FINAL

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ANCHOR
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Memorandum

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

Date: January 19, 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 December 6, 2021, 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 Monday, December 6, 2021, from 9:00 to 11:30 a.m. Attendees are listed in Attachment A to these meeting minutes.

I. Welcome

A. Agenda, Announcements

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

All HCP-HCs and PRCC HSC representatives approved the agenda. Hillman noted that action items and meeting minutes from the previous HCP-HCs meeting will be discussed at the HCP-HCs regularly scheduled meeting next week on December 15, 2021. This meeting focuses on hatchery production recalculation only.

II. Joint HCP-HCs and PRCC HSC

A. Hatchery Production Recalculation

Tracy Hillman said the purpose of today's meeting is to finish discussing No Net Impact (NNI) recalculation data sources and the approach that will be used in the sensitivity analysis. He reviewed that the PUDs provided a draft statement of agreement (SOA) titled *Regarding the 2023 No Net Impact Hatchery Recalculation Dataset* (Draft 2023 Recalculation Data Sources SOA), on December 1, 2021, for Hatchery Committees' review and discussion (this draft SOA will be the basis for individual SOAs for the PUDs). Hillman noted that Keely Murdoch compared the hatchery production recalculation method (using smolt-to-adult return [SAR] values), that was used previously by the Hatchery Committees, to the method (using SAR values) that was proposed by the PUDs and agreed to in the November 17, 2021, meeting. (A revised version of Murdoch's comparison of analysis

methods for the natural-origin returns (NOR) component of the Biological Assessment and Management Plan (BAMP) was provided to the Committees following this meeting on December 7, 2021; Attachment B).

Catherine Willard said the Draft 2023 Recalculation Data Sources SOA reflects discussions from the previous meeting, includes the dataset as an attachment that will be used for this recalculation, and describes different SAR data sources. During the November 17, 2021, meeting, representatives agreed to alternate between using passive integrated transponder (PIT)-tag data and coded wire tag (CWT) data for annual SARs values. However, as data were reviewed and updated, there were some anomalies where it was not possible to alternate data sources for each year. Willard said the background section of the SOA describes how the recalculation methods are a compromise and not a default, with a statement that future methodologies will be worked on in 2022.

Hillman asked the Committees for any questions on the Draft 2023 Recalculation Data Sources SOA. There were none.

Approve Data Sources

Hillman invited Murdoch to review her comparison of analysis methods for the NOR component of the BAMP method. Murdoch shared her presentation with the Hatchery Committees (Appendix B), thanked Willard for her help in pulling together the data for this analysis, and noted that the slides are a summary of the analysis and that she can provide the raw data and analysis if requested. She said some decisions were made regarding data analysis that might be different than what others would decide, such as the mitigation allocation of fish to different programs. She summarized her methods and results as follows:

Priest Rapids Summer Chinook Salmon – Slide 1

Murdoch allocated mitigation to the same proportions as was done in the previous recalculation. She was under the impression that the mitigation should be assigned to the three components equally (Wenatchee, Methow, and Okanogan Subbasins); however, this is not how it was implemented during the previous recalculation. This may be due to capacities at different locations.

When comparing the previous method (CWTs) to the hybrid method now proposed, there would be a reduction in smolts and adults. Murdoch said she had hoped this difference would be small, because she disagreed with the incorporation of PIT-tag data, but the difference appears to be large.

This example stands out because summer Chinook salmon have a larger NOR component than spring Chinook salmon.

Rock Island Summer Chinook Salmon – Slide 2

Murdoch's calculations of summer Chinook salmon mitigation for Priest Rapids resulted in a difference of 46,000 smolts between the two methods. The difference is a result of where mitigation is assigned. The 2011 SOA titled *Regarding the 2013 No Net Impact Recalculation Methodology* describes mitigation only being allocated to the Rock Island and Chief Joseph Dam programs. With the Chelan Falls program added, there is a difference.

