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 21, 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 19, 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 Wednesday, January 19, 2022, from 1:00 p.m. to 5:00 p.m. Attendees are listed in Attachment A to these meeting minutes.

Action Item Summary

Joint HCP-HCs and PRCC HSC

Long-term

- Mike Tonseth will distribute the analysis showing feasibility of the Methow Spring Chinook Salmon Outplanting plan based on historical run size data (Item I-A). (*Note: This item is ongoing; expected completion to be determined.*)
- Kirk Truscott will work with Colville Confederated Tribe staff to develop a model that addresses the probability of encountering natural-origin Okanogan River spring Chinook salmon at Wells Dam (Item I-A). (*Note: This item is ongoing; expected completion date to be determined.*)
- Kirk Truscott will determine the number of scales that should be collected from spring Chinook salmon at Wells Dam for elemental signature analysis to discern Okanogan River spring Chinook salmon from Methow River spring Chinook salmon (Item I-A). (*Note: This item is ongoing; completion depends on the outcome of the previous action item.*)
- Keely Murdoch and Mike Tonseth will obtain estimates of pre-spawn mortality from Andrew Murdoch to update the retrospective analysis for Wenatchee spring Chinook salmon (Item I-A). (*Note: This item is ongoing; expected completion date to be determined.*)
- Mike Tonseth and Greg Mackey will solicit input from hatchery managers on effective methods to count surplus fish (Item I-A). (*Note: This item is ongoing; expected completion by early 2022 for incorporation into Broodstock Collection Protocols.*)

Near-term (to be completed by next meeting)

- Larissa Rohrbach will file and distribute *10-year Comprehensive Review* chapters and comments to the Committees for review as they are completed (Item I-A). (*Note: This item is ongoing.*)
- Todd Pearsons and Catherine Willard will revise Grant and Chelan PUD's draft Statements of Agreement on Sockeye Salmon Obligation for approval in an upcoming meeting (Item I-A). (*Note: This item is ongoing.*)
- Todd Pearsons will update Table 8 of the *2024–2033 Recalculation Data Summary (Version 11)* to correctly show data sources for Nason Spring Chinook Salmon smolt-to-adult return (SAR) ratios to be used in recalculation (Item II-A).
- Mike Tonseth will review available Upper Columbia River DPS Steelhead harvest data by river zone and incidental mortality rates by gear type to determine if this source of mortality can be accounted for in SAR values at Priest Rapids Dam and other projects upstream (Item II-A).

Rock Island/Rocky Reach HCP-HCs

- None.

Wells HCP-HC

- None.

PRCC HSC

- None.

Decision Summary

- None.

Agreements

- None.

Review Items

- The revised draft SOA Regarding the 2023 NNI Hatchery Recalculation Dataset and updated *2024–2033 Recalculation Data Summary (Version 11)* were distributed by Larissa Rohrbach on January 13, 2022.

Finalized Documents

- The final *2020 Methow Complex M&E Report* was distributed by Larissa Rohrbach on December 21, 2021.

- No comments were received on the 2022 Wells HCP Action plan was approved as final by the HCP Coordinating Committee on January 25, 2022.

I. Welcome

A. Agenda, Announcements, Approve Past Meeting Minutes, Last Meeting's Action Items

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 from the HCP-HCs and PRCC HSC meeting on December 15, 2021, were reviewed and discussed *(Note: Italicized text below corresponds to action items from the previous meeting*).

Joint HCP-HCs and PRCC HSC

Long-term

- *Mike Tonseth will distribute the analysis showing feasibility of the Methow Spring Chinook Salmon Outplanting plan based on historical run size data (Item I-A). (Note: This item is ongoing; expected completion to be determined.)*
- *Kirk Truscott will work with Colville Confederated Tribe staff to develop a model that addresses the probability of encountering natural-origin Okanogan River spring Chinook Salmon at Wells Dam (Item I-A). (Note: This item is ongoing; expected completion date to be determined.)*
- *Kirk Truscott will determine the number of scales that should be collected from spring Chinook Salmon at Wells Dam for elemental signature analysis to discern Okanogan River spring Chinook Salmon from Methow River spring Chinook Salmon (Item I-A). (Note: This item is ongoing; completion depends on the outcome of the previous action item.)*
- *Keely Murdoch and Mike Tonseth will update the retrospective analysis for Wenatchee spring Chinook Salmon (Item I-A). (Note: This item is ongoing; expected completion date to be determined.)*

  Andrew Murdoch has generated some pre-spawn mortality estimates that were shared with the hatchery committee for the Chiwawa Spring Chinook Salmon a couple of years ago and may be generated for other stocks based on more recent work. This action item has been resolved to adjust program sizing when numbers are available resulting from recalculation.
- *Mike Tonseth and Greg Mackey will solicit input from hatchery managers on effective methods to count juvenile surplus fish (Item I-A). (Note: This item is ongoing; expected completion by early 2022 for incorporation into Broodstock Collection Protocols.)*

