at large.

Willard said Chelan PUD will not agree to mitigating for inundation at this step. Chelan PUD would agree to accepting the dataset independently from the commitment to inundation mitigation, which should occur during the sensitivity analysis step.

Hillman noted that there may not be agreement on the dataset if the mitigation for inundation is linked to the dataset. Murdoch said she is unsure how to move forward with this. The YN does not necessarily view the approval of the dataset as linked to including inundation mitigation in the sensitivity analysis and did not intend to include this in the SOA, but proposed this to open a transparent dialogue, recorded in the meeting minutes, to lay cards out on the table in advance so the process can continue moving forward. The YN is trying to ensure that mitigation is not set at a lower level than they feel is correct and trying to avoid hitting a wall later in the process.

Truscott noted that the PUDs are opposed to linking the dataset SOA to agreeing to mitigation for inundation, but they have not said clearly if they would agree to include mitigation for inundation. Pearsons said the first several steps of the process are technical. The next step is more of a negotiation based on what parties believe should be included in mitigation. Because there are disagreements, this is the way the PUDs can come up with an agreement that works. Truscott said he is asking if Column G of the sensitivity analysis (mitigation for inundation) will be a part of the mitigation outcome. Pearsons said it will be a part of the negotiation process; there will be a range presented with low and a high values generated and the final number is negotiated. It is too premature to commit to including it in the mitigation implementation plan. Truscott asked if there is a categorial answer from the PUDs whether it will not be included whatsoever. Column G will be calculated, but whether it will be included in the final agreed-to mitigation is unknown. Pearsons said the PUDs will repeat the sensitivity analysis as it was done before, which includes Column G, and the next step will be to negotiate the numbers. Willard said that is how Chelan PUD would characterize their position at this time as well.

Murdoch said she will take this information back and talk to her supervisors to determine what the YN will do. Tonseth said not having a linkage between the two is acceptable. If the commitment to which groups of fish are subject to mitigation cannot be resolved now, he is accepting of approving this dataset and moving on to the discussion of including mitigation for fixed inundation during the next step in the process. Truscott agreed but has concerns about the process becoming stalled again during the sensitivity analysis step. All others agreed to work toward approving the dataset in the next meeting separate from a commitment to the final mitigation that would be determined during the sensitivity analysis process and subsequent negotiation.

III. Administrative Items

C. Next Meetings

The next regular HCP-HCs and PRCC HSC meetings will be held on January 19, 2022; Wednesday, February 16, 2022; and Wednesday March 16, 2022, by conference call and web-share until further notice.

IV. List of Attachments

Attachment A	List of Attendees
Attachment B	2024–2033 Recalculation Data Summary (Version 10)
Attachment C	Hatchery Allocation Proportions for Chelan PUD’s Mitigation

Attachment A
List of Attendees

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

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

2024-2033 RECALCULATION DATA SUMMARY

Chelan PUD, Douglas PUD, Grant PUD

DECEMBER 2021

Introduction

This document summarizes data used to recalculate hatchery compensation for Douglas, Chelan, and Grant PUDs for future release years 2024-2033. The period of record for this effort includes natural origin adult return years 2011-2020.

Relevant Brood Years

The brood years contributing to this period vary by species and are summarized in Tables 1-4.

Table 1. Chinook Salmon brood years contributing to adult return years 2011-2020.

	Return Year																				
Brood Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
2003	RY	A3	A4	A5	A6																
2004		RY	A3	A4	A5	A6															
2005	BY		RY	A3	A4	A5	A6														
2006		BY		RY	A3	A4	A5	A6													
2007			BY		RY	A3	A4	A5	A6												
2008				BY		RY	A3	A4	A5	A6											
2009					BY		RY	A3	A4	A5	A6										
2010						BY		RY	A3	A4	A5	A6									
2011							BY		RY	A3	A4	A5	A6								
2012								BY		RY	A3	A4	A5	A6							
2013									BY		RY	A3	A4	A5	A6						
2014										BY		RY	A3	A4	A5	A6					
2015											BY		RY	A3	A4	A5	A6				
2016												BY		RY	A3	A4	A5	A6			
2017													BY		RY	A3	A4	A5	A6		
2018														BY		RY	A3	A4	A5	A6	
2019															BY		RY	A3	A4	A5	A6
2020																BY		RY	A3	A4	A5
2021																	BY		RY	A3	A4

Notes: Grey background delineates return years 2011-2020. BY = brood year, RY = release year, A = age. 2007 is the first relevant brood year for spring Chinook, and 2006 is the first relevant brood year for summer Chinook.

Table 2. Steelhead brood years contributing to adult return years 2011-2020.

	Return Year																				
Brood Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
2005	BY	RY	O1	O2	O3																
2006		BY	RY	O1	O2	O3															
2007			BY	RY	O1	O2	O3														
2008				BY	RY	O1	O2	O3													
2009					BY	RY	O1	O2	O3												
2010						BY	RY	O1	O2	O3											
2011							BY	RY	O1	O2	O3										
2012								BY	RY	O1	O2	O3									
2013									BY	RY	O1	O2	O3								
2014										BY	RY	O1	O2	O3							
2015											BY	RY	O1	O2	O3						
2016												BY	RY	O1	O2	O3					
2017													BY	RY	O1	O2	O3				
2018														BY	RY	O1	O2	O3			
2019															BY	RY	O1	O2	O3		
2020																BY	RY	O1	O2	O3	
2021																	BY	RY	O1	O2	O3

Notes: Grey background delineates return years 2011-2020. BY = brood year, RY = release year, O = ocean year. 2008 is the first relevant brood year for steelhead.

Table 3. Sockeye brood years contributing to adult return years 2011-2020.

	Return Year																				
Brood Year	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
2004		RY	A3	A4	A5	A6															
2005	BY		RY	A3	A4	A5	A6														
2006		BY		RY	A3	A4	A5	A6													
2007			BY		RY	A3	A4	A5	A6												
2008				BY		RY	A3	A4	A5	A6											
2009					BY		RY	A3	A4	A5	A6										
2010						BY		RY	A3	A4	A5	A6									
2011							BY		RY	A3	A4	A5	A6								
2012								BY		RY	A3	A4	A5	A6							
2013									BY		RY	A3	A4	A5	A6						
2014										BY		RY	A3	A4	A5	A6					
2015											BY		RY	A3	A4	A5	A6				
2016												BY		RY	A3	A4	A5	A6			
2017													BY		RY	A3	A4	A5	A6		
2018														BY		RY	A3	A4	A5	A6	
2019															BY		RY	A3	A4	A5	A6
2020																BY		RY	A3	A4	A5
2021																	BY		RY	A3	A4

Notes: Grey background delineates return years 2011-2020. BY = brood year, RY = release year, A = age. 2008 is the first relevant brood year for Sockeye.

Table 4. Coho brood years contributing to adult return years 2011-2020.

	Return Year																				
Brood Year	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
2004		RY	O1																		
2005	BY		RY	O1																	
2006		BY		RY	O1																
2007			BY		RY	O1															
2008				BY		RY	O1														
2009					BY		RY	O1													
2010						BY		RY	O1												
2011							BY		RY	O1											
2012								BY		RY	O1										
2013									BY		RY	O1									
2014										BY		RY	O1								
2015											BY		RY	O1							
2016												BY		RY	O1						
2017													BY		RY	O1					
2018														BY		RY	O1				
2019															BY		RY	O1			
2020																BY		RY	O1		
2021																	BY		RY	O1	

Notes: Grey background delineates return years 2011-2020. BY = brood year, RY = release year, O = ocean year. 2008 is the first relevant brood year for Coho.

Natural-Origin Adult Returns

The adult return years evaluated for the current recalculation effort cover the period of 2011 to 2020. The average numbers of natural-origin adult returns at each project during this period are summarized in Table 5. Species that are compensated through alternative PUD funding agreements (e.g., Coho, Okanogan Sockeye, Summer Chinook above Wells) are not addressed in this document.

Table 5. Estimated average natural-origin adult passage at Wells, Rocky Reach, Rock Island, Priest Rapids hydroelectric projects during the period of 2011-2020.

Project	Species	Note	Average Count
Wells	Spring Chinook		656
Wells	Steelhead		1,353
Wells	Summer and Fall Chinook		24,849
Wells	Coho		42
Rocky Reach	Spring Chinook		901
Rocky Reach	Steelhead		1,728
Rocky Reach	Summer and Fall Chinook		33,434
Rocky Reach	Coho		58
Rock Island	Sockeye	Wenatchee Only	38,173
Rock Island	Spring Chinook	Nadir Method	1,653
Rock Island	Steelhead		2,632
Rock Island	Summer and Fall Chinook		43,064
Rock Island	Coho		335
Priest Rapids	Fall Chinook		11,679
Priest Rapids	Summer Chinook		32,882
Priest Rapids	Spring Chinook	Nadir Method	1,777
Priest Rapids	Steelhead		3,123

The detailed methods used to calculate adult returns for each species are summarized in Figures 1-17 below and described in Table 6. Annual calculated estimates are bounded by a green outline and the average number of fish from 2011-2020 is highlighted in orange within each figure.

METHOD: WELLS SPRING CHINOOK

	Natural Origin SPCH Observed at Wells (1)
Year	Total
2011	965
2012	663
2013	603
2014	1038
2015	790
2016	658
2017	549
2018	604
2019	386
2020	306
	656

Data Sources

1. Derived from Appendix O (Page 213) of Snow, C., C. Frady, D. Grundy, B. Goodman, and A. Haukenes. 2020. Monitoring and evaluation of the Wells Hatchery and Methow Hatchery programs: 2019 annual report. Report to Douglas PUD, Grant PUD, Chelan PUD, and the Wells and Rocky Reach HCP Hatchery Committees, and the Priest Rapids Hatchery Subcommittees, East Wenatchee, WA.

Figure 1. Annual natural-origin Spring Chinook passage at Wells Dam during 2011-2020.

METHOD: WELLS STEELHEAD

Douglas PUD M&E/WDFW Wells Stock Assessment (1)	
Brood Year	Natural Origin Count (less double counts and fallback)
2011	1770
2012	1395
2013	914
2014	1873
2015	1986
2016	1718
2017	880
2018	817
2019	827
2020	N/A
	1353

Data Sources

1. Derived from Appendix A: Attachment C, Page 228: Snow, C., C. Frady, D. Grundy, B. Goodman, and A. Haukenes. 2020. Monitoring and evaluation of the Wells Hatchery and Methow Hatchery programs: 2019 annual report. Report to Douglas PUD, Grant PUD, Chelan PUD, and the Wells and Rocky Reach HCP Hatchery Committees, and the Priest Rapids Hatchery Subcommittees, East Wenatchee, WA.

Figure 2. Annual natural-origin Steelhead passage at Wells Dam during brood years 2011-2020.

METHOD: WELLS SUMMER CHINOOK

DART Summer Chinook (1)				
Return Year	Summer Chinook Total	Count Adjusted by subtracting Spring Chinook (2)	Percent Natural Origin (3)*	Natural Origin Summer Chinook
2011	51,745	43,524	29%	12,418
2012	52,846	47,559	24%	11,222
2013	82,762	77,261	43%	33,565
2014	83,506	72,960	61%	44,498
2015	103,358	93,366	55%	51,796
2016	65,822	60,611	56%	33,780
2017	43,458	38,516	50%	19,291
2018	34,841	29,881	23%	6,958
2019	38,251	33,358	37%	12,503
2020	64,870	61,262	37%	22,463
				24,849

Data Sources

1. Columbia River DART, Columbia Basin Research, University of Washington. (2021). Adult Passage Daily Counts. Available from http://www.cbr.washington.edu/dart/query/adult_daily.

2. Spring Chinook data from the Monitoring and Evaluation of the Wells Hatchery and Methow Hatchery Programs: 2020 Annual Report. Appendix O.

3. WDFW 14-20 Wells E+W Sum Chinook stock assessment data (Sent by Chris Moran on June 9, 2021)

Figure 3. Annual natural-origin Summer/Fall Chinook passage at Wells Dam during brood years 2011-2020.

METHOD: WELLS COHO

Year	DART Wells Coho Counts (1)	Methow Natural Origin Percent (2)	Methow Natural Origin Estimate
2011	5,796	1.17%	68
2012	2,042	0.00%	0
2013	573	3.38%	19
2014	9,149	0.81%	74
2015	1,173	1.32%	15
2016	423	0.00%	0
2017	3,847	2.30%	89
2018	2,946	0.00%	0
2019	4,088	0.53%	22
2020	12,372	1.06%	131
			42

Natural Origin Calculation			
Return Year	Natural-origin Return	Total Return	Percent Natural Origin
2011	69	5885	1.17%
2012	0	2148	0.00%
2013	25	740	3.38%
2014	78	9654	0.81%
2015	22	1666	1.32%
2016	0	536	0.00%
2017	114	4950	2.30%
2018	0	3706	0.00%
2019	28	5282	0.53%
2020		Avg 2011-19	1.06%

Data Sources

1. Columbia River DART, Columbia Basin Research, University of Washington. (2021). Adult Passage Daily Counts. Available from http://www.cbr.washington.edu/dart/query/adult_daily.

2. Table 53 of Yakama Nation Fisheries. 2020. Mid-Columbia Coho Reintroduction Monitoring and Evaluation Report

Figure 4. Annual natural-origin Coho passage at Wells Dam during brood years 2011-2020.