Rocky Reach Summer Chinook Salmon – Slide 3

Murdoch calculated a difference of approximately 13,000 smolts or 200 adults.

Priest Rapids Spring Chinook Salmon – Slide 4

Murdoch calculated a difference of approximately 39,000 smolts.

Rock Island Spring Chinook Salmon –Slide 5

Murdoch calculated a difference of approximately 1,700 smolts.

Rocky Reach Spring Chinook Salmon – Slide 6

Murdoch calculated a difference of approximately 1,700 smolts.

Wells Spring Chinook Salmon – Slide 7

Murdoch calculated a difference of approximately 900 smolts.

Comparison of NOR Mitigation and Differences in Adult Returns– Slides 8 and 9

Many of the differences in smolt release numbers are not significant for spring Chinook salmon programs; however, there are more significant differences with the summer Chinook salmon programs.

The difference in adult returns between the two methods is also more significant for summer Chinook salmon programs.

Murdoch also presented additional questions and comments about the data that came up during her comparative analysis, which are summarized in her December 3, 2021, email (Attachment C), as follows:

1. When reviewing the summer Chinook salmon data, Murdoch said she did not find any data for Wells Dam. However, there was a small component of summer Chinook salmon NNI mitigation for Douglas PUD that appears to have been met through Chief Joseph Hatchery. No PIT-tag-based SARs were provided for these fish, and they are not described in the PUDs' data summary document.

2. Murdoch asked whether Similkameen Pond is the most appropriate SAR to use to calculate Chief Joseph Hatchery mitigation. Most of the PUDs' production is being met through subyearling SARs, so a yearling SAR from Similkameen Pond is not appropriate to calculate subyearling production. The Wells subyearling SAR might be a better surrogate. She also asked whether there are any data from Chief Joseph Hatchery that could be incorporated into the estimate, even if the dataset is not complete.

3. Per the final 2011 SOA *Regarding the 2013 No Net Impact Recalculation Methodology*, Douglas PUD's summer Chinook salmon NNI mitigation is being met at Chief Joseph Hatchery; however, there are no PIT-tag-based SAR data in the data document for summer Chinook salmon to Wells Dam, only for spring Chinook salmon. Summer Chinook salmon PIT-tag data to Wells Dam should be used to calculate the mitigation component.

4. CWT data are available for Twisp spring Chinook salmon. Murdoch asked whether PIT-tag data are available from fish that are PIT tagged during acclimation in Twisp Pond.

5. The same question applies for Chewuch spring Chinook salmon.

6. Murdoch suggested incorporating data from Nason spring Chinook salmon when it is available, even if it is not a full dataset.

7. NNI mitigation is calculated separately for Rocky Reach and Rock Island dams. A summer Chinook salmon PIT-tag-based SAR to Rocky Reach Dam should also be provided for calculating the mitigation for Rocky Reach Dam. For spring Chinook salmon, both a PIT-tag-based SAR for Rock Island and Wells dams are provided but a PIT-tag-based SAR to Rocky Reach Dam is needed to calculate the Rocky Reach Dam mitigation under the PIT method proposed by the PUDs.

Greg Mackey noted that shortly after recalculation was complete, an agreement for NNI mitigation was put in place to substitute fish for funding contribution to Chief Joseph Hatchery operations, so the PIT-tag-based SAR to Wells Dam was not meant to be incorporated. Murdoch asked if this affects the funding agreement. Mackey said no, the agreement hinges on calculations of unavoidable project mortality to calculate the Douglas PUD mitigation, which is met by funding a share of the hatchery operations and monitoring and evaluation (M&E) budget of Chief Joseph Hatchery. Murdoch asked if unavoidable project mortality is calculated for NOR fish. Mackey said the approximately 48,000 number is the recalculated value. He said the mitigation is a financial contribution to running the program for NOR fish (as well as Chief Joseph Hatchery production fish); it is not a direct number of NOR fish.