Near-term (to be completed by next meeting)

- *Larissa Rohrbach will file and distribute 10-year Comprehensive Review chapters and comments to the Committees for review as they are completed (Item I-A). (Note: This item is ongoing.)*
- *Todd Pearsons and Catherine Willard will revise Grant and Chelan PUD's draft Statements of Agreement on Sockeye Salmon Obligation for approval in an upcoming meeting (Item I-A). (Note: This item is ongoing.)*
- *Todd Pearsons will update Table 8 of the 2024–2033 Recalculation Data Summary (Version 11) to correctly show data sources for Nason Spring Chinook Salmon smolt-to-adult return (SAR) ratios to be used in recalculation (Item II-A).*
- *Mike Tonseth will review available Upper Columbia River DPS Steelhead harvest data by river zone and incidental mortality rates by gear type to determine if this source of mortality can be accounted for in SAR values at Priest Rapids Dam and other projects upstream (Item II-A).*

II. Joint HCP-HCs and PRCC HSC

A. Hatchery Production Recalculation: Recalculation Data Summary

The HCP-HCs and PRCC HSC continued discussing No Net Impact (NNI) recalculation data sources and the approach that will be used in the sensitivity analysis.

The following materials were distributed on January 13, 2022, to support the discussion in today's meeting:

- The PUDs provided a revised draft SOA titled *Regarding the 2023 No Net Impact Hatchery Recalculation Dataset* (Draft 2023 Recalculation Data Sources SOA; this draft SOA will be the basis for individual SOAs for the PUDs).
- The PUDs provided an updated version of the *2024–2033 Recalculation Data Summary (Version 11*; Attachment B)
- Grant PUD provided a suggested allocation of adult equivalents to hatchery facilities for mitigation for Priest Rapids Dam (Attachment C).

Updates made to the draft 2023 Recalculation Data Sources (Version 11) include the following:

- Updates to the SAR data to include an average of a passive integrated transponder (PIT)-based and coded wire tag (CWT)-based SAR for brood year 2013 for Carlton, Dryden, and Chelan Falls Summer Chinook Salmon.
- Rock Island yearling survival was updated from 93.75 to 93.93 in Table 7.
- Updates suggested by Matt Cooper to Entiat and Leavenworth National Fish Hatchery Spring Chinook Salmon.
- Tables 8 and 9 showing proportion of mitigation allocated to facilities were eliminated.
- Updating the text in Table 5 to indicate that Fall and Summer Chinook Salmon are included as combined Summer/Fall Chinook counts at Wells Dam (versus just summer Chinook Salmon).

- One update needs to be made for Nason Spring Chinook Salmon SARs. There are two years of SARs available (2013 to 2014). Table 8 needs to be updated to state that the remaining years will be taken from the Chiwawa Spring Chinook Salmon dataset. Grant PUD will update Table 8 with this number and indicate which years come from Nason, Chiwawa, and which are PIT-tag-based or CWT-based.

Steelhead Smolt-to-Adult Returns

Tom Kahler shared an analysis responding to his action item from January 6, 2022, to use PIT-tag detections to estimate harvest on upper Columbia steelhead upstream of Bonneville Dam (BON) and between projects. Kahler shared a spreadsheet of Methow, Entiat, and Wenatchee steelhead returns (return-years 2004-2020) to BON as indicated by PIT-tag detections, their fate after passing upstream of BON if known, based on later detections that included recoveries in harvest, as carcasses on spawning grounds, and straying. The data were broken out by each subbasin of origin. The only fish excluded were a few fish detected at BON in the adult fishways during their release year. Kahler highlighted the number of known strays into tributaries outside the Upper Columbia region such as the Deschutes River or Snake River. Conversion rates to each PUD project above McNary Dam (MCN) were also shown. Kahler concluded that straying is a very small percentage of the population. In contrast, approximately 20% of each population are lost between BON and MCN, which is not attributable to straying or dam mortality (as estimated from conversion rates to projects upstream of MCN) and could be attributable to harvest.