METHOD: RR SPRING CHINOOK

Natural Origin SPCH Observed at Wells (1)		Conversion Rate (2)	Conversion Rate Expanded RR SPCH	Entiat Natural Origin SPCH Returns (3)	Sum of Entiat and Expanded RR SPCH
Year	Total	Natural Origin PIT-Based RR to Wells	Total	Total*	Total
2011	965	100%	965	321	1286
2012	663	100%	663	334	997
2013	603	100%	603	188	791
2014	1038	73.3%	1415	225	1641
2015	790	100.0%	790	417	1207
2016	658	100.0%	658	297	955
2017	549	100.0%	549	64	613
2018	604	100.0%	604	46	650
2019	386	100.0%	386	60	446
2020	306	100.0%	306	120	426
					901

*2020 based on average of 2011-19.

Data Sources

1. Derived from Appendix O (Page 213) of Snow, C., C. Frady, D. Grundy, B. Goodman, and A. Haukenes. 2020. Monitoring and evaluation of the Wells Hatchery and Methow Hatchery programs: 2019 annual report. Report to Douglas PUD, Grant PUD, Chelan PUD, and the Wells and Rocky Reach HCP Hatchery Committees, and the Priest Rapids Hatchery Subcommittees, East Wenatchee, WA.

2. Columbia River DART, Columbia Basin Research, University of Washington. (2021). PIT Tag Adult Returns Conversion Rate. Available from http://www.cbr.washington.edu/dart/query/pitadult_conrate.

3.Fraser, G. S., and M. R. Cooper. 2021. Chinook Salmon spawning ground surveys on the Entiat River, 2020. U. S. Fish and Wildlife Service, Leavenworth, Washington

Figure 5. Annual natural-origin Spring Chinook passage at Rocky Reach Dam during 2011-2020.

METHOD: RR STEELHEAD

DART RR Counts (1)		Fallback Correction (2)	Natural Origin Correction	Entiat Counts (3)		Estimate of Non_Entiat Natural Origin		Sum of Entiat Natural Origin + Non-Entiat Natural Origin
Year	Total	RR_STL FCF	% Natural	Entiat Total	Natural Returns Entiat*	(DART Total*FCF)-Entiat Total	Natural non_Entiat	Total RR Natural Origin
2011	15,280	96.49%	13.98%	465	293	14,279	1,996	2289
2012	13,100	96.34%	12.20%	657	531	11,964	1,460	1991
2013	9,201	98.18%	9.76%	379	245	8,655	845	1090
2014	10,587	98.34%	26.59%	478	433	9,933	2,642	3075
2015	10,894	98.98%	27.53%	647	588	10,136	2,791	3379
2016	5,728	90.41%	19.90%	521	461	4,658	927	1388
2017	3,988	95.11%	19.43%	226	159	3,567	693	852
2018	4,238	96.49%	23.69%	158	113	3,931	931	1044
2019	3,298	96.06%	28.07%	146	109	3,022	848	957
2020	5,398	98.49%	20.13%	218	188	5,098	1,026	1214
								1728

*Assumed prespawn mortality of 10% added to reported value

Wells Stock Assessment WDFW (4)			
BY	Hatchery	Natural	% Natural
2011	10,894	1,770	13.98%
2012	10,040	1,395	12.20%
2013	8,452	914	9.76%
2014	5,170	1,873	26.59%
2015	5,227	1,986	27.53%
2016	6,916	1,718	19.90%
2017	3,649	880	19.43%
2018	2,632	817	23.69%
2019	2,119	827	28.07%
2020	avg 2011-2019		20.13%

Data Sources

1. Columbia River DART, Columbia Basin Research, University of Washington. (2021). Adult Passage Daily Counts. Available from http://www.cbr.washington.edu/dart/query/adult_daily.
2. Buchanan, R.A., and J. R. Skalski. 2012-2020. Detection Efficiencies at Rock Island, Rocky Reach, and Tumwater Dam Adult Ladders (2012-2020). Columbia Basin Research, School
3. https://fortress.wa.gov/dfw/score/score/species/population_details.jsp?stockId=6903
4. Derived from Appendix A: Attachment C, Page 228: Snow, C., C. Frady, D. Grundy, B. Goodman, and A. Haukenes. 2020. Monitoring and evaluation of the Wells Hatchery and Methow Hatchery programs: 2019 annual report. Report to Douglas PUD, Grant PUD, Chelan PUD, and the Wells and Rocky Reach HCP Hatchery Committees, and the Priest Rapids Hatchery Subcommittees, East Wenatchee, WA.

Figure 6. Annual natural-origin Steelhead passage at Rocky Reach Dam during 2011-2020.

METHOD: RR SUMMER CHINOOK

Nadir Apportionment						Fallback Correction % (2)		Natural Origin Correction. CPUD Window Count Data (3)		Adjusted Natural Origin Estimate		
Year	Total SUCH & FACH (1)	Nadir Dates SPCH to SUCH	Nadir Dates SUCH to FACH	SUCH Total	FACH Total	SUCH FCF	FACH FCF	SUCH Natural Origin	FACH Natural Origin	SUCH Total	FACH Total	SUCH+FACH Total
2011	56,516	6/29/2011	9/9/2011	50,274	6,242	89.5%	90.7%	36.66%	83.93%	16,496	4,749	21,245
2012	60,972	6/27/2012	9/16/2012	52,560	8,412	81.6%	78.6%	32.99%	73.84%	14,157	4,880	19,038
2013	122,622	6/6/2013	9/7/2013	73,186	49,436	64.1%	91.4%	45.16%	76.07%	21,175	34,382	55,558
2014	90,401	6/13/2014	9/8/2014	70,657	19,744	92.6%	96.7%	59.15%	81.70%	38,712	15,594	54,307
2015	122,711	5/24/2015	8/24/2015	87,853	34,858	97.8%	88.4%	53.01%	73.52%	45,524	22,661	68,185
2016	80,412	6/5/2016	8/26/2016	66,690	13,722	97.2%	89.3%	49.42%	71.87%	32,028	8,805	40,833
2017	56,685	6/18/2017	9/8/2017	45,981	10,704	95.4%	91.7%	36.90%	79.07%	16,181	7,759	23,939
2018	43,419	6/13/2018	9/7/2018	36,621	6,798	91.2%	100.0%	18.78%	84.34%	6,269	5,733	12,002
2019	50,457	6/10/2019	8/31/2019	42,073	8,384	91.8%	85.7%	18.69%	72.70%	7,221	5,224	12,445
2020	80,663	6/12/2020	9/6/2020	70,335	10,328	94.0%	94.1%	30.16%	70.54%	19,934	6,857	26,791
												33,434

Data Sources

1. Columbia River DART, Columbia Basin Research, University of Washington. (2021). Adult Passage Daily Counts. Available from http://www.cbr.washington.edu/dart/query/adult_daily.
2. Buchanan, R.A., and J. R. Skalski. 2012-2020. Detection Efficiencies at Rock Island, Rocky Reach, and Tumwater Dam Adult Ladders (2012-2020). Columbia Basin Research, School of Aquatic and Fishery Sciences, University of Washington
3. Chelan PUD adipose clip/raw window count data 2011-2020

Figure 7. Annual natural-origin Summer and Fall Chinook passage at Rocky Reach Dam during 2011-2020.

METHOD: RR COHO

Year	DART RR Coho Counts (1)	Methow Natural Origin Percent (2)	Methow Natural Origin Estimate
2011	7,951	1.17%	93
2012	2,440	0.00%	0
2013	533	3.38%	18
2014	13,170	0.81%	106
2015	2,140	1.32%	28
2016	418	0.00%	0
2017	5,432	2.30%	125
2018	4,424	0.00%	0
2019	6,810	0.53%	36
2020	16,125	1.06%	170
			58

Natural Origin Calculation

Return Year	Natural-origin Return	Total Return	Percent Natural Origin
2011	69	5885	1.17%
2012	0	2148	0.00%
2013	25	740	3.38%
2014	78	9654	0.81%
2015	22	1666	1.32%
2016	0	536	0.00%
2017	114	4950	2.30%
2018	0	3706	0.00%
2019	28	5282	0.53%
2020		Avg 2011-19	1.06%

Data Sources

1. Columbia River DART, Columbia Basin Research, University of Washington. (2021). Adult Passage Daily Counts. Available from http://www.cbr.washington.edu/dart/query/adult_daily.

2. Table 53 of Yakama Nation Fisheries. 2020. Mid-Columbia Coho Reintroduction Monitoring and Evaluation Report

Figure 8. Annual natural-origin Coho passage at Rocky Reach Dam during 2011-2020

METHOD: RI SOCKEYE (Wenatchee River Only)

DART Counts (1)			Fallback Correction (2)		FCF Adjusted Counts		RI TOTAL Wenatchee Natural Origin
Year	RI	RR	RI_SOCK FCF	RR_SOCK FCF	RI	RR	Delta: Adjusted RI minus RR
2011	146,111	132,096	98%	98%	143,692	129,330	14,363
2012	410,620	363,314	98%	98%	401,801	355,511	46,290
2013	159,208	131,655	98%	97%	156,024	127,811	28,213
2014	581,121	492,892	99%	98%	576,763	484,464	92,299
2015	264,678	216,389	99%	97%	260,999	209,421	51,578
2016	310,341	235,925	99%	99%	307,641	234,085	73,556
2017	73,218	46,701	98%	99%	72,098	46,253	25,845
2018	172,009	162,684	99%	98%	170,599	159,333	11,266
2019	58,562	50,464	97%	98%	57,063	49,485	7,578
2020	280,440	249,521	97%	97%	272,504	241,761	30,743
							38,173

Data Sources

1. Columbia River DART, Columbia Basin Research, University of Washington. (2021). Adult Passage Daily Counts. Available from http://www.cbr.washington.edu/dart/query/adult_daily.

2. Buchanan, R.A., and J. R. Skalski. 2012-2020. Detection Efficiencies at Rock Island, Rocky Reach, and Tumwater Dam Adult Ladders. Columbia Basin Research, School of Aquatic and Fishery Sciences, University of Washington

Figure 9. Annual natural-origin Wenatchee River Sockeye passage at Rock Island Dam during 2011-2020.

METHOD: RI SPRING CHINOOK

	Nadir Apportionment		Fallback Correction % (2)		Adjusted SPCH Counts		Total WEN River Count	WEN River Natural Origin	Adjusted "WEN River Only" Count	RR SPCH converting from RI	Total RI SPCH: Sum of WEN River and RR
Year	Nadir RR SPCH	Nadir RI SPCH	RR_SPCH FCF	RI_SPCH FCF	RR SPCH	RI SPCH	Delta: Adjusted RI SPCH Minus RR SPCH	% Natural	Natural Origin	Natural Origin	Natural Origin
2011	12,026	18,927	91.45%	95.68%	10,997	18,110	7,112	10.34%	736	1286	2022
2012	7,087	22,709	89.77%	89.77%	6,362	20,386	14,024	13.46%	1888	997	2885
2013	6,538	14,119	90.50%	96.25%	5,917	13,590	7,673	10.40%	798	791	1589
2014	12,767	23,549	71.12%	91.47%	9,080	21,540	12,460	11.33%	1411	1641	3052
2015	8,391	21,807	97.65%	98.30%	8,194	21,436	13,242	6.99%	926	1207	2133
2016	5,840	13,062	98.67%	98.90%	5,762	12,918	7,156	11.01%	788	1041	1829
2017	6,157	8,175	92.42%	99.30%	5,690	8,118	2,427	14.19%	344	613	957
2018	5,754	7,694	91.28%	97.42%	5,252	7,495	2,243	12.27%	275	650	925
2019	5,177	5,801	100.00%	97.79%	5,177	5,673	496	8.43%	42	446	488
2020	3,851	7,563	91.60%	91.93%	3,528	6,953	3,425	6.43%	220	426	646
											1,653

Wenatchee SPCH

	Non-LNFH Wenatchee Spawning Escapement (3)		Estimated Natural-origin SPCH Escapement	Natural-origin Broodstock Collected (4)	Estimated Natural-origin Return	Hatchery-origin Escapement and Broodstock (4)	Sum of Hatchery and Natural Origin	LNFH Return To Icicle Creek (5)	Total Wenatchee Return	
Year	Total	Natural Origin Percentage	Total	Total	Total	Total	Total	Total	Total	Estimated Natural Origin Percentage
2011	3,376	29.94%	1011	80	1,091	2,466	3,557	6,990	10,547	10.34%
2012	2,845	45.10%	1283	68	1,351	1,611	2,962	7,074	10,036	13.46%
2013	2,242	20.25%	454	180	634	2,152	2,786	3,309	6,095	10.40%
2014	1,761	54.38%	958	85	1,043	2,157	3,200	6,005	9,205	11.33%
2015	1,657	40.25%	667	51	718	1,402	2,120	8,149	10,269	6.99%
2016	975	69.31%	676	128	804	1,221	2,025	5,277	7,302	11.01%
2017	705	38.43%	271	121	392	953	1,345	1,417	2,762	14.19%
2018	890	21.36%	190	90	280	1,026	1,306	976	2,282	12.27%
2019	888	16.46%	146	77	223	1,020	1,243	1,404	2,647	8.43%
2020	806	31.76%	256	115	371	885	1,256	4,511	5,767	6.43%

Non-Wenatchee Natural-origin SPCH Converting from RI to RR

RR SPCH Estimate	Conversion Rate (6)	Conversion Rate Expanded RI SPCH
Total	Natural Origin PIT-Based RI to RR	Total
1,286	100.00%	1,286
997	100.00%	997
791	100.00%	791
1,641	100.00%	1,641
1,207	100.00%	1,207
955	91.67%	1,041
613	100.00%	613
650	100.00%	650
446	100.00%	446
426	100.00%	426