Kirk Truscott added that the cost-sharing agreement with Douglas PUD provides for smolt production based on a 3.7% unavoidable loss. This resulted in a production at the hatchery of 33,300 yearling spring Chinook salmon, plus summer Chinook salmon (addition: 48,100 yearling summer Chinook salmon and 175,000 subyearling summer Chinook salmon). This encompasses the

entire NNI and hatchery mitigation obligation for Douglas PUD. Those numbers are slightly higher now because the unavoidable loss has increased (addition: from 3.70% to 3.96%).

Mackey said once a new survival study is completed, the Colville Confederated Tribes and Bonneville Power Administration are notified, and the obligation is adjusted. Truscott noted that the most current numbers are greater than the numbers included in Murdoch's analysis. Murdoch said she did not analyze summer Chinook salmon data at Wells Dam. It is also important to make sure the correct project mortality is being used for the life stage being released. For example, NOR summer Chinook salmon generally migrate as subyearlings, so project mortality for subyearlings should be used to calculate mitigation.

Mackey said when the agreement was made to fund Chief Joseph Hatchery, subyearling mortality was used and converted to yearling "currency" in order to determine the funding arrangement (Addition: This is partially correct. The Chief Joseph Hatchery agreement for Douglas PUD uses the unavoidable project mortality as calculated for yearlings as the proportional payment of the operation and maintenance and M&E costs. The numbers of fish produced at Chief Joseph Hatchery on behalf of Douglas PUD uses the unavoidable project mortality for yearlings or subyearlings, as appropriate). The distinction is that Douglas PUD's mitigation covers natural-origin summer/fall Chinook salmon from the Okanogan basin plus the Chief Joseph Hatchery releases of spring Chinook salmon and yearling and subyearling summer/fall Chinook salmon). Murdoch said one goal of the recalculation process is to make sure everything is transparent. She suggested calculating mitigation as it is agreed to, then adding a section about how the mitigation is actually implemented. What is calculated and what is implemented turns out to be different based on program-specific features like capacity, missing data, species swaps, or other agreed upon changes, but the calculation itself is important.

Willard responded to Murdoch's first comment about Chief Joseph Hatchery summer Chinook salmon data. Chelan PUD overwinters the fish at Similkameen Pond to meet this entire obligation, including both subyearling and yearling proportions of the program. This is why Similkameen Pond SARs are used. Murdoch agreed that this approach makes sense. Truscott added that Chelan PUD does not cost share the operations and maintenance portion of Chief Joseph Hatchery, but they do fully fund operations and maintenance at Similkameen Pond, as well as their proportion of M&E activities at Chief Joseph Hatchery (funding calculated based on unavoidable project mortality). Murdoch asked that these details be described in the data summary document. Truscott added that CWT, SAR, and PIT-tag data are available for Chief Joseph Hatchery, but only after the 2013 brood when production began, which presents a limited dataset compared to using Similkameen Pond data. Murdoch suggested using the data when they are available.

Mackey responded to Murdoch's second and third comments regarding Twisp spring Chinook salmon and Chewuch spring Chinook salmon. Methow Hatchery releases are the primary data source

for SARs, but he was not aware of Murdoch's analysis to incorporate alternate release sites. The NOR return counts that are used in that formula are not split out by subrelease groups. However, they could be incorporated by using all of the SAR data (Methow, Chewuch, and Twisp) and applying a weighted average based on the release sizes to obtain an overall SAR. Murdoch said Twisp and Chewuch spring Chinook salmon SARs could be incorporated by taking the total adults and applying a percentage to different release locations, which would allow for using a different SAR for the two release sites. Mackey said he will look into incorporating that method using data from Twisp and Chewuch spring Chinook salmon. Willard added that only one SAR was used for the Methow spring Chinook salmon programs because Chewuch spring Chinook salmon are only spring-acclimated for one month, and the decision was made to composite Chewuch and Methow spring Chinook salmon (i.e., MetComp), so it seemed that using one SAR for the entire MetComp program was sufficient. Murdoch emphasized that the use of release site SARs is to improve SARs at the release location.