Murdoch asked about the idea raised in the last meeting to use the average harvest rate reported in Technical Advisory Committee (TAC) documents. Murdoch said there is a need to determine the number of adult equivalents to release to bring those missing adults back to the upper Columbia tributaries, whether they are missing due to straying or other losses. Murdoch said she understands the desire to adjust for harvest because that loss results from a management decision. The SARs used in the last recalculation are reported in the 2013 recalculation notebook (*Recalculation of Mid-Columbia River Public Utility District Hatchery Production, 2014–2023, Chelan PUD Supporting Documents*). For fish released in the Wenatchee River, PIT tags detected at Rock Island Dam and elastomers tags observed at Priest Rapids Dam (PRD) were used to estimate SARs to the mid-Columbia River (3 years of elastomer tags and 2 years of PIT tags to Rock Island) and data were not adjusted for harvest. For steelhead released at or above Wells Dam, ad-clipped fish observed at Wells Dam were used and data were also not adjusted for harvest. What is core and integral to the HCPs or Priest Rapids Salmon and Steelhead Settlement Agreement is getting to NNI. In the last recalculation, a conservative approach was used to be sure to get to NNI by using SARs from Upper Columbia River projects. Using a SAR calculated at BON leaves us short of NNI. There is a need to ensure that all mortality that happens along their journey is included in the SAR with perhaps the exception of harvest. Murdoch said she would support using the TAC harvest rates, which is a published value. Murdoch said strays are a part of the loss that should be mitigated for.

Mike Tonseth asked if the PIT-tag data that were analyzed were from hatchery- and natural-origin fish. Kahler said this includes all hatchery and natural fish PIT tagged in the Methow, Entiat, and Wenatchee subbasins. Gale asked if the Winthrop National Fish Hatchery steelhead were included. Kahler said yes.

Tonseth said the objective is to try to estimate a harvest rate on hatchery-origin fish to derive hatchery-origin SARs. Tonseth talked to Ryan Lothrop, Washington Department of Fish and Wildlife (WDFW's) Columbia River Fishery Manager, to understand lower Columbia River steelhead harvest. Tonseth said there are some datasets used to estimate A-run harvest below BON, and there are some for estimating harvest between BON to McNary Dam (MCN), both treaty and non-treaty fish (sport and tribal fisheries that occur in those areas), though data may not be available across all years. Looking at the 2008 through 2016 return years, the combined tribal and non-tribal harvest from BON upstream to the State Route 395 Bridge in Pasco, Washington (upstream of MCN and just upstream of the confluence of the Snake River) is approximately 13.3%. The TAC reports do not differentiate between components of the A-run (e.g., Upper Columbia Tributaries from Snake River). One could assume there is an average harvest rate of 14% across all A-run populations. However, this is not likely to be the case upstream of the Snake River. The assumption would be that harvest would be mainly on the Upper Columbia DPS. WDFW does have some harvest information upstream of PRD that could be applied, but it's not in a format that is usable yet. Tonseth said Jeremy Cram (WDFW) has prepared some harvest data from 2000 to 2013 for the Upper Columbia Salmon Recovery Board's (UCSRB) Harvest Summary[1] for steelhead. Those data may be from years that cannot be used for our purposes, but they could inform the approach to use an average for a time period.

Pearsons said one challenge, and the reason the BON SAR was used, is that in the UCSRB Harvest Report there is an average harvest rate of approximately 10%, and a harvest plus unaccounted-for loss of 24%. Harvest rates are likely to be underestimates based on the existing literature, and with the unaccounted-for loss, it is hard to pin-point what the actual harvest loss is. Perhaps WDFW has better information that would inform what the actual harvest is. To generate SARs back to the projects and then adjust them for harvest, the challenge is identifying the harvest rate that should be used because there appear to be a range of estimated harvest rates.

Tonseth said there are data that would allow the SAR to the tributaries to be calculated and adjusted for harvest from downstream zones, but there are assumptions that would have to be made. There are relatively good data on A-run harvest from the mouth of the Columbia River to State Route 395.

PIT-tag data for returns to PRD or BON could be used to estimate the relative proportions of the run that would be assigned to each tributary population. There would still be a component of the

[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/.

population that are lost from the system. We don't know what happened to them; it could be natural mortality, but we don't know. Pearsons asked if there would still be a big gap between known harvest and unaccounted-for loss. Pearsons said there are data for the Okanogan, but they are not included in Kahler's analysis. Tonseth said he will reach out to Cram to understand what dataset was used to generate numbers for the UCSRB Harvest Report. If looking at the A-run as an aggregate in Cram's analysis, the average harvest rate from BON to MCN, including both tribal and non-tribal fisheries, is lower than the loss rate shown in Kahler's analysis. Looking at harvest from the mouth of the Columbia River to at least PRD and adding in the strays will probably account for approximately 20% of losses. There will be some unaccounted-for loss, which may be natural mortality and that can't be assigned back to a tributary to adjust the SAR calculation. To the degree that harvest and strays can be accounted for, more reasonable steelhead SARs can be achieved. Pearsons said the numbers in the UCSRB Harvest Report do not include harvest below BON. Tonseth said preliminary harvest rates for BON to the State Route 395 Bridge is closer to 16.5%, which is higher than what was included in the UCSRB report.