Caracass Survey Data (7)

Year	Natural Origin	Hatchery Origin	% Natural Origin
2011	100	234	29.94%
2012	253	308	45.10%
2013	131	516	20.25%
2014	211	177	54.38%
2015	128	190	40.25%
2016	210	93	69.31%
2017	83	133	38.43%
2018	66	243	21.36%
2019	66	335	16.46%
2020	108	232	31.76%

Data Sources

1. Columbia River DART, Columbia Basin Research, University of Washington. (2021). Adult Passage Daily Counts. Available from http://www.cbr.washington.edu/dart/query/adult_daily.
2. Buchanan, R.A., and J. R. Skalski. 2014-2020. Detection Efficiencies at Rock Island, Rocky Reach, and Tumwater Dam Adult Ladders (2014-2020). Columbia Basin Research, School of Aquatic and Fishery Sciences, University of
3. Derived from Table 6.25a in Hillman, T., M. Miller, M. Hughes, C. Moran, J. Williams, M. Tonseth, C. Willard, S. Hopkins, J. Caisman, T. Pearsons, and P. Graf. 2021. Monitoring and evaluation of the Chelan and Grant County PUDs
4. Derived from Tables 5.1 and 6.4 in Hillman, T., M. Miller, M. Hughes, C. Moran, J. Williams, M. Tonseth, C. Willard, S. Hopkins, J. Caisman, T. Pearsons, and P. Graf. 2021. Monitoring and evaluation of the Chelan and Grant County PUDs
5. USFWS 2019 Monitoring and Evaluation of the Leavenworth National Fish Hatchery Spring Chinook Salmon Program, 2019.
6. Columbia River DART, Columbia Basin Research, University of Washington. (2021). PIT Tag Adult Returns Conversion Rate. Available from http://www.cbr.washington.edu/dart/query/pitadult_conrate.
7. Derived from Tables 5.32 and 6.26 in Hillman, T., M. Miller, M. Hughes, C. Moran, J. Williams, M. Tonseth, C. Willard, S. Hopkins, J. Caisman, T. Pearsons, and P. Graf. 2021. Monitoring and evaluation of the Chelan and Grant County

Figure 10. Annual natural-origin Spring Chinook passage at Rock Island Dam during 2011-2020 (Nadir Method).

METHOD: RI STEELHEAD

Year	DART RI Counts (1) Total	DART RR Counts (1) Total	Fallback Correction (2) RI_STL FCF	Fallback Correction (2) RR_STL FCF	FCF Adjusted Subtotal RI_STL	FCF Adjusted Subtotal RR_STL	Delta RI-RR (WEN River Only) Total	Natural Origin Correction % Natural	WEN River Only Natural Origin Total	Expanded PIT from RI to RR Total RR Natural Origin	Sum of WEN River Only and Total RR Natural Origin Total RI Natural Origin
2011	19,024	15,280	95.43%	96.49%	18,154	14,744	3,411	36.40%	1185	2,289	3473
2012	15,454	13,100	96.34%	96.34%	14,889	12,621	2,268	27.90%	610	1,991	2600
2013	11,505	9,201	96.31%	98.18%	11,081	9,034	2,047	53.50%	1055	1,090	2144
2014	15,037	10,587	95.59%	98.34%	14,374	10,411	3,963	47.30%	1792	3,075	4866
2015	14,041	10,894	97.63%	98.98%	13,708	10,783	2,925	39.90%	1140	3,446	4586
2016	7,166	5,728	96.07%	90.41%	6,884	5,179	1,706	52.50%	860	1,441	2301
2017	5,265	3,988	93.52%	95.11%	4,924	3,793	1,131	58.10%	614	852	1467
2018	5,229	4,238	94.34%	96.49%	4,933	4,089	844	50.00%	398	1,044	1442
2019	4,360	3,298	96.59%	96.06%	4,211	3,168	1,043	67.60%	681	1,003	1684
2020	6,753	5,398	92.47%	98.49%	6,244	5,316	928	62.70%	538	1,214	1752
											2632

Dryden Stock Assessment Percent Natural Origin (3)			
Year	Hatchery	Natural	Percent Natural Origin
2011	143	82	36%
2012	191	74	28%
2013	53	61	54%
2014	106	95	47%
2015	86	57	40%
2016	29	32	52%
2017	49	68	58%
2018	47	47	50%
2019	48	100	68%
2020	25	42	63%

Year	RR (4) Total Natural Origin	Conversion Rate (5) Natural Origin PIT: RI to RR	Expanded PIT from RI to RR Total RR Natural Origin
2011	2289	1.00	2,289
2012	1991	1.00	1,991
2013	1090	1.00	1,090
2014	3075	1.00	3,075
2015	3379	0.98	3,446
2016	1388	0.96	1,441
2017	852	1.00	852
2018	1044	1.00	1,044
2019	957	0.95	1,003
2020	1214	1.00	1,214

Data Sources

1. Columbia River DART, Columbia Basin Research, University of Washington. (2021). Adult Passage Daily Counts. Available from http://www.cbr.washington.edu/dart/query/adult_daily.
2. Buchanan, R.A., and J. R. Skalski. 2012-2020. Detection Efficiencies at Rock Island, Rocky Reach, and Tumwater Dam Adult Ladders (2012-2020). Columbia Basin Research, School of Aquatic and Fishery Sciences, University of Washington
3. WDFW stock assessment data; "2011-2020 Dryden Steelhead Origins.xlsx" Provided 8/5/2021
4. See RR Steelhead Method
5. Columbia River DART, Columbia Basin Research, University of Washington. (2021). PIT Tag Adult Returns Conversion Rate. Available from http://www.cbr.washington.edu/dart/query/pitadult_conrate.

Figure 11. Annual natural-origin Steelhead passage at Rock Island Dam during 2011-2020.

METHOD: RI SUMMER CHINOOK

	Nadir Apportionment					Fallback Correction % (2)		Ad-present Correction. CPUD Window Count Data (3)		Natural Origin Subtotal		FACH PRH Overshoot	Adjusted Natural Origin Estimate		
Year	DART (1) Total SUCH & FACH	Nadir Dates SPCH to SUCH	Nadir Dates SUCH to FACH	SUCH Total	FACH Total	SUCH FCF	FACH FCF	SUCH Natural Origin	FACH Natural Origin	SUCH Natural Origin	FACH Natural Origin	Ad-Present Natural Origin Fish	SUCH Total	FACH Total	SUCH+FACH Total
2011	75,563	6/11/2011	9/11/2011	67,356	8,207	91.9%	81.6%	47.22%	92.20%	29,237	6,174	85.96%	29,237	5,307	34,544
2012	69,365	6/26/2012	9/7/2012	57,694	11,671	81.6%	78.6%	30.12%	77.30%	14,186	7,089	85.96%	14,186	6,093	20,280
2013	144,102	6/14/2013	9/6/2013	85,452	58,650	75.8%	89.2%	51.07%	77.26%	33,058	40,398	85.96%	33,058	34,725	67,783
2014	121,555	6/14/2014	9/13/2014	95,253	26,302	96.4%	90.9%	66.67%	85.84%	61,225	20,525	85.96%	61,225	17,643	78,868
2015	146,196	5/25/2015	8/27/2015	107,039	39,157	97.7%	97.9%	54.36%	75.32%	56,838	28,865	85.96%	56,838	24,812	81,650
2016	109,215	6/1/2016	9/1/2016	92,314	16,901	99.0%	92.3%	55.25%	75.87%	50,482	11,836	85.96%	50,482	10,174	60,656
2017	73,895	6/14/2017	8/19/2017	58,325	15,570	96.6%	68.8%	45.47%	61.52%	25,611	6,585	85.96%	25,611	5,660	31,272
2018	52,247	6/12/2018	8/25/2018	42,208	10,039	98.5%	83.3%	24.83%	83.46%	10,328	6,982	85.96%	10,328	6,001	16,329
2019	60,186	5/31/2019	8/22/2019	47,027	13,159	92.1%	61.5%	23.87%	75.19%	10,340	6,089	85.96%	10,340	5,234	15,574
2020	89,322	6/12/2020	8/24/2020	75,156	14,166	89.7%	71.9%	33.44%	13.03%	22,541	1,327	85.96%	22,541	1,141	23,681
															43,064

	Fall Chinook Natural Origin Correction. Average PRH overshoot using PIT estimate and ad-present releases from PRH (4)		Apportionment of ad-present Fall Chinook	
Year	PIT estimate PRH-origin at RI	Ad-present PRH-origin releases	Ad-present PRH Overshoots	Ad-Present Natural Origin Fish
2011	30.20%	46.50%	14.04%	85.96%
2012	30.20%	46.50%	14.04%	85.96%
2013	30.20%	46.50%	14.04%	85.96%
2014	30.20%	46.50%	14.04%	85.96%
2015	30.20%	46.50%	14.04%	85.96%
2016	30.20%	46.50%	14.04%	85.96%
2017	30.20%	46.50%	14.04%	85.96%
2018	30.20%	46.50%	14.04%	85.96%
2019	30.20%	46.50%	14.04%	85.96%
2020	30.20%	46.50%	14.04%	85.96%

Data Sources

1. Columbia River DART, Columbia Basin Research, University of Washington. (2021). Adult Passage Daily Counts. Available from http://www.cbr.washington.edu/dart/query/adult_daily.
2. Buchanan, R.A., and J. R. Skalski. 2012-2020. Detection Efficiencies at Rock Island, Rocky Reach, and Tumwater Dam Adult Ladders. Columbia Basin Research, School of Aquatic and Fishery Sciences, University of Washington
3. Chelan PUD adipose clip/raw window count data 2011-2020
4. Richards, S. and T. Pearsons. 2021. Priest Rapids Hatchery Monitoring and Evaluation Annual Report for 2019-2020. The average value of PIT-tagged PRH-origin fall Chinook Salmon detected at Rock Island Dam was derived from Table 52 and included BY's 2010-2013. The average value of ad-present releases was derived from Table 15 and included BY's 2010-2013.

Figure 12. Annual natural-origin Summer and Fall Chinook passage at Rock Island during 2011-2020.

METHOD: RI COHO

Year	DART RI Coho Counts (1)	Percent Wenatchee	Percent Methow	Wenatchee Count Estimate	Methow Count Estimate	Wenatchee Natural Origin Percent (2)	Methow Natural Origin Percent (3)	Wenatchee Natural Origin Estimate	Methow Natural Origin Estimate	Total RI (Sum of Wenatchee & Methow)
2011	31,045	80.20%	19.80%	24,897	6,148	2.24%	1.17%	557	72	629
2012	8,277	73.10%	26.90%	6,050	2,227	5.09%	0.00%	308	-	308
2013	2,611	72.90%	27.10%	1,904	707	0.95%	3.38%	18	24	42
2014	47,587	78.14%	21.86%	37,183	10,404	3.15%	0.81%	1,170	84	1254
2015	4,499	60.17%	39.83%	2,707	1,792	2.58%	1.32%	70	24	94
2016	2,489	79.48%	20.52%	1,978	511	0.24%	0.00%	5	-	5
2017	13,200	62.01%	37.99%	8,185	5,015	3.86%	2.30%	316	115	432
2018	8,391	51.76%	48.24%	4,343	4,048	0.23%	0.00%	10	-	10
2019	13,594	56.25%	43.75%	7,646	5,948	0.09%	0.53%	7	32	38
2020	30,973	68.22%	31.78%	21,131	9,842	2.05%	1.06%	433	104	537
										335

Relative Run Size

Return Year	Wenatchee Total Return	Methow Total Return	Percent Wenatchee	Percent Methow
2011	23833	5885	80.20%	19.80%
2012	5837	2148	73.10%	26.90%
2013	1991	740	72.90%	27.10%
2014	34501	9654	78.14%	21.86%
2015	2517	1666	60.17%	39.83%
2016	2076	536	79.48%	20.52%
2017	8080	4950	62.01%	37.99%
2018	3976	3706	51.76%	48.24%
2019	6790	5282	56.25%	43.75%

Natural Origin Calculation Wenatchee

Return Year	Natural-origin Return	Total Return	Percent Natural Origin
2011	533	23833	2.24%
2012	297	5837	5.09%
2013	19	1991	0.95%
2014	1086	34501	3.15%
2015	65	2517	2.58%
2016	5	2076	0.24%
2017	312	8080	3.86%
2018	9	3976	0.23%
2019	6	6790	0.09%
2020	Avg 2014-19		2.05%

Natural Origin Calculation Methow

Return Year	Natural-origin Return	Total Return	Percent Natural Origin
2011	69	5885	1.17%
2012	0	2148	0.00%
2013	25	740	3.38%
2014	78	9654	0.81%
2015	22	1666	1.32%
2016	0	536	0.00%
2017	114	4950	2.30%
2018	0	3706	0.00%
2019	28	5282	0.53%
2020	Avg 2014-19		1.06%

Data Sources

1. Columbia River DART, Columbia Basin Research, University of Washington. (2021). Adult Passage Daily Counts. Available from http://www.cbr.washington.edu/dart/query/adult_daily.
2. Table 27 of Yakama Nation Fisheries. 2020. Mid-Columbia Coho Reintroduction Monitoring and Evaluation Report
3. Table 53 of Yakama Nation Fisheries. 2020. Mid-Columbia Coho Reintroduction Monitoring and Evaluation Report

Figure 13. Annual natural-origin Coho passage at Rock Island during 2011-2020.