Willard thanked Kahler and Tonseth for looking deeper into this. Willard noted there are data showing rates of incidental mortality from harvest in the UCSRB Harvest Report that are quite high, and the conclusion was the number of fish that die from incidental mortality is higher than the number retained as catch (Table 5 of the UCSRB Harvest Report). Tonseth said incidental mortality due to hooking mortality is accounted for in WDFW's harvest estimates, but the Zone 6 tribal fishery and the below BON non-tribal commercial net fishery do not account for this loss.

Murdoch responded to Pearsons' concerns about published harvest rates being an underestimate. She said if those harvest rates are an underestimate, then at least there is confidence that they are minimum harvest rates and then there would be confidence the mitigation would at least achieve NNI. After hearing Tonseth's comments, Murdoch said she would propose piecing together the harvest rates in each of the zones that Tonseth described to improve confidence that NNI is not being cut short.

Gale asked how precise the harvest rates need to be. It is not surprising that there is approximately 15% uncertainty in the unaccounted-for losses from BON to the upper projects, which is likely attributable to many different things, including natural mortality, harvest, and straying. There is uncertainty associated with all the data used for recalculation. Tonseth noted that there are also errors in creel expansion, so it all becomes additive.

Mackey said the concern was in the pattern of the data. The losses are very high from BON to MCN, much lower above MCN. The losses in excess of the reported harvest from BON to MCN are much higher than the rest of the system upstream, suggesting that mortality from harvest is higher in this reach. It would be better to improve these numbers if possible. Mackey supported the suggestion to identify where losses occur in the river. Tonseth said the two largest harvest zones are from the mouth to BON and BON to MCN (the Zone 6 fishery, which has a number of net fisheries). The Zone 6 fishery accounts for almost 50% of the harvest. A gear-based mortality rate for hook and line, gill nets, and other gear could be applied to account for fish that are not retained but are injured. The uncertainty around unaccounted-for losses would not be as large if harvest is broken down into harvest zones and an incidental mortality rate applied by gear type. Tonseth will review the available data on harvest rates by zone and incidental mortality rates by gear type from TAC documents and other existing literature, then consider how to add harvest into SAR estimates above PRD. Tonseth said he may prepare an average harvest rate on A-run harvest to PRD, then use WDFW Upper Columbia harvest reports to piece together harvest from PRD to projects upstream. Differentiation between A-run and B-run is based on fish size at BON, and there may be some inaccuracy. Gear type incidental mortality estimates will depend on what data are available for gear types and net mesh size. Tonseth's approach will also incorporate loss due to straying as estimated by Kahler. Tonseth will discuss with Cram the differences between his analysis of Upper Columbia River harvest and other literature.

Gale said the only harvest in Zone 6 is a treaty-tribe harvest. Beyond taking TAC estimates of post-fishery mortality, Gale questioned whether the Committees should be creating estimates for what is a treaty-tribe fishery. Tonseth said the joint staff reports do report treaty impact rates for steelhead for natural-origin fish, which is likely attributable for hatchery-origin fish. Gale asked if the joint staff reports are TAC-approved estimates. Tonseth confirmed these are TAC-reviewed documents generated by the joint Columbia River staff (Oregon and Washington), used by the TAC to report their respective annual take of listed species to National Oceanic Atmospheric Administration, including that impact from tribal counterparts. Tonseth said he will only use values that have been previously reviewed and reported.

Brood-year cohort harvest data will not be available (only annual data). Tonseth asked if the return year data should be reported by brood year? For instance, if using BY 2008 to 2015 for the SAR data for other species, should the return years for those same brood years be used? Pearsons said the return year data should be matched up to the brood years as best as possible. Rod O'Connor suggested following Table 2 in the Recalculation Data Summary document, which shows the matrix for return years and brood years for steelhead. BY 2008 to 2015 SARs would align with 2011 to 2020 return years. Tonseth suggested the dataset may need to be backed up one year if the 2020 data are not available.

Tonseth will prepare steelhead harvest data by return year by the end of next week for use in calculating steelhead SARs to the project areas based on returns adjusted for harvest rates.

A meeting will be held on the morning of Thursday, February 3 to discuss Tonseth's results within the context of approving the recalculation dataset.

B. Draft 2023 Recalculation Data Sources SOA

Willard has made updates to the SOA to reflect the updated approach to calculating SARs (for all species other than steelhead). Pearsons said the change discussed for the Nason Spring Chinook SARs should also be added as a row to the Table and to the footnotes in the SOA.

Tonseth suggested adding a placeholder for inserting language on how steelhead SARs will be handled when that is determined in February.

No other changes to the draft SOA were suggested.

C. Goat Wall Acclimation Site Review Preparations

Murdoch said that the Committees are due for an update on the Goat Wall Acclimation Site. The Yakama Nation (YN) has been releasing spring Chinook Salmon under a 5-year study plan from 2017 to 2021. There was a check-in in 2019 at which time an issue was identified that at the conclusion of the program, the complete adult return data would not yet be available. Many of the objectives in the study plan consider adult distribution; however, the last year of juvenile releases was just completed in 2021, and CWT data from returning adults will also take additional time to be reported. The Committees concluded in 2019 that a decision whether to continue acclimating and releasing fish at Goat Wall could be made based on juvenile data while we wait for the rest of the adult return data.

Next month, Rick Alford (YN) and Cory Kamphaus (YN) will present the results from the assessment and share the direction the YN would like to take this program. At this point, the YN is still planning to acclimate fish at Goat Wall in 2022, so the Committees will need to make at least a short-term decision in the February meeting whether to acclimate fish at Goat Wall in 2022.

Murdoch said Alford and Kamphaus will prepare a complete juvenile dataset and possibly a partial adult dataset. One of the overall objectives was that fish acclimated at Goat Wall would home back to the upper reach of the Methow River near Goat Wall, and to understand what proportion home back to the acclimation site versus what proportion home back to the hatchery. These data would apply to the Methow spring Chinook Salmon proportionate natural influence calculations.

Tonseth asked that Alford and Kamphaus come to the meeting prepared to speak to the potential risk of burn scar runoff to the acclimation site and to the acclimating fish at Goat Wall this spring.

Pearsons said Grant PUD has a similar short-term decision need regarding release timing for fall Chinook Salmon at Priest Rapids Hatchery in 2022. Releases were carried out at early, middle, and late portions of the season for 5 years. All adult data are not back; however, juvenile down-river survival data are available, with the understanding that in some studies the juvenile survival data do not align with adult survival data. Grant PUD will try to show the juvenile data and at least a partial adult dataset to determine whether to continue with the release timing study or cancel it this year, which will affect information in the BCPs too.

D. 2022 Broodstock Collection Protocols Preparations

Larissa Rohrbach has shared an online working version of the 2022 Broodstock Collection Protocols (BCPs) with various parties. Editing online is working; however, it's a bit harder to see whether changes were made accurately.

Tonseth said once the numbers are updated based on recalculation, the updates to the BCPs can be made relatively quickly, within a day or so. The BCP authors will aim to provide a draft for approval during the March meeting, per the usual protocol schedule. If the process falls behind schedule, the HCP Hatchery Committees will need to keep the Wells HCP Coordinating Committee apprised because they need to approve the protocols before the protocols are submitted to National Marine Fisheries Service (NMFS).

Mackey noted that approval of the BCPs in the Hatchery Committee(s), including approval by the NMFS representative on the HCP Hatchery Committee and Wells HCP Coordinating Committee that actually approves the BCPs, is the formal acceptance of the BSPs by NMFS. The BCPs are supposed to be submitted to NMFS by April 15 each year. In a worst-case scenario, the BCP for spring Chinook Salmon, only, could be prepared because they are collected early in the year, and the entire BCPs can be completed later. Tonseth reminded the Committees that the BCPs can be amended later in the year if the conversations around recalculation take more time than is available before April. The BCPs can focus on collection and allocation of adults for broodstock, and the juvenile release strategies can be amended later. Tonseth said he agreed that NMFS approval within the HCP Hatchery Committees is equivalent to approval of the BCPs. Tonseth said he is not advocating for an extension but asked Brett Farman if NMFS would be willing to entertain an extension request if notified by the Committees. Farman answered that would not be a problem.

Pearsons said the Committees may need to consider having more meetings to hash through recalculated numbers. Hillman said he supports holding more meetings as needed to get the products completed on time.

Bill Gale said some coordination with the U.S. Fish and Wildlife Service (USFWS) Ecological Services is needed on the BCPs. The former staff person in the position to review the BCPs, Cindy Raekes, is now retired and this may require additional coordination with whomever is newly assigned to this task. Gale will determine who is filling this role for USFWS and Tonseth will reach out to USFWS on Chiwawa Weir operation in advance of a draft BCP. (Gale reported by email on January 24, 2022, that Michael Humling, who has past experience with the BCPs, will take on this role).

The following topics in the BCPs were identified that will require further discussion:

- Spring Chinook Salmon broodstock trapping at Chiwawa Weir
- Acclimation and release of spring Chinook Salmon at Goat Wall
- Fall Chinook Salmon release timing at Priest Rapids Hatchery

E. Coronavirus Disease 2019 and Monitoring and Evaluation Activities

Tracy Hillman asked Committees' members to provide their monthly updates on impacts of COVID-19 restrictions on monitoring and evaluation activities. COVID-19 case rates are at historic highs at this time and the option to meet in person is not likely to be available.