METHOD: PR FALL CHINOOK

Nadir Apportionment (1)				Natural Origin Correction Factors			Adjusted Natural Origin Estimate
Year	Total SUCH & FACH (1)	RI Nadir Dates SUCH to FACH	RI FACH Total	Reascension Correction Factor RI FACH RCF	% Ad-present (3)	FACH PRH Overshoot adjustment Ad-Present Natural Origin Fish	RI FACH Total
2011	54,276	9/11/2011	8,207	81.59%	92.20%	85.96%	5,307
2012	60,488	9/7/2012	11,671	78.57%	77.30%	85.96%	6,093
2013	127,869	9/6/2013	58,650	89.16%	77.26%	85.96%	34,725
2014	107,688	9/13/2014	26,302	90.91%	85.84%	85.96%	17,643
2015	140,216	8/27/2015	39,157	97.87%	75.32%	85.96%	24,812
2016	103,517	9/1/2016	16,901	92.31%	75.87%	85.96%	10,174
2017	71,122	8/19/2017	15,570	68.75%	61.52%	85.96%	5,660
2018	49,289	8/25/2018	10,039	83.33%	83.46%	85.96%	6,001
2019	57,187	8/22/2019	13,159	61.54%	75.19%	85.96%	5,234
2020	85,361	8/24/2020	14,166	71.87%	13.03%	85.96%	1,141
							11,679

	Fall Chinook Natural Origin Correction. Average PRH overshoot using PIT estimate and ad-present releases from PRH (4)		Apportionment of ad-present Fall Chinook	
Year	PIT estimate PRH-origin at RI	Ad-present PRH-origin releases	Ad-present PRH Overshoots	Ad-Present Natural Origin Fish
2011	30.20%	46.50%	14.04%	85.96%
2012	30.20%	46.50%	14.04%	85.96%
2013	30.20%	46.50%	14.04%	85.96%
2014	30.20%	46.50%	14.04%	85.96%
2015	30.20%	46.50%	14.04%	85.96%
2016	30.20%	46.50%	14.04%	85.96%
2017	30.20%	46.50%	14.04%	85.96%
2018	30.20%	46.50%	14.04%	85.96%
2019	30.20%	46.50%	14.04%	85.96%
2020	30.20%	46.50%	14.04%	85.96%

Data Sources

1. Columbia River DART, Columbia Basin Research, University of Washington. (2021). Adult Passage Daily Counts. Available from http://www.cbr.washington.edu/dart/query/adult_daily.
2. Buchanan, R.A., and J. R. Skalski. 2012-2020. Detection Efficiencies at Rock Island, Rocky Reach, and Tumwater
3. CPUD raw window count data
4. Richards, S. and T. Pearsons. 2021. Priest Rapids Hatchery Monitoring and Evaluation Annual Report for 2019-2020. The average value of PIT-tagged PRH-origin fall Chinook Salmon detected at Rock Island Dam was derived from Table 52 and included BY's 2010-2013. The average value of ad-present releases was derived from Table 15 and included BY's 2010-2013.

Figure 14. Annual natural-origin Fall Chinook passage at Rock Island during 2011-2020 for GPUD mitigation.

METHOD: PR SPRING CHINOOK

	Nadir Apportionment (1)		Reascension Correction % (2), (3)		Adjusted SPCH Counts for Reascension		Total WEN River Count	WEN River Natural Origin Correction	Adjusted WEN River Count	RR SPCH converting from PR	Total PR SPCH: Sum of WEN River and RR
Year	Nadir RR SPCH	Nadir PR SPCH	RR_SPCH RCF	PR_SPCH RCF	RR SPCH	PR SPCH	Delta: Adjusted PR SPCH Minus RR SPCH	% Natural	Natural Origin	Natural Origin	Natural Origin
2011	8,046	20,312	91.45%	98.33%	7,358	19,973	12,616	10.34%	1305	1,286	2591
2012	6,619	25,897	89.77%	98.28%	5,942	25,451	19,509	13.46%	2626	997	3623
2013	4,601	14,471	90.50%	100.00%	4,164	14,471	10,307	10.40%	1072	791	1863
2014	10,487	19,523	71.12%	98.75%	7,458	19,279	11,821	11.33%	1339	1,641	2980
2015	8,137	20,388	97.65%	98.99%	7,946	20,182	12,236	6.99%	856	1,207	2063
2016	5,553	12,592	98.67%	100.00%	5,479	12,592	7,113	11.01%	783	1,015	1798
2017	5,754	7,734	92.42%	98.04%	5,318	7,582	2,265	14.19%	321	613	934
2018	4,975	6,315	91.28%	100.00%	4,541	6,315	1,774	12.27%	218	650	868
2019	4,819	6,071	100.00%	100.00%	4,819	6,071	1,252	8.43%	106	446	552
2020	3,444	4,348	91.60%	98.00%	3,155	4,261	1,106	6.43%	71	426	497
											1777

Caracass Survey Data (8)			
Year	Natural Origin	Hatchery Origin	% Natural Origin
2011	100	234	29.94%
2012	253	308	45.10%
2013	131	516	20.25%
2014	211	177	54.38%
2015	128	190	40.25%
2016	210	93	69.31%
2017	83	133	38.43%
2018	66	243	21.36%
2019	66	335	16.46%
2020	108	232	31.76%

Wenatchee SPCH										
	Non-LNFH Wenatchee Spawning Escapement (4)		Estimated Natural-origin SPCH Escapement	Natural-origin Broodstock Collected (5)	Estimated Natural-origin Return	Hatchery-origin Escapement and Broodstock (5)	Sum of Hatchery and Natural Origin	LNFH Return To Icicle Creek (6)	Total Wenatchee Return	
Year	Total	Natural Origin Percentage	Total	Total	Total	Total	Total	Total	Total	Estimated Natural Origin Percentage
2011	3,376	29.94%	1011	80	1,091	2,466	3,557	6,990	10,547	10.34%
2012	2,845	45.10%	1283	68	1,351	1,611	2,962	7,074	10,036	13.46%
2013	2,242	20.25%	454	180	634	2,152	2,786	3,309	6,095	10.40%
2014	1,761	54.38%	958	85	1,043	2,157	3,200	6,005	9,205	11.33%
2015	1,657	40.25%	667	51	718	1,402	2,120	8,149	10,269	6.99%
2016	975	69.31%	676	128	804	1,221	2,025	5,277	7,302	11.01%
2017	705	38.43%	271	121	392	953	1,345	1,417	2,762	14.19%
2018	890	21.36%	190	90	280	1,026	1,306	976	2,282	12.27%
2019	888	16.46%	146	77	223	1,020	1,243	1,404	2,647	8.43%
2020	806	31.76%	256	115	371	885	1,256	4,511	5,767	6.43%

*2020 based on avg 2014-19

Non-Wenatchee Natural-origin SPCH Converting from PR to RR		
RR SPCH Estimate	Conversion Rate (7)	Conversion Rate Expanded PR SPCH
Total	Natural Origin PIT-Based PRD to RR	Total
1,286	100.00%	1,286
997	100.00%	997
791	100.00%	791
1,641	100.00%	1,641
1,207	100.00%	1,207
955	94.00%	1,015
613	100.00%	613
650	100.00%	650
446	100.00%	446
426	100.00%	426

Data Sources

1. Columbia River DART, Columbia Basin Research, University of Washington. (2021). Adult Passage Daily Counts. Available from http://www.cbr.washington.edu/dart/query/adult_daily.
2. GPUD unpublished data
3. Buchanan, R.A., and J. R. Skalski. 2014-2020. Detection Efficiencies at Rock Island, Rocky Reach, and Tumwater Dam Adult Ladders (2014-2020). Columbia Basin Research, School of Aquatic and Fishery Sciences, University of Washington
4. Derived from Table 6.25a in Hillman, T., M. Miller, M. Hughes, C. Moran, J. Williams, M. Tonseth, C. Willard, S. Hopkins, J. Caisman, T. Pearsons, and P. Graf. 2021. Monitoring and evaluation of the Chelan and Grant County
5. Derived from Table 5.1 and 6.4 in Hillman, T., M. Miller, M. Hughes, C. Moran, J. Williams, M. Tonseth, C. Willard, S. Hopkins, J. Caisman, T. Pearsons, and P. Graf. 2021. Monitoring and evaluation of the Chelan and Grant County PUDs hatchery programs: 2020 annual report.
6. USFWS. 2019. Monitoring and Evaluation of the Leavenworth National Fish Hatchery Spring Chinook Salmon Program, 2019.
7. Columbia River DART, Columbia Basin Research, University of Washington. (2021). PIT Tag Adult Returns Conversion Rate. Available from http://www.cbr.washington.edu/dart/query/pitadult_conrate.
8. Derived from Tables 5.32 and 6.26 in Hillman, T., M. Miller, M. Hughes, C. Moran, J. Williams, M. Tonseth, C. Willard, S. Hopkins, J. Caisman, T. Pearsons, and P. Graf. 2021. Monitoring and evaluation of the Chelan and Grant County PUDs hatchery programs: 2020 annual report.

Figure 15. Annual natural-origin Spring Chinook passage at Priest Rapids during 2011-2020 (Nadir Method).

METHOD: PR STEELHEAD

	DART PR Counts (1)	DART RR Count (1)	Reascension Correction % (2)	Reascension Correction % (3)	RCF Adjusted Subtotal		Delta PR-RR ("WEN ONLY")	Natural Origin Correction	WEN River Only	Expanded PIT from PR to RR	Sum of WEN River Only and Total RR Natural Origin
Year	Total	Total	PR STL RCF	RR STL RCF	PR_STL	RR_STL	Total	% Natural	Natural Origin Total	Total RR Natural Origin	Total PR Natural Origin
2011	20,757	15,280	96.33%	96.49%	19,995	14,744	5,252	36.44%	1914	2,373	4287
2012	17,230	13,100	95.99%	96.34%	16,539	12,621	3,919	27.92%	1094	1,991	3085
2013	15,011	9,201	94.99%	98.18%	14,260	9,034	5,226	53.51%	2796	1,090	3886
2014	19,843	10,587	97.65%	98.34%	19,377	10,411	8,966	47.26%	4238	2,816	7054
2015	14,316	10,894	97.65%	98.98%	13,980	10,783	3,197	39.86%	1274	3,105	4380
2016	6,498	5,728	96.36%	90.41%	6,262	5,179	1,083	52.46%	568	1,118	1686
2017	5,804	3,988	97.70%	95.11%	5,671	3,793	1,878	58.12%	1091	950	2042
2018	4,918	4,238	98.25%	96.49%	4,832	4,089	742	50.00%	371	1,080	1452
2019	3,924	3,298	97.67%	96.06%	3,833	3,168	664	67.57%	449	917	1366
2020	6,506	5,398	98.00%	98.49%	6,376	5,316	1,059	62.69%	664	1,330	1994
											3123

Dryden Stock Assessment Percent Natural Origin (4)			
Year	Hatchery	Natural	Percent Natural Origin
2011	143	82	36%
2012	191	74	28%
2013	53	61	54%
2014	106	95	47%
2015	86	57	40%
2016	29	32	52%
2017	49	68	58%
2018	47	47	50%
2019	48	100	68%
2020	25	42	63%

	RR (5)	Conversion Rate (6)	Expanded PIT from PR to RR
Year	Total Natural Origin	Natural Origin PIT: PR to RR	Total RR Natural Origin
2011	2,289	0.96	2,373
2012	1,991	1.00	1,991
2013	1,090	1.00	1,090
2014	2,816	1.00	2,816
2015	3,047	0.98	3,105
2016	1,080	0.97	1,118
2017	760	0.80	950
2018	982	0.91	1,080
2019	917	1.00	917
2020	1,330	1.00	1,330

Data Sources

1. Columbia River DART, Columbia Basin Research, University of Washington. (2021). Adult Passage Daily Counts. Available from http://www.cbr.washington.edu/dart/query/adult_daily.
2. GPUD unpublished data
3.Buchanan, R.A., and J. R. Skalski. 2012-2020. Detection Efficiencies at Rock Island, Rocky Reach, and Tumwater Dam Adult Ladders (2012-2020). Columbia Basin Research, School of Aquatic and Fishery Sciences, University of Washington
4. WDFW stock assessment data; "2011-2020 Dryden Steelhead Origins.xlsx" Provided 8/5/2021
5. See RR Steelhead Method
6. Columbia River DART, Columbia Basin Research, University of Washington. (2021). PIT Tag Adult Returns Conversion Rate. Available from http://www.cbr.washington.edu/dart/query/pitadult_conrate.

Figure 16. Annual natural-origin Steelhead passage at Priest Rapids during 2011-2020.

METHOD: PR SUMMER CHINOOK

Nadir Apportionment (1)				Reascention Correction % (2)	Natural Origin Correction. GPUD Window Count Data (3)	Adjusted Natural Origin Estimate
Year	SPCH to SUCH	SUCH to FACH	PR SUCH	PR SUCH RCF	SUCH Natural Origin	PR SUCH Total
2011	6/10/2011	8/31/2011	61,773	100.0%	43.34%	26,773
2012	6/27/2012	8/27/2012	51,761	100.0%	38.36%	19,858
2013	6/12/2013	8/26/2013	80,814	100.0%	50.95%	41,175
2014	5/29/2014	8/26/2014	94,152	100.0%	66.46%	62,570
2015	5/26/2015	8/25/2015	96,402	98.8%	54.49%	51,908
2016	5/29/2016	8/20/2016	92,542	100.0%	57.30%	53,028
2017	6/12/2017	8/16/2017	55,277	100.0%	47.08%	26,024
2018	6/6/2018	8/21/2018	44,611	100.0%	26.80%	11,957
2019	6/3/2019	8/18/2019	44,286	100.0%	21.66%	9,592
2020	5/31/2020	8/30/2020	76,735	100.0%	33.80%	25,935
						32,882

Data Sources

1. Columbia River DART, Columbia Basin Research, University of Washington. (2021). Adult Passage Daily Counts. Available from http://www.cbr.washington.edu/dart/query/adult_daily.
2. GPUD unpublished data.
3. Grant PUD raw window count data 2011-2020

Figure 17. Annual natural-origin Summer Chinook passage at Priest Rapids during 2011-2020.

Comparison Between Natural-origin Adult Enumeration Methods for 2013 and 2023 Recalculation Efforts

Table 6. Summary and comparison of methods used during 2013 and 2023 recalculation efforts

Project	Species	2013 Method Summary	2023 Method Summary
Wells	Spring Chinook	Natural-origin spring Chinook returns at Wells were calculated using stock assessment data provided by WDFW. Returns were adjusted for broodstock removals, fallback, and double counts.	Same
Wells	Steelhead	Natural-origin steelhead returns at Wells were calculated using Wells stock assessment data provided by WDFW. Returns were adjusted for broodstock removals, fallback, and double counts.	Same
Wells	Summer Chinook	Funding for CJH. Recalculation was not used	Summer Chinook adults were enumerated at Wells using total Chinook counts from DART and then subtracting spring-Chinook based on stock assessments at Wells by WDFW. The proportion of natural-origin summer Chinook were also obtained from stock assessments at Wells and then applied to the remainder to estimate total natural-origin summer Chinook passage.
Wells	Coho	N/A	Hatchery- and natural-origin proportions were applied to annual DART counts at Wells. Hatchery- and natural-origin proportions were provided by the Yakama Nation through M&E reporting on Methow program (Caisman et al. 2020).
Rocky Reach	Spring Chinook	Natural-origin spring Chinook returns at Rocky Reach were calculated by first apportioning spring Chinook by average nadir date and then subtracting unmarked hatchery fish based on 1) Wells/WDFW stock assessment data and 2) PIT expansion of HORs using conversion rate from RR to Wells. The availability of PIT data was limited to HORs and only a	Natural-origin spring Chinook returns at Rocky Reach were calculated based on the conversion rate of NORs from RR to Wells and Entiat escapement. Specifically, the availability of 1) PIT data for natural origin fish and all return years (2011-2020) allowed for the direct calculation of natural origin spring Chinook at Rocky Reach using 1) Wells/WDFW stock assessment data for NORs and 2) PIT expansion of NORs using conversion rate from Wells. NORs returning

Project	Species	2013 Method Summary	2023 Method Summary
		fraction of return years, therefore it was only possible to remove unmarked hatchery fish for 2006-2010 return years.	to the Entiat (USFWS data) were subsequently added to the expanded RR count. This method directly solves for NORs and reflects data that were not previously available during the earlier recalculation. In addition, this approach uses 10 return years (instead of 5 return years) because of the availability of NOR PIT data for all return years.
Rocky Reach	Steelhead	Natural-origin steelhead returns at Rocky Reach were calculated by adjusting RR window counts by NOR percentage using data obtained from Wells stock assessment efforts.	Natural-origin steelhead returns at Rocky Reach were calculated by adjusting window counts by 1) NOR percentage using Wells stock assessment data, and 2) fallback correction factor[1] data for 2012-2020 return years were used to correct window counts for multiple ascension attempts. Entiat steelhead were considered separately because they do not convert to Wells dam and therefore may influence the hatchery to natural-origin ratio. The estimated number of Entiat NORs were subsequently added to the total for Rocky Reach. The previous recalculation method did not account for the Entiat River specifically and therefore may have had additional error associated with the hatchery to natural-origin ratio
Rocky Reach	Summer and Fall Chinook	Natural-origin summer/fall Chinook counts were based on window counts with stock apportionment by nadir date as adjusted by the percentage of NORs. Nadir apportionment was based on the average nadir date of all return years. Hatchery and natural-origin percentages were determined using adipose fin observations from fish counting windows and the percent NOR was applied to the nadir count. Clipped and unclipped adult data records were only available in 2002 and thereafter.	Natural-origin summer/fall Chinook counts were based on window counts with stock apportionment by nadir date as adjusted by 1) the percentage of NORs, and 2) fallback correction factor[1] data. Nadir apportionment was based on 1) individual return years and 2) summer and fall runs within each year. Hatchery and natural-origin percentages were determined using adipose fin observations from fish counting windows for all return years. The estimates for the current recalculation effort are likely to be more accurate than the previous recalculation effort because the individual nadir year approach was used instead of the “average” to capture annual variability in run timing. In addition, fallback correction factor[1] data were available and used to correct window counts for multiple ascension attempts for both summer and fall Chinook.
Rocky Reach	Coho	N/A	Hatchery- and natural-origin proportions were applied to annual DART counts at Rocky Reach. Hatchery- and natural-origin proportions were provided by the Yakama Nation through M&E reporting on Methow program (Caisman et al. 2020).
Rock Island	Sockeye	Wenatchee natural-origin sockeye returns at Rock Island were calculated by 1) subtracting window counts at Rock	Wenatchee natural-origin sockeye returns at Rock Island were calculated by 1) subtracting window counts at Rock Island from

Project	Species	2013 Method Summary	2023 Method Summary
		Island from window counts at Rocky Reach and 2) applying NOR percentage data obtained from PRD stock assessment efforts.	window counts at Rocky Reach and 2) applying fallback correction factor[1] data to correct window counts for multiple ascension attempts. There was no hatchery program in the Wenatchee during the period of record so NOR percentage was not considered.
Rock Island	Spring Chinook	Natural-origin spring Chinook returns at Rock Island were calculated by first apportioning spring Chinook by average nadir date and then subtracting unmarked hatchery fish based on 1) Wells/WDFW stock assessment data and 2) PIT expansion of HORs using conversion rate from RI to Wells. The availability of PIT data was limited to HORs and only a fraction of return years, therefore it was only possible to remove unmarked hatchery fish for 2006-2010 return years.	The nadir method first apportioned spring Chinook from window counts using the nadir date for each return year. For the Wenatchee River, spring Chinook counts were subsequently adjusted by 1) the percentage of NORs observed in the Wenatchee River, and 2) fallback correction factor[1] data. NORs upstream of Rock Island were estimated using a PIT tag-based expansion derived from the RI to RR conversion rate of NORs. This method is an improvement over the previous recalculation approach because it solves for NORs directly. In addition, the nadir method used uses new data sources that were not previously available during the earlier recalculation (e.g., NOR PIT data) and expand the period of record from 5 years (2006-2010) to 10 years (2011-2020).
Rock Island	Steelhead	Natural-origin steelhead returns at Rock Island were calculated by adjusting RI window counts by NOR percentage obtained from PRD stock assessment. The PRD stock assessment historically relied on visual assessments of elastomer tags to identify unclipped hatchery fish (up to brood year 2010 and return year 2014). However, elastomer tag loss was not corrected for and therefore PRD estimates likely inflated the number of NORs present. In addition, PRD stock assessment results include significant numbers of hatchery origin returns from Ringold and other unidentified hatchery locations. As a result, hatchery-origin to natural-origin ratios derived from PRD stock assessment data are not expected to be reflective of ratios expected for upstream tributaries.	Natural-origin steelhead returns at Rock Island were calculated by 1) estimating Wenatchee origin NORs and adding these to 2) PIT expanded NORs calculated for RR. The Wenatchee NOR component was calculated by subtracting RR window counts from RI window counts (after applying fallback correction factor[1] data to correct window counts for multiple ascension attempts) and then applying the percentage NOR obtained from Dryden stock assessment activities. The PIT expanded NOR calculation for RR was based on the conversion rate for NORs from RI to RR. This method uses natural origin return PIT data that were not previously available and uses stock assessment data from WDFW collected at two sources (Dryden and Wells). The use of Dryden and Wells stock assessment data allows for comparison with other M&E tributary data to verify count accuracy. For example, the estimated average Dryden-based count of Wenatchee steelhead is 887 for return years 2011-2020 which is higher but similar to the average Wenatchee NORs for contributing brood years (Avg = 865; BY =

Project	Species	2013 Method Summary	2023 Method Summary
			2008-2014) and more than the average of the combined harvest, escapement, and brood collection of NORs for return years 2011-2020 (Avg = 547). In short, the calculated adult returns numbers are likely higher than the actual number of NORs present.
Rock Island	Summer and Fall Chinook	Natural-origin summer/fall Chinook counts were based on window counts with stock apportionment by nadir date as adjusted by the percentage of NORs. Nadir apportionment was based on the average nadir date of all return years. Hatchery and natural-origin percentages were determined using adipose fin observations from fish counting windows and the percent NOR was applied to the nadir count. Clipped and unclipped adult data records were only available in 2002 and thereafter. Fall Chinook overshoots from PRD were corrected for by using PIT detections at RI and juvenile fall Chinook marking data from PRD	Natural-origin summer/fall Chinook counts were based on window counts with stock apportionment by nadir date as adjusted by 1) the percentage of NORs, and 2) fallback correction factor[1] data. Nadir apportionment was based on 1) individual return years and 2) summer and fall runs within each year. Adipose-present hatchery-origin fall Chinook from PR hatchery were corrected for by using PIT detections at RI and juvenile fall Chinook marking data from PR hatchery. Hatchery and natural-origin percentages were determined using adipose fin observations from fish counting windows for all return years. The estimates for the current recalculation effort are likely to be more accurate than the previous recalculation effort because the individual nadir year approach was used instead of the "average" to capture annual variability in run timing. In addition, fallback correction factor[1] data were available and used to correct window counts for multiple ascension attempts for both summer and fall Chinook.
Rock Island	Coho	N/A	Hatchery- and natural-origin proportions were applied to annual DART counts at Rock Island. Hatchery- and natural-origin proportions were provided by the Yakama Nation through M&E reporting on Methow and Wenatchee programs (Caisman et al. 2020).
Priest Rapids	Fall Chinook	Natural-origin fall Chinook counts were based on window counts at Rock Island and stock apportionment by nadir date as adjusted by the percentage of NORs. Nadir apportionment was based on the average nadir date of all return years. Hatchery and natural-origin percentages were determined using adipose fin observations from fish counting windows and the percent NOR was applied to the nadir count. Clipped and unclipped adult data records were only available between 2007 and 2010, and therefore limited the period of record to 4 years.	Natural-origin fall Chinook counts were based on window counts at Rock Island with stock apportionment by nadir date as adjusted by 1) the percentage of NORs, and 2) reascension correction factor[2] data. Nadir apportionment was based on 1) individual return years and 2) summer and fall runs within each year. Adipose-present hatchery-origin fall Chinook from PR hatchery were corrected for by using PIT detections at RI and juvenile fall Chinook marking data from PR hatchery. Hatchery and natural-origin percentages were determined using adipose fin observations from fish counting windows for all return years. The estimates for the current recalculation effort are likely to be more accurate than the previous recalculation effort

Project	Species	2013 Method Summary	2023 Method Summary
			because the individual nadir year approach was used instead of the "average" to capture annual variability in run timing. In addition, reascension correction factor[2] data were available and used to correct window counts for multiple ascension attempts for both summer and fall Chinook.
Priest Rapids	Spring Chinook	Natural-origin spring Chinook counts were based on window counts at Priest Rapids and stock apportionment by nadir date as adjusted by the percentage of NORs. Nadir apportionment was based on the average nadir date of all return years. Natural-origin spring Chinook salmon were estimated as unclipped fish at Priest Rapids Dam minus unclipped hatchery fish at Wells adjusted by conversion rates between Priest Rapids Dam and Wells Dam. Clipped and unclipped adult data records were only available between 2007 and 2010, and therefore limited the period of record to 4 years.	Natural-origin spring Chinook counts at Priest Rapids use similar method as Rock Island spring Chinook except the counting location and PIT tag expansion uses Priest Rapids as the control point (not Rock Island). See Rock Island 2023 spring Chinook method. The new method is an improvement over the previous recalculation approach because NORs are calculated directly and new data sources expand the period of record from 4 years (2007-2010) to 10 years (2011-2020).
Priest Rapids	Steelhead	Natural origin steelhead counts were based on window counts at Priest Rapids Dam as adjusted by NOR percentage. NOR percentage was calculated using stock assessment data collected from PRD.	Natural-origin steelhead counts at Priest Rapids use similar method as Rock Island steelhead except the counting location and PIT tag expansion uses Priest Rapids as control point (not Rock Island). See Rock Island 2023 steelhead method.
Priest Rapids	Summer Chinook	Natural-origin Summer Chinook counts were based on window counts at Priest Rapids and stock apportionment by nadir date as adjusted by the percentage of NORs. Nadir apportionment was based on the average nadir date of all return years. Hatchery and natural-origin percentages were determined using adipose fin observations from fish counting windows and the percent NOR was applied to the nadir count. Clipped and unclipped adult data records were only available between 2007 and 2010, and therefore limited the period of record to 4 years.	Natural-origin Summer Chinook counts were based on window counts at Priest Rapids and stock apportionment by nadir date as adjusted by 1) the percentage of NORs and 2) reascension correction[2] factor. Nadir apportionment was based on the individual nadir date for each return year. Hatchery and natural-origin percentages were determined using adipose fin observations from fish counting windows and the percent NOR was applied to the nadir count. Clipped and unclipped adult data records were available for all return years. The estimates for the current recalculation effort are likely to be more accurate than the previous recalculation effort because the individual nadir year approach was used instead of the "average" to capture annual variability in run timing. In addition, window counts were corrected for multiple ascension attempts and counts for all return years have been included.