- Matt Cooper and Bill Gale said the phased return back to the office has been pushed back for a few weeks to February for USFWS. The return to offices will include only those personnel necessary for operations in the office, less than 25% capacity. The return to offices is likely to be pushed back again. USFWS is not likely to support in-person meetings before late April.
- Brett Farman said NMFS has pushed returning back to the office back. Staff are moving back at least one and in some cases two phases, so returning to the offices is unlikely to occur for two to three months.
- Mike Tonseth said staff are back to the WDFW offices in a socially distanced setting, wearing masks indoors and in vehicles. WDFW was originally planning to reopen state offices to the public, which has been pushed back to a yet-to-be-determined date.
- Keely Murdoch said the YN has entered another partial shut-down, which does not affect fisheries. It does affect the fisheries staff indirectly because administrative staff are working part time right now through the end of January. For meeting in-person when that time comes, the precautions that would be in place, such as how many people will attend and the amount of space, affects what YN staff would be allowed to do.
- Kirk Truscott said Colville Confederated Tribes staff are working in their offices with no updates to protocols other than wearing masks and social distancing. There are several staff absences in supporting departments who tested positive and are isolating, which has had indirect effects on things like purchase orders and cost accounting. Fortunately, there is not a lot of monitoring work going on at the moment.
- Greg Mackey said there has not been much change on policies at Douglas PUD. Cases are high and testing accommodations have been made internally. Douglas PUD does not appear to have a formal policy around meeting in person with external people, but Mackey said he does not see that being supported in the near-future.
- Catherine Willard said Chelan PUD has the same status as Douglas PUD.
- Todd Pearsons said there are no changes at Grant PUD since last month. Deanne Pavlik-Kunkel said as for meeting in-person, permission would need to be obtained and a clear protocol would need to be approved internally. The current case load has created the same issues for their workload.

III. Administrative Items

Bill Gale shared that USFWS will be opening a position on Monday to fill the deputy project leader/assistant manager position for the Mid-Columbia Fish and Wildlife Conservation Office (a GS-12 supervisory fish biologist position). This person will supervise several fish programs depending on expertise. Gale will send a link to the Committees when the position officially opens.

Pearsons shared that Peter Graf has taken a new position within Grant PUD. Rod O'Connor will serve as the new alternate to the PRCC Hatchery Subcommittee. Deanne Pavlik-Kunkel shared that a position has been opened on their website to fill Peter Graf's former position as a fish biologist.

F. Next Meetings

The next regular HCP-HCs and PRCC HSC meetings will be held on Wednesday, February 16, 2022; Wednesday, March 16, 2022; and April 20, 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 11)
Attachment C Hatchery Allocation Proportions for Grant 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
Rod O'Connor	Grant 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
Katy Shelby	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

Attachment B
2024–2033 Recalculation Data Summary (Version 11)

Rocky Reach and Rock Island HCP Hatchery Committees
DRAFT Statement of Agreement
Regarding the 2023 NNI Hatchery Recalculation Dataset
December XX, 2021

Statement

The Rocky Reach and Rock Island Habitat Conservation Plan (HCP) Hatchery Committees agree to the 2023 NNI Hatchery Recalculation data set (Attachment A). The data set includes the release to adult survival rate (SAR) data sources from the identified hatchery programs described in Table 1. These data will be used to recalculate hatchery mitigation values to achieve NNI for the next 10 years (2023 to 2033).

Table 1. SAR data sources used for 2023 Hatchery Recalculation.

Hatchery Program	Brood Years Included	Brood Years (n)	PIT[1] + CWT Harvest SAR Brood Years	CWT[2] SAR Brood Years	Average of CWT and PIT + CWT Harvest SAR Brood Years
Spring Chinook Salmon					
Chiwawa	2007-2014	8	2007, 2009, 2011, 2013	2008, 2010, 2012, 2014	NA
Methow[3]	2007-2014	8	2008, 2010, 2012, 2014	2007, 2009, 2011, 2013	NA
Summer Chinook Salmon					
Carlton[3,4]	2006-2014	9	2008, 2009, 2012, 2014	2006, 2007, 2010, 2011	2013
Chelan Falls[3]	2006-2014	9	2007, 2010, 2012, 2014	2006, 2008, 2009, 2011	2013
Dryden[3]	2006-2014	9	2008, 2011, 2012, 2014	2006, 2007, 2009, 2010	2013
Similkameen[3,5]	2006-2014	9	2008, 2009, 2011	2006, 2007, 2010, 2012, 2013, 2014	NA
Fall Chinook Salmon					
Priest Rapids Hatchery[6]	2006-2013	8	2007, 2009, 2011, 2013	2006, 2008, 2010, 2012	NA
Steelhead[7]					
Chiwawa/Wenatchee	2008-2015	8	NA	NA	NA
Okanogan	2008-2015	8	NA	NA	NA
Wells Methow R. programs	2008-2015	8	NA	NA	NA
Sockeye Salmon[7]					
Wenatchee	2007-2015	9	NA	NA	NA

Notes:

1. PIT + CWT Harvest = SARs to relevant PUD projects, plus CWT based harvest data.
2. CWT = SAR values from PUD Annual Hatchery Monitoring and Evaluation Reports.
3. 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.
4. PIT + CWT harvest data were available for only 5 of 9 relevant brood years, therefore PIT + CWT harvest data were used for the available years regardless of sequence.
5. PIT + CWT harvest data were available for only 3 of 9 relevant brood years, therefore PIT + CWT harvest data were used for the available years regardless of sequence.
6. The PIT SAR estimate for Priest Rapids Hatchery BY2006 was unreliable.
7. There is limited CWT data available for steelhead and no hatchery program for Wenatchee Sockeye Salmon.

Background

The HCP Hatchery Committees agreed to use the equation described in the Biological Assessment and Management Plan (BAMP) to calculate hatchery compensation for the natural-origin population in the June 16, 2021, SOA "Regarding Methods for 2023 NNI Hatchery Recalculation". The BAMP equation includes counts of natural-origin adult returns and SARs from the hatchery being used for the mitigation. However, the HCP Hatchery Committees were unable to come to a consensus on which data would be used in this equation. The position of the PUDs was that the adult counts and SARs should be derived at the same location, and the dams provided the best location for measuring both. Other committees' members' positions were that adults should be counted at the dams and CWT recoveries should be used for the SAR component of the equation. Ultimately, the HCP Hatchery Committees compromised and agreed to use adult counts at the dams and a combination of CWT recoveries and PIT-tag based SARS. The SARS will alternate between PIT based and CWT based where possible; for summer Chinook Salmon with nine relevant brood years, brood year 2013 will be an average of CWT and PIT SARS. This negotiated agreement is not the default for future recalculations.

The HCP Hatchery Committees will endeavor to come to an agreement by December 2022 on a method and data sources for the 2033 recalculation of hatchery compensation for the natural-origin populations, following approval of the 2023 NNI Recalculation Implementation Plan. Additionally, the HCP Hatchery Committees will include the core data needed for the agreed upon future recalculation method in annual reports to ensure these data are available and approved prior to recalculation.

2024-2033 RECALCULATION DATA SUMMARY

Chelan PUD, Douglas PUD, Grant PUD

JANUARY 2022

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	1,667
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	1,781
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 and FALL CHINOOK

Return Year	DART Summer and Fall Chinook (1): Summer and Fall Chinook Total	DART Summer and Fall Chinook (1): Count Adjusted by Spring Chinook (2)	Percent Natural Origin (3)*	Natural Origin Summer and Fall 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 numbers obtained from stock assessment at Wells

3. Natural-origin proportions obtained from WDFW: 2011-2020_Wells_Run_Comp_CD_Updated2.xlsx (Sent by Chris Moran)

Figure 3. Annual natural-origin Summer and 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

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	10.55%	361	426	787
											1,667

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	2,262	3,518	10.55%

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

Year	RR SPCH Estimate	Conversion Rate (6)	Conversion Rate Expanded RI SPCH
	Total	Natural Origin PIT-Based RI to RR	Total
2011	1,286	100.00%	1,286
2012	997	100.00%	997
2013	791	100.00%	791
2014	1,641	100.00%	1,641
2015	1,207	100.00%	1,207
2016	955	91.67%	1,041
2017	613	100.00%	613
2018	650	100.00%	650
2019	446	100.00%	446
2020	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. Muir, H., M. Maxey, M. Cooper, K. Royer, T. Bundy 2021. Monitoring and Evaluation of the Leavenworth National Fish Hatchery Spring Chinook Salmon Program, 2020. U.S. Fish and Wildlife Service, Leavenworth WA.
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

	DART RI Counts (1)	DART RR Counts (1)	Fallback Correction (2)	Fallback Correction (2)	FCF Adujsted Subtotal		Delta RI-RR (WEN River Only)	Natural Origin Correction	WEN River Only	Expanded PIT from RI to RR	Sum of WEN River Only and Total RR Natural Origin
Year	Total	Total	RI_STL FCF	RR_STL FCF	RI_STL	RR_STL	Total	% Natural	Natural Origin Total	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%

	RR (4)	Conversion Rate (5)	Expanded PIT from RI to RR
Year	Total Natural Origin	Natural Origin PIT: 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	10.55%	117	426	542
											1781

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	2,262	3,518	10.55%

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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
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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 and Fall 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