Notes

1. The fallback correction factor is used to adjust window counts for multiple ascension attempts or fallback to attain estimates of run size. The fallback correction factor is estimated based on observed PIT-tag detections in the adult ladders and reflect the ratio of number of unique fish to number of passage attempts. Fallback correction factors were calculated by Columbia Basin Research: *Buchanan, R.A., and J. R. Skalski. 2012-2020. Detection Efficiencies at Rock Island, Rocky Reach, and Tumwater Dam Adult Ladders (2012-2020). Columbia Basin Research, School of Aquatic and Fishery Sciences, University of Washington*

2. Fallback Correction Factor = Reascension Correction Factor

Project Survival and Unavoidable Project Mortality Data

Project survival and associated unavoidable project mortality values are summarized in Table 7. Updated values for Rock Island yearling Chinook are anticipated upon completion of a project survival study in 2021.

Table 7. Summary of project survival and unavoidable project mortality data based on completed survival studies or other agreements.

Project	Species	Project Survival	UPM
Wells	Spring Chinook	96.04%	3.96%
Wells	Summer/Fall Chinook Subyearling	93.00%	7.00%
Wells	Summer/Fall Chinook Yearling	96.04%	3.96%
Wells	Steelhead	96.04%	3.96%
Wells	Sockeye	93.00%	7.00%
Wells	Coho	96.04%	3.96%
Rock Island	Spring Chinook	93.75%	6.25%
Rock Island	Summer/Fall Chinook Subyearling	93.00%	7.00%
Rock Island	Summer/Fall Chinook Yearling	93.75%	6.25%
Rock Island	Steelhead	96.75%	3.25%
Rock Island	Sockeye	93.27%	6.73%
Rock Island	Coho	93.00%	7.00%
Rocky Reach	Spring Chinook	93.00%	7.00%
Rocky Reach	Summer/Fall Chinook Subyearling	93.00%	7.00%
Rocky Reach	Summer/Fall Chinook	93.00%	7.00%
Rocky Reach	Steelhead	95.79%	4.21%
Rocky Reach	Sockeye	93.59%	6.41%
Rocky Reach	Coho	93.00%	7.00%
PRD/WAN	Spring Chinook	86.59%	13.41%
PRD/WAN	Summer/Fall Chinook Subyearling	86.49%	13.51%
PRD/WAN	Summer/Fall Chinook Yearling	86.59%	13.41%
PRD/WAN	Steelhead	87.03%	12.97%
PRD/WAN	Sockeye	91.70%	8.30%

Natural-origin Spawner Distribution

The average number and relative distribution of natural-origin spawners is summarized in Table 8. Data were compiled from the Washington State Department of Fish and Wildlife "SCORE" website[1] and hatchery monitoring and evaluation annual reports[2]. During the previous recalculation effort, natural-origin spawner distributions contributed to the apportionment of hatchery production among facilities. Specifically, the spawner data (and other factors) were used to populate the "proportion" of hatchery compensation allocated to individual facilities in developing the sensitivity analysis (Table 8).

Table 8. Natural-origin spawner distribution for the period of 2011-2020

Species	Stock_Tributary	Average NOS (2011-2020)	Percent Distribution Above RI	Percent Distribution Above RR	Percent Distribution Above Wells
Spring Chinook	SPCH_METH	341	28%	62%	100%
Spring Chinook	SPCH_ENTI	209	17%	38%	
Spring Chinook	SPCH_WEN	673	55%		
		Species Total (N)	1223	550	341
Steelhead	STL_METH	677	40%	56%	75%
Steelhead	STL_OKAN	224	13%	18%	25%
Steelhead	STL_ENTI	314	19%	26%	
Steelhead	STL_WEN	471	28%		
		Species Total (N)	1687	1215	901
Summer Chinook	SUCH_METH	1,367	10%	16%	18%
Summer Chinook	SUCH_OKAN	6,357	46%	76%	82%
Summer Chinook	SUCH_ENTI	225	2%	3%	
Summer Chinook	SUCH_CHEL	468	3%	6%	
Summer Chinook	SUCH_WEN	5,508	40%		
		Species Total (N)	13924	8417	7723
Sockeye	SOCK_OKAN	170,143	82%	100%	100%
Sockeye	SOCK_WEN	38,173	18%		
		Species Total (N)	208316	170143	170143
Coho	COHO_METH	45	13%	100%	100%
Coho	COHO_ WEN	289	87%		
		Species Total (N)	334	45	45

1 https://fortress.wa.gov/dfw/score/

2 Hillman, T., M. Miller, M. Hughes, C. Moran, J. Williams, M. Tonseth, C. Willard, S. Hopkins, J. Caisman, T. Pearsons, and P. Graf. 2021. Monitoring and evaluation of the Chelan and Grant County PUDs hatchery programs: 2020 annual report.

Snow, C., C. Frady, D. Grundy, B. Goodman, G. Mackey, and A. Haukenes. 2021. Monitoring and evaluation of the Wells Hatchery and Methow Hatchery programs: 2020 annual report. Report to Douglas PUD, Grant PUD, Chelan PUD, and the Wells and Rocky Reach HCP Hatchery Committees, and the Priest Rapids Hatchery Subcommittees, East Wenatchee, WA.

Table 9. Historic calculated hatchery compensation rates for natural-origin returns at mid-Columbia projects for 2013-2024 illustrating the proportion (orange highlight) of hatchery compensation allocated to specific hatcheries.

Project	Species	Ave. wild returns	Project survival	Less adults	Hatchery	Proportion	SAR	Smolts owed
WEL	SpCH	568	0.9630	21.8	Methow	100%	0.234%	9,326
	SuCH	15,531	0.9630	596.7	Wells	25%	1.236%	12,066
					Chief Joe	75%	1.227%	36,475
	StHD	992	0.9630	38.1	Wells	100%	1.137%	3,352
RRH	SpCH	717	0.9300	54.0	Methow	100%	0.234%	23,063
	SuCH	25,991	0.9300	1,956.3	Chelan Falls	100%	1.320%	148,205
					Similkameen	0%	1.227%	-
	StHD	1,310	0.9579	57.6	Chiwawa	100%	1.262%	4,562
RIS	SpCH	1,534	0.9375	102.3	Chiwawa	100%	0.540%	18,938
					Methow	0%	0.234%	-
	SuCH	43,990	0.9375	2,932.7	Dryden	60%	0.632%	278,418
					Carlton	0%	0.205%	-
					Similkameen	40%	1.227%	95,604
	StHD	3,606	0.9675	121.1	Chiwawa	100%	1.262%	9,598
PRD	SpCH	1,885	0.8659	291.9	White/Nason	50%	0.540%	27,030
					Methow	50%	0.234%	62,377
	SuCH	22,739	0.8659	3,521.5	Dryden	65%	0.632%	362,184
					Carlton	9%	0.205%	154,604
					Chief Joe	26%	1.227%	74,621
	FaCH	8,619	0.8659	1,334.7	Priest Rapids	100%	0.410%	325,543
	StHD	4,003	0.8105	935.9	Wells	100%	1.137%	82,281

SAR Data

Smolt to adult return (SAR) rates were calculated for individual public utility district hatchery programs. The brood years included in the calculations represent those brood years that are expected to contribute to the adult return years of 2011-2020 (see Tables 1-4). This approach uses a 10-year adult return window and maximizes the number of relevant brood year SARs that are included. It should be noted that if the brood year SARs are not linked with their associated adult return years, changes in hatchery performance will be muted by variability in ocean productivity and the resultant hatchery compensation values will primarily reflect the extent of the mismatch between the ocean productivity experienced by adult returns and the decoupled brood years (as opposed to hatchery performance). For the current recalculation effort, complete brood year SARs from the previous recalculation were not used. However, because a single brood year may span multiple adult return years, it is impossible to generate continuous brood year SARs that do not overlap recalculation periods (Figure 19). Therefore, an incomplete brood year from one recalculation period may contribute to and remain relevant in the next recalculation period as it is updated with additional returns.

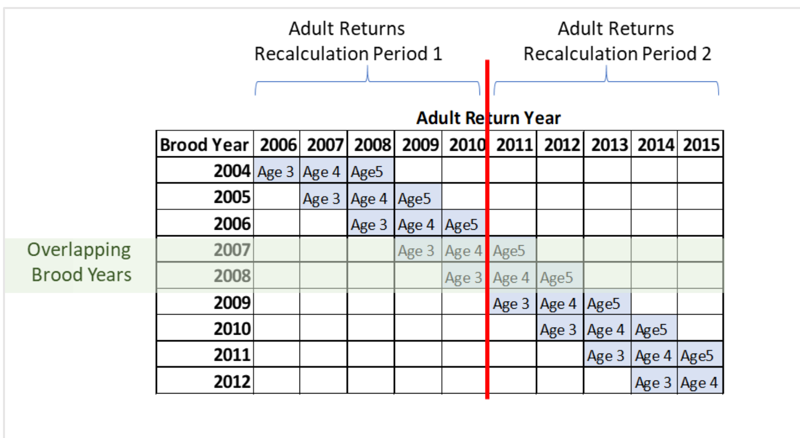

Figure 18. Illustration of brood years overlapping recalculation periods

The following sections provide an overview of the SAR calculation method for individual species and stocks. For Chinook stocks, the proposed method for calculating SARs includes: Alternating between 1) PIT data from Project or upstream detection locations plus CWT data from downstream harvest ["PIT + CWT harvest"]; and 2) CWT-based SARs obtained directly from annual reports ["CWT"; e.g., Hillman et al. 2021].

The alternation sequence begins with the first brood year populated with a PIT + CWT harvest value followed by the second brood year populated with a CWT value and continues thereafter for all relevant brood years (e.g., BY1 = PIT + CWT harvest; BY2 = CWT; BY3 = PIT + CWT harvest; BY 4 = CWT; etc.). For spring and fall Chinook with 8 relevant brood years, SAR data includes 4 brood years populated with PIT + CWT harvest data and 4 brood years populated with CWT data. For summer Chinook with 9 relevant brood years, SAR data includes 5 brood years populated with PIT + CWT harvest data and 4 brood years populated with CWT data. In instances where an initial relevant brood year lacked PIT data, the inclusion of PIT + CWT harvest values began at the first brood year where PIT data became available and alternated thereafter with CWT values. Where PIT data were available for less than the target number of brood years (i.e., 4 years for spring and fall Chinook and 5 years for summer Chinook), all available PIT + CWT harvest data were used regardless of sequence with CWT data. After selecting the SAR data for the relevant brood years (e.g., PIT + CWT harvest or CWT), the arithmetic mean of all values was calculated for each stock.

The mixing of two different SAR data sets for Chinook Salmon has been proposed as a compromise to facilitate continued progress with the current hatchery recalculation process as there is disagreement among the Hatchery Committee members on how SARs should be calculated to support hatchery recalculation.

Spring Chinook

For Spring Chinook, PIT + CWT harvest data were obtained from the following sources: 1) PIT tag data from release to detection at individual hydroprojects or upstream location, and 2) CWT harvest data for downstream ocean, Zone 1-5 commercial, recreational, and Tribal fisheries. CWT data were obtained from annual reports (e.g., Hillman et al. 2021; Snow et al. 2021)

Summer Chinook

For Summer Chinook, PIT + CWT harvest data were obtained from the following sources: 1) PIT tag data from release to adult detection at individual hydroprojects or upstream locations, and 2) CWT harvest data for downstream ocean, Zone 1-5 commercial, and Zone 6 Tribal fisheries. CWT data were obtained from annual reports (e.g., Hillman et al. 2021; Snow et al. 2021)

Fall Chinook

For Fall Chinook PIT + CWT harvest were obtained from the following sources: 1) PIT tag data from release to adult detection at McNary Dam, and 2) CWT data obtained from downstream ocean, Zone 1-5 commercial, recreational, and Tribal fisheries. McNary Dam was used as a control point because significant numbers of adult fall Chinook spawners use the Hanford Reach. CWT data were obtained from annual reports (e.g., Richards and Pearsons 2021)

Steelhead

Summer Steelhead SARs were calculated using 1) PIT tag data from release to detection at Bonneville Dam or 2) stock assessment data if PIT tags were not available for a given brood year.

Sockeye

Hatchery production did not occur in the Wenatchee basin and hatchery SARs were not calculated. Therefore, natural-origin SARs were calculated based on run reconstruction using smolt production and adult return estimates from Hillman et al. 2021.

Table 10 summarizes the calculated SARs for the PUD hatchery facilities and includes the brood years that were considered (based on Tables 1-3). Table 11 provides specific detail for individual brood year SARs.

Coho

Coho SARs were obtained from the Yakama Nation Mid-Columbia Coho Reintroduction Monitoring and Evaluation Report for 2019 for the Wenatchee and Methow programs. Pit data were also obtained from the WINT and WINTBC programs to support SAR estimates to Wells for the Twisp program.