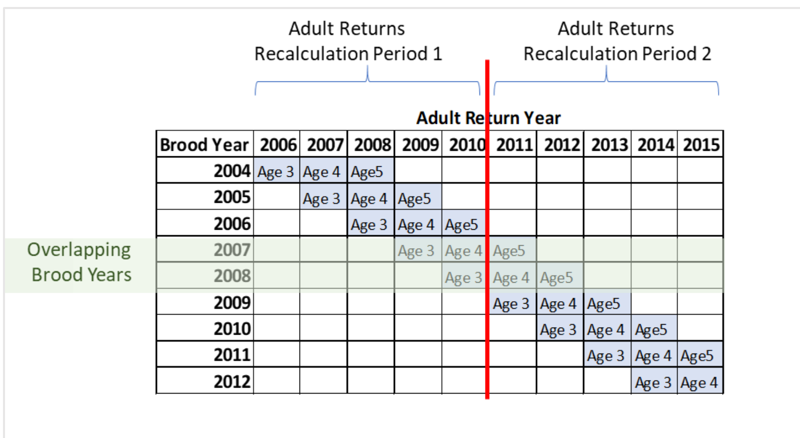
Project survival and associated unavoidable project mortality values are summarized in Table 7. Updated values for Rock Island yearling Chinook are anticipated upon completion of a project survival study in 2021.

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	93.93%	6.07%
Rock Island	Summer/Fall Chinook Subyearling	93.00%	7.00%
Rock Island	Summer/Fall Chinook Yearling	93.93%	6.07%
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%

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.



Brood Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
2004	Age 3	Age 4	Age5							
2005		Age 3	Age 4	Age5						
2006			Age 3	Age 4	Age5					
2007				Age 3	Age 4	Age5				
2008					Age 3	Age 4	Age5			
2009						Age 3	Age 4	Age5		
2010							Age 3	Age 4	Age5	
2011								Age 3	Age 4	Age5
2012									Age 3	Age 4

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 4 brood years populated with PIT + CWT harvest data and 4 brood years populated with CWT data and 1 brood year with the average of CWT and PIT + CWT harvest data (i.e., Carlton, Dryden and Chelan Falls Summer Chinook). 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. For Summer Chinook, exceptions to the previously described method include Wells (100% CWT) and Similkameen (SAR data includes 3 brood years populated with PIT + CWT harvest data and 6 brood years populated with CWT data).

After selecting the SAR data for the relevant brood years (e.g., PIT + CWT harvest or CWT or a combination thereof), 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 8 summarizes the calculated SARs for the PUD hatchery facilities and includes the brood years that were considered (based on Tables 1-3). Table 9 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 8. 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	Avg. Rock Island 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		0.818%			Project/Upstream PIT + Downstream CWT harvest: 2008, 2009, 2012, 2014; M&E CWT only: 2006, 2007, 2010, 2011; AVG of 1. CWT and 2. PIT + CWT harvest, detections at or upstream of project: 2013
	Chelan Falls	2006-2014; N = 9	2000-2004		1.859%	1.782%[3]		Project/Upstream PIT + Downstream CWT harvest: 2007, 2010, 2012, 2014; M&E CWT only: 2006, 2008, 2009, 2011: AVG of 1. CWT and 2. PIT + CWT harvest, detections at or upstream of project: 2013
	Dryden	2006-2014; N = 9	2000-2004		0.788%	0.774%[3]		Project/Upstream PIT + Downstream CWT harvest: 2008, 2011, 2012, 2014; M&E CWT only: 2006, 2007, 2009, 2010: AVG of 1. CWT and 2. PIT + CWT harvest, detections at or upstream of project: 2013
	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.
5. Red text indicates updates to values (January 10, 2022)

Table 9. 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		0.60%			AVG of 1. CWT and 2. 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		0.71%	0.69%		AVG of 1. CWT and 2. 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		0.98%	0.87%		AVG of 1. CWT and 2. 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 Grant PUD's Mitigation

GPUD

NOS Proportions					PRP						
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
SPCH	Methow	28%	62%	100%	SPCH	Methow	1,781	86.59%	276	77	Methow
SPCH	Okanogan	0%	0%	0%	SPCH	Okanogan				-	CJH
SPCH	Entiat	17%	38%	0%	SPCH	Entiat				47	Nason
SPCH	Wenatchee	55%	0%	0%	SPCH	Wenatchee				152	Nason
STL	Methow	40%	56%	75%	STL	Methow	3,123	87.03%	465	187	Okanogan
STL	Okanogan	13%	18%	25%	STL	Okanogan				62	Okanogan
STL	Entiat	19%	26%	0%	STL	Entiat				87	Okanogan
STL	Wenatchee	28%	0%	0%	STL	Wenatchee				130	Okanogan
SUCH	Methow	10%	16%	18%	SUCH	Methow	32,882	86.49%	5136	504	Carlton
SUCH	Okanogan	46%	76%	82%	SUCH	Okanogan				2,345	CJH
SUCH	Entiat	2%	3%	0%	SUCH	Entiat				83	CJH
SUCH	Chelan	3%	6%	0%	SUCH	Chelan				173	CJH
SUCH	Wenatchee	40%	0%	0%	SUCH	Wenatchee				2,032	Dryden (50%)/CJH (50%)
FAC	Columbia	100%			FAC	Columbia	11,679	86.49%	1824	1,824	Priest Rapids