Table 10. Summary of average hatchery smolt to adult return data for public utility district hatchery programs

Species	Program	Brood Years Included (Current Recalculation)	Brood Years included (Previous Recalculation)	Avg. SAR[1]	Project-based SAR: Avg. Priest Rapids SAR	Project-based SAR: Avg. Rock Island SAR	Project-based SAR: Avg. Wells SAR	Data Used
Spring Chinook								
	Chiwawa	2007-2014; N = 8	2002-2004, 2007[2], 2008[2]			0.525%[3]		Project/Upstream PIT + Downstream CWT harvest: 2007, 2009, 2011, 2013; M&E CWT only: 2008, 2010, 2012, 2014
	Nason	2013-2014	N/A		0.480%			Nason data were available for 2 brood years: 2013 and 2014
	Methow	2007-2014; N = 8	2001-2005		0.527%	0.527%	0.527%	Project/Upstream PIT + Downstream CWT harvest: 2008, 2010, 2012, 2014; M&E CWT only: 2007, 2009, 2011, 2013
Summer Chinook								
	Carlton	2006-2014; N = 9	2000-2004		0.827%			Project/Upstream PIT + Downstream CWT harvest: 2008, 2009, 2012, 2013, 2014; M&E CWT only: 2006, 2007, 2010, 2011
	Chelan Falls	2006-2014; N = 9	2000-2004		1.879%	1.789%[3]		Project/Upstream PIT + Downstream CWT harvest: 2007, 2010, 2012, 2013, 2014; M&E CWT only: 2006, 2008, 2009, 2011
	Dryden	2006-2014; N = 9	2000-2004		0.800%	0.782%[3]		Project/Upstream PIT + Downstream CWT harvest: 2008, 2011, 2012, 2013, 2014; M&E CWT only: 2006, 2007, 2009, 2010
	Similkameen	2006-2014; N = 9	2000-2004		2.076%	1.993%[3]		Project/Upstream PIT + Downstream CWT harvest: 2008, 2009, 2011; M&E CWT only: 2006, 2007, 2010, 2012, 2013, 2014
	Wells	2006-2014; N = 9	N/A				1.412%	CWT data used for all years
Fall Chinook								
	Priest Rapids Hatchery	2006-2013; N = 8	2001-2005		1.433%			Project/Upstream PIT + Downstream CWT harvest: 2007, 2009, 2011, 2013; M&E CWT only: 2006, 2008, 2010, 2012
Steelhead								
	Chiwawa/Wenatchee	2008-2015; N = 8	2001-2003, 2006, 2007	0.581%				PIT release to BON: 2008-2015
	Okanogan	2008-2015; N = 8		0.609%				PIT release to BON: 2008-2015

	Wells & Methow	2008-2015; N = 8	2002-2006	0.869%		M&E Report 2008; PIT release to BON: 2009-2015
Sockeye						
	Wenatchee	2007-2015; N = 8	2002, 2003, 2006-2008[2]	6.31%[4]		No hatchery program (natural-origin run reconstruction from M&E Report)
Coho						
	Wenatchee	2008-2016: N = 9	N/A	0.413%		YN M&E Data from2019 Mid-C Coho Reintroduction and Monitoring Report
	Methow	2008-2016: N = 9	N/A	0.268%		YN M&E Data from2019 Mid-C Coho Reintroduction and Monitoring Report
	Twisp	2008-2018: N=11	N/A		0.915%	PIT data from WINT and WINTBC programs

Notes:

1. A single average SAR estimate was calculated for steelhead and Sockeye Salmon.
2. Incomplete brood years previously calculated with PIT Data
3. PIT data corrected for detection efficiency: (Spring Chinook Avg = 0.9135, Summer Chinook Avg = 0.9179; Buchanan, R.A., and J. R. Skalski. 2012-2020. Detection Efficiencies at Rock Island, Rocky Reach, and Tumwater Dam Adult Ladders (2012-2020). Columbia Basin Research, School of Aquatic and Fishery Sciences, University of Washington
4. Natural-origin SAR. No hatchery program.

Table 11. Smolt to adult return data for individual public utility hatcheries.

				Project SAR based on Alternating PIT and CWT Data			
Species	**Program**	**Brood Year**	**Single SAR**	**SAR PRD**	**SAR RI**	**SAR Wells**	**SAR Data Notes**
SPCH	Chiwawa	2007		0.71%	0.65%		PIT + CWT harvest, detections at or upstream of project
SPCH	Chiwawa	2008		0.64%	0.64%		CWT
SPCH	Chiwawa	2009		0.59%	0.61%		PIT + CWT harvest, detections at or upstream of project
SPCH	Chiwawa	2010		0.62%	0.62%		CWT
SPCH	Chiwawa	2011		0.99%	0.73%		PIT + CWT harvest, detections at or upstream of project
SPCH	Chiwawa	2012		0.37%	0.37%		CWT
SPCH	Chiwawa	2013			0.33%		PIT + CWT harvest, detections at or upstream of project
SPCH	Chiwawa	2014			0.26%		CWT
SPCH	Nason (PRD)	2013		0.480%			PIT + CWT harvest, detections at or upstream of project
SPCH	Nason (PRD)	2014		0.480%			CWT
SPCH	Methow	2007		0.46%	0.46%	0.46%	CWT
SPCH	Methow	2008		1.32%	1.32%	1.32%	PIT + CWT harvest, detections at or upstream of project; first PIT data year
SPCH	Methow	2009		0.22%	0.22%	0.22%	CWT
SPCH	Methow	2010		0.88%	0.88%	0.88%	PIT + CWT harvest, detections at or upstream of project
SPCH	Methow	2011		0.83%	0.83%	0.83%	CWT
SPCH	Methow	2012		0.17%	0.17%	0.17%	PIT + CWT harvest, detections at or upstream of project
SPCH	Methow	2013		0.14%	0.14%	0.14%	CWT
SPCH	Methow	2014		0.20%	0.20%	0.20%	PIT + CWT harvest, detections at or upstream of project
SUCH	Carlton	2006		0.91%			CWT
SUCH	Carlton	2007		0.12%			CWT
SUCH	Carlton	2008		2.45%			PIT + CWT harvest, detections at or upstream of project; first PIT data year
SUCH	Carlton	2009		0.18%			PIT + CWT harvest, detections at or upstream of project
SUCH	Carlton	2010		0.41%			CWT
SUCH	Carlton	2011		1.10%			CWT
SUCH	Carlton	2012		0.14%			PIT + CWT harvest, detections at or upstream of project
SUCH	Carlton	2013		0.69%			PIT + CWT harvest, detections at or upstream of project
SUCH	Carlton	2014		1.45%			PIT + CWT harvest, detections at or upstream of project
SUCH	Dryden	2006		1.13%	1.13%		CWT
SUCH	Dryden	2007		0.11%	0.11%		CWT
SUCH	Dryden	2008		1.99%	2.00%		PIT + CWT harvest, detections at or upstream of project; first PIT data year
SUCH	Dryden	2009		0.51%	0.51%		CWT
SUCH	Dryden	2010		0.38%	0.38%		CWT

				Project SAR based on Alternating PIT and CWT Data			
Species	Program	Brood Year	Single SAR	SAR PRD	SAR RI	SAR Wells	SAR Data Notes
SUCH	Dryden	2011		1.30%	1.22%		PIT + CWT harvest, detections at or upstream of project
SUCH	Dryden	2012		0.51%	0.50%		PIT + CWT harvest, detections at or upstream of project
SUCH	Dryden	2013		0.82%	0.77%		PIT + CWT harvest, detections at or upstream of project
SUCH	Dryden	2014		0.45%	0.43%		PIT + CWT harvest, detections at or upstream of project
SUCH	Chelan Falls	2006		2.82%	2.82%		CWT
SUCH	Chelan Falls	2007		1.73%	1.75%		PIT + CWT harvest, detections at or upstream of project; first PIT data year
SUCH	Chelan Falls	2008		2.07%	2.07%		CWT
SUCH	Chelan Falls	2009		1.13%	1.13%		CWT
SUCH	Chelan Falls	2010		2.99%	2.58%		PIT + CWT harvest, detections at or upstream of project
SUCH	Chelan Falls	2011		1.81%	1.81%		CWT
SUCH	Chelan Falls	2012		1.44%	1.42%		PIT + CWT harvest, detections at or upstream of project
SUCH	Chelan Falls	2013		1.17%	0.94%		PIT + CWT harvest, detections at or upstream of project
SUCH	Chelan Falls	2014		1.76%	1.59%		PIT + CWT harvest, detections at or upstream of project
SUCH	Similkameen	2006		2.28%	2.28%		CWT
SUCH	Similkameen	2007		0.81%	0.81%		CWT
SUCH	Similkameen	2008		2.99%	3.04%		PIT + CWT harvest, detections at or upstream of project; first PIT data year
SUCH	Similkameen	2009		1.89%	1.52%		PIT + CWT harvest, detections at or upstream of project
SUCH	Similkameen	2010		1.75%	1.75%		CWT
SUCH	Similkameen	2011		3.77%	3.35%		PIT + CWT harvest, detections at or upstream of project
SUCH	Similkameen	2012		2.50%	2.50%		CWT
SUCH	Similkameen	2013		0.90%	0.90%		CWT; data source Andrea Pearl CCT-Harvest included
SUCH	Similkameen	2014		1.79%	1.79%		CWT; data source Andrea Pearl CCT-Harvest included
SUCH	Wells	2006				2.169%	CWT
SUCH	Wells	2007				0.442%	CWT
SUCH	Wells	2008				1.609%	CWT
SUCH	Wells	2009				1.647%	CWT
SUCH	Wells	2010				0.895%	CWT
SUCH	Wells	2011				2.619%	CWT
SUCH	Wells	2012				1.112%	CWT
SUCH	Wells	2013				1.034%	CWT
SUCH	Wells	2014				1.180%	CWT
FACH	Priest Rapids Hatchery	2006		0.05%			CWT
FACH	Priest Rapids Hatchery	2007		1.72%			PIT + CWT harvest, detections at McNary; first PIT data year
FACH	Priest Rapids Hatchery	2008		0.33%			CWT

				Project SAR based on Alternating PIT and CWT Data			
Species	Program	Brood Year	Single SAR	SAR PRD	SAR RI	SAR Wells	SAR Data Notes
FACH	Priest Rapids Hatchery	2009		1.95%			PIT + CWT harvest, detections at McNary
FACH	Priest Rapids Hatchery	2010		3.10%			CWT
FACH	Priest Rapids Hatchery	2011		1.94%			PIT + CWT harvest, detections at McNary
FACH	Priest Rapids Hatchery	2012		1.75%			CWT
FACH	Priest Rapids Hatchery	2013		0.62%			PIT + CWT harvest, detections at McNary
STLHD	Chiwawa/Wenatchee	2008	0.95%				PIT SAR (Release to BON)
STLHD	Chiwawa/Wenatchee	2009	1.18%				PIT SAR (Release to BON)
STLHD	Chiwawa/Wenatchee	2010	0.50%				PIT SAR (Release to BON)
STLHD	Chiwawa/Wenatchee	2011	0.56%				PIT SAR (Release to BON)
STLHD	Chiwawa/Wenatchee	2012	0.76%				PIT SAR (Release to BON)
STLHD	Chiwawa/Wenatchee	2013	0.43%				PIT SAR (Release to BON)
STLHD	Chiwawa/Wenatchee	2014	0.01%				PIT SAR (Release to BON)
STLHD	Chiwawa/Wenatchee	2015	0.26%				PIT SAR (Release to BON)
STLHD	Okanogan	2008	0.07%				PIT SAR (Release to BON)
STLHD	Okanogan	2009	1.30%				PIT SAR (Release to BON)
STLHD	Okanogan	2010	0.54%				PIT SAR (Release to BON)
STLHD	Okanogan	2011	0.92%				PIT SAR (Release to BON)
STLHD	Okanogan	2012	0.44%				PIT SAR (Release to BON)
STLHD	Okanogan	2013	0.98%				PIT SAR (Release to BON)
STLHD	Okanogan	2014	0.07%				PIT SAR (Release to BON)
STLHD	Okanogan	2015	0.55%				PIT SAR (Release to BON)
STLHD	Wells & Methow	2008	1.32%				DPUD M&E Report
STLHD	Wells & Methow	2009	1.22%				PIT SAR (Release to BON)
STLHD	Wells & Methow	2010	0.57%				PIT SAR (Release to BON)
STLHD	Wells & Methow	2011	1.24%				PIT SAR (Release to BON)
STLHD	Wells & Methow	2012	0.99%				PIT SAR (Release to BON)
STLHD	Wells & Methow	2013	1.11%				PIT SAR (Release to BON)
STLHD	Wells & Methow	2014	0.01%				PIT SAR (Release to BON)
STLHD	Wells & Methow	2015	0.49%				PIT SAR (Release to BON)
SOCK	Wenatchee	2007	3.46%				Run reconstruction SAR using smolt trap data and adult returns Chelan PUD M&E
SOCK	Wenatchee	2008	1.39%				Run reconstruction SAR using smolt trap data and adult returns Chelan PUD M&E
SOCK	Wenatchee	2009	2.33%				Run reconstruction SAR using smolt trap data and adult returns Chelan PUD M&E
SOCK	Wenatchee	2010	12.97%				Run reconstruction SAR using smolt trap data and adult returns Chelan PUD M&E
SOCK	Wenatchee	2011	7.43%				Run reconstruction SAR using smolt trap data and adult returns Chelan PUD M&E

				Project SAR based on Alternating PIT and CWT Data			
Species	**Program**	**Brood Year**	**Single SAR**	**SAR PRD**	**SAR RI**	**SAR Wells**	**SAR Data Notes**
SOCK	Wenatchee	2012	5.00%				Run reconstruction SAR using smolt trap data and adult returns Chelan PUD M&E
SOCK	Wenatchee	2013	2.15%				Run reconstruction SAR using smolt trap data and adult returns Chelan PUD M&E
SOCK	Wenatchee	2014	9.01%				Run reconstruction SAR using smolt trap data and adult returns Chelan PUD M&E
SOCK	Wenatchee	2015	13.06%				Run reconstruction SAR using smolt trap data and adult returns Chelan PUD M&E
COHO	Wenatchee	2008	0.720%				CWT and PBT from YN M&E
COHO	Wenatchee	2009	0.300%				CWT and PBT from YN M&E
COHO	Wenatchee	2010	0.120%				CWT and PBT from YN M&E
COHO	Wenatchee	2011	0.930%				CWT and PBT from YN M&E
COHO	Wenatchee	2012	0.140%				CWT and PBT from YN M&E
COHO	Wenatchee	2013	0.260%				CWT and PBT from YN M&E
COHO	Wenatchee	2014	0.420%				CWT and PBT from YN M&E
COHO	Wenatchee	2015	0.510%				CWT and PBT from YN M&E
COHO	Wenatchee	2016	0.320%				CWT and PBT from YN M&E
COHO	Methow	2008	0.250%				CWT and PBT from YN M&E
COHO	Methow	2009	0.150%				CWT and PBT from YN M&E
COHO	Methow	2010	0.060%				CWT and PBT from YN M&E
COHO	Methow	2011	0.320%				CWT and PBT from YN M&E
COHO	Methow	2012	0.140%				CWT and PBT from YN M&E
COHO	Methow	2013	0.040%				CWT and PBT from YN M&E
COHO	Methow	2014	0.520%				CWT and PBT from YN M&E
COHO	Methow	2015	0.440%				CWT and PBT from YN M&E
COHO	Methow	2016	0.480%				CWT and PBT from YN M&E
COHO	Twisp	2008				1.213%	PIT data from WINT and WINTBC programs
COHO	Twisp	2009				0.329%	PIT data from WINT and WINTBC programs
COHO	Twisp	2010				0.058%	PIT data from WINT and WINTBC programs
COHO	Twisp	2011				2.012%	PIT data from WINT and WINTBC programs
COHO	Twisp	2012				0.201%	PIT data from WINT and WINTBC programs
COHO	Twisp	2013				0.103%	PIT data from WINT and WINTBC programs
COHO	Twisp	2014				0.973%	PIT data from WINT and WINTBC programs
COHO	Twisp	2015				0.600%	PIT data from WINT and WINTBC programs
COHO	Twisp	2016				1.105%	PIT data from WINT and WINTBC programs
COHO	Twisp	2017				1.125%	PIT data from WINT and WINTBC programs
COHO	Twisp	2018				2.349%	PIT data from WINT and WINTBC programs

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Attachment C
Hatchery Allocation Proportions for Chelan PUD's Mitigation

Project	Species	Ave. wild returns	Project survival	Less adults	Hatchery	Proportion	SAR	Smolts owed
WEL	SpCH	568	0.9630	21.8	Methow	100%	0.234%	9,326
	SuCH	15,531	0.9630	596.7	Wells	25%	1.236%	12,066
					Chief Joe	75%	1.227%	36,475
	StHD	992	0.9630	38.1	Wells	100%	1.137%	3,352
RRH	SpCH	717	0.9300	54.0	Methow	100%	0.234%	23,063
	SuCH	25,991	0.9300	1,956.3	Chelan Falls	100%	1.320%	148,205
					Similkameen	0%	1.227%	-
	StHD	1,310	0.9579	57.6	Chiwawa	100%	1.262%	4,562
RIS	SpCH	1,534	0.9375	102.3	Chiwawa	100%	0.540%	18,938
					Methow	0%	0.234%	-
	SuCH	43,990	0.9375	2,932.7	Dryden	60%	0.632%	278,418
					Carlton	0%	0.205%	-
					Similkameen	40%	1.227%	95,604
	StHD	3,606	0.9675	121.1	Chiwawa	100%	1.262%	9,598
PRD	SpCH	1,885	0.8659	291.9	White/Nason	50%	0.540%	27,030
					Methow	50%	0.234%	62,377
	SuCH	22,739	0.8659	3,521.5	Dryden	65%	0.632%	362,184
					Carlton	9%	0.205%	154,604
					Chief Joe	26%	1.227%	74,621
	FaCH	8,619	0.8659	1,334.7	Priest Rapids	100%	0.410%	325,543
	StHD	4,003	0.8105	935.9	Wells	100%	1.137%	82,281

II. Compensation for Natural-Origin Smolts

Agreed Method

Step 1: Calculate the average number of adults that would have returned to a project absent UPM.

$$ONR_p/S_p = Premortality\ Return\ Estimate_p$$

Step 2: Calculate the difference between the premortality estimate and observed returns to determine the number of adult equivalents required to meet NNI.

$$Premortality\ Return\ Estimate_p - ONR_p = Adult\ Equivalents_p$$

Step 3: Convert adult equivalents to hatchery smolt production numbers by dividing adult equivalents by average hatchery specific SAR. Therefore, Compensation for Natural Origin Smolts at project "P" using PUD Hatchery "Z" =

$$\frac{Adult\ Equivalents_p}{SAR_z} = CN$$

For the purposes of this analysis it was assumed that hatchery compensation for natural origin fish would be distributed in accordance with (1) the relative proportion of adult spawners in tributaries with PUD hatcheries or (2) based upon the previous allocation of hatchery production agreed to in the HCPs.

Natural-origin spawner distribution for the period 2021-2020.

Species	Stock_Tributary	Average NOS (2011-2020)	Percent Distribution Above RI	Percent Distribution Above RR	Percent Distribution Above Wells
Spring Chinook	SPCH_METH	341	28%	62%	100%
Spring Chinook	SPCH_ENTI	209	17%	38%	
Spring Chinook	SPCH_WEN	673	55%		
		Species Total (N)	1223	550	341
Steelhead	STL_METH	677	40%	56%	75%
Steelhead	STL_OKAN	224	13%	18%	25%
Steelhead	STL_ENTI	314	19%	26%	
Steelhead	STL_WEN	471	28%		
		Species Total (N)	1687	1215	901
Summer Chinook	SUCH_METH	1,367	10%	16%	18%
Summer Chinook	SUCH_OKAN	6,357	46%	76%	82%
Summer Chinook	SUCH_ENTI	225	2%	3%	
Summer Chinook	SUCH_CHEL	468	3%	6%	
Summer Chinook	SUCH_WEN	5,508	40%		
		Species Total (N)	13924	8417	7723
Sockeye	SOCK_OKAN	170,143	82%	100%	100%
Sockeye	SOCK_WEN	38,173	18%		
		Species Total (N)	208316	170143	170143
Coho	COHO_METH	45	13%	100%	100%
Coho	COHO_ WEN	289	87%		
		Species Total (N)	334	45	45

NOS Proportions

STOCK	TRIBUTARY	Percent Distribution Above RI & PRD	Percent Distribution Above RR	Percent Distribution Above Wells
SPCH	Methow	28%	62%	100%
SPCH	Entiat	17%	38%	0%
SPCH	Wenatchee	55%	0%	0%
STL	Methow	40%	56%	75%
STL	Okanogan	13%	18%	25%
STL	Entiat	19%	26%	0%
STL	Wenatchee	28%	0%	0%
SUCH	Methow	10%	16%	18%
SUCH	Okanogan	46%	76%	82%
SUCH	Entiat	2%	3%	0%
SUCH	Chelan	3%	6%	0%
SUCH	Wenatchee	40%	0%	0%

RI

STOCK	TRIBUTARY	NOR	PROJECT SURVIVAL	Adult Equivalents NUMBER	Adult Equivalent TRIBUTARY ALLOCATION	PUD HATCHERY
SPCH	Methow	1,653	93.75%	110	31	?
SPCH	Entiat				19	?
SPCH	Wenatchee				61	?
STL	Methow	2,632	96.75%	88	35	?
STL	Okanogan				12	?
STL	Entiat				16	?
STL	Wenatchee				25	?
SUCH	Methow	43,064	93.00%	3241	318	?
SUCH	Okanogan				1,480	?
SUCH	Entiat				52	?
SUCH	Chelan				109	?
SUCH	Wenatchee				1,282	?

RR

STOCK	TRIBUTARY	NOR	PROJECT SURVIVAL	Adult Equivalents NUMBER	Adult Equivalent TRIBUTARY ALLOCATION	PUD HATCHERY
SPCH	Methow	901	93.00%	68	42	?
SPCH	Entiat				26	?
SPCH	Wenatchee				NA	?
STL	Methow	1,728	95.79%	76	42	?
STL	Okanogan				14	?
STL	Entiat				20	?
STL	Wenatchee				NA	NA
SUCH	Methow	33,434	93.00%	2517	409	?
SUCH	Okanogan				1,901	?
SUCH	Entiat				67	?
SUCH	Chelan				140	?
SUCH	Wenatchee				NA	NA

Last recalculation's hatchery assignments using this recalculation's adult equivalents and updated spawner distribution data.

NOS Proportions					RI							RR				
STOCK	TRIBUTARY	Percent Distribution Above RI & PRD	Percent Distribution Above RR	Percent Distribution Above Wells	STOCK	TRIBUTARY	NOR	PROJECT SURVIVAL	Adult Equivalents NUMBER	Adult Equivalent TRIBUTARY ALLOCATION	PUD HATCHERY	NOR	PROJECT SURVIVAL	Adult Equivalents NUMBER	Adult Equivalent TRIBUTARY ALLOCATION	PUD HATCHERY
SPCH	Methow	28%	62%	100%	SPCH	Methow				31	Chiwawa	901	93.00%	68	42	Methow
SPCH	Entiat	17%	38%	0%	SPCH	Entiat	1,653	93.75%	110	19	Chiwawa				26	Methow
SPCH	Wenatchee	55%	0%	0%	SPCH	Wenatchee				61	Chiwawa				NA	NA
STL	Methow	40%	56%	75%	STL	Methow				35	Chiwawa				42	Chiwawa
STL	Okanogan	13%	18%	25%	STL	Okanogan	2,632	96.75%	88	12	Chiwawa	1,728	95.79%	76	14	Chiwawa
STL	Entiat	19%	26%	0%	STL	Entiat				16	Chiwawa				20	Chiwawa
STL	Wenatchee	28%	0%	0%	STL	Wenatchee				25	Chiwawa				NA	NA
SUCH	Methow	10%	16%	18%	SUCH	Methow				318	Dryden				409	Chelan Falls
SUCH	Okanogan	46%	76%	82%	SUCH	Okanogan				1,480	CJH	33,434	93.00%	2517	1,901	NA
SUCH	Entiat	2%	3%	0%	SUCH	Entiat	43,064	93.00%	3241	52	NA				67	NA
SUCH	Chelan	3%	6%	0%	SUCH	Chelan				109	NA				140	Chelan Falls
SUCH	Wenatchee	40%	0%	0%	SUCH	Wenatchee				1,282	Dryden				NA	NA

No RI Chelan Falls summer Chinook were allocated to the Chelan Hatchery because of unknowns regarding capacity issues.

There were too few Entiat summer Chinook to allocate to a hatchery.

Table 9 shows 0% allocated to CJH; however, after the sharing agreement was signed with the CCT, they were allocated to CJH.

	NOS Proportions			
STOCK	TRIBUTARY	Percent Distribution Above RI & PRD	Percent Distribution Above RR	Percent Distribution Above Wells
SPCH	Methow	28%	62%	100%
SPCH	Entiat	17%	38%	0%
SPCH	Wenatchee	55%	0%	0%
STL	Methow	40%	56%	75%
STL	Okanogan	13%	18%	25%
STL	Entiat	19%	26%	0%
STL	Wenatchee	28%	0%	0%
SUCH	Methow	10%	16%	18%
SUCH	Okanogan	46%	76%	82%
SUCH	Entiat	2%	3%	0%
SUCH	Chelan	3%	6%	0%
SUCH	Wenatchee	40%	0%	0%

		RI					RR				
STOCK	TRIBUTARY	NOR	PROJECT SURVIVAL	Adult Equivalents NUMBER	Adult Equivalent TRIBUTARY ALLOCATION	PUD HATCHERY	NOR	PROJECT SURVIVAL	Adult Equivalents NUMBER	Adult Equivalent TRIBUTARY ALLOCATION	PUD HATCHERY
SPCH	Methow	1,653	93.75%	110	31	Chiwawa	901	93.00%	68	42	Methow
SPCH	Entiat				19	Chiwawa				26	Methow
SPCH	Wenatchee				61	Chiwawa				NA	NA
STL	Methow	2,632	96.75%	88	35	Chiwawa	1,728	95.79%	76	42	Chiwawa
STL	Okanogan				12	Chiwawa				14	Chiwawa
STL	Entiat				16	Chiwawa				20	Chiwawa
STL	Wenatchee				25	Chiwawa				NA	NA
SUCH	Methow	43,064	93.00%	3241	318	?	33,434	93.00%	2517	409	?
SUCH	Okanogan				1,480	CJH				1,901	CJH
SUCH	Entiat				52	?				67	?
SUCH	Chelan				109	Chelan Falls				140	Chelan Falls
SUCH	Wenatchee				1,282	Dryden					