Todd Pearsons responded to Murdoch's fifth comment about Nason spring Chinook salmon SARs. He and Murdoch have discussed this, and he agrees with Murdoch's suggestion and will be making those revisions to include Nason SARs that are available.

Regarding Murdoch's sixth comment about Rocky Reach NNI mitigation, Willard said spring Chinook salmon SAR data from Wells Dam are used for adult returns because, in some years (such as the Wanapum Dam drawdown), detection efficiency was not sufficient at Rock Island for spring Chinook salmon. In those years, Wells Dam was a better detection point and a more conservative choice. Murdoch said that approach seems fine, and more detail about that could be described in the data summary. She suggested using Rocky Reach Dam detection data for summer Chinook salmon. Willard said Rocky Reach data were not used for summer Chinook salmon because reach specific harvest in the Upper Columbia River would need to be incorporated into the dataset, and cannot be determined based on CWTs. Murdoch said that approach makes sense. Mike Tonseth asked if impacts associated with the Rocky Reach project's effects on the Entiat River NOR population are considered. Willard said yes, because NOR counts are used at both Rocky Reach and Wells dams.

Hillman summarized that there is still work to be completed in order to finalize the data sources, including Mackey, Pearsons, and Willard updating data sources and adding footnotes describing more details about choices that were made regarding the selection of data sources. Pearsons said the PUDs will endeavor to provide the updated documentation within a week.

Draft 2023 Recalculation Data Sources SOA

Hillman said the Draft 2023 Recalculation Data Sources SOA is available for review by the Hatchery Committees; however, some of the data are still likely to change. That said, he noted that there is disagreement over data sources to be used in recalculating summer Chinook salmon mitigation, and he asked representatives present how they are generally feeling about approving the SOA once the

data sources are finalized. The SOA is for a 10-year period, and it includes a commitment to endeavoring to determine a method for future recalculation by December 2022.

Tonseth said the Washington Department of Fish and Wildlife is still reviewing the SOA and data sources. He agreed that the spring Chinook salmon data and analysis is not concerning; the summer Chinook salmon data present a potential issue. He will continue reviewing the materials.

Truscott said the Colville Confederated Tribes are also still reviewing the data sources and SOA. He will discuss the cost share with the PUDs to properly describe the mitigation obligation.

Matt Cooper said U.S. Fish and Wildlife Service is also still discussing the data sources. With the amount of variability in the estimates for summer Chinook salmon, a closer look is warranted. Bill Gale agreed.

Murdoch said Yakama Nation (YN) is still discussing this item internally with upper management. She said one idea from Tom Scribner is to offset some of the reduced summer Chinook salmon production with additional orca production. This would hinge on finding and acquiring funding and on coordination with Washington Department of Fish and Wildlife and hatchery operators. Orca production is currently only happening at Wells Hatchery. Offsetting the reduction (or expressing willingness to) might be a simpler way to reach a compromise on this topic.

Brett Farman said National Marine Fisheries Service is also still considering this item.

Willard said from the Chelan PUD perspective, she is disappointed that this discussion is more about the numbers of fish produced than the methodology and integrity of the data.

Pearsons agreed and said that it seemed all parties except the YN were in agreement about the compromised approach at the last meeting. It does not make sense to move forward with the sensitivity analysis until there is an approved dataset. This additional analysis (described by YN) makes it harder to see how an approved dataset will come to resolution.

Murdoch said she was clear at the last meeting that a comparison of past and proposed smolt production was important to the YN, and she raised issues about using PIT-tag-based SARs at the projects. Her concerns are also about data integrity, and it is her opinion that PIT-tag data should not be incorporated. If the differences were trivial, it could be a viable compromise, but it is not a trivial difference. Pearsons said it was the other parties, not the YN, that seemed in agreement with the proposed approach, and he had hoped that the YN could discuss this internally prior to this meeting. Murdoch said she is also not stating that the YN will not compromise on this matter, just that she is still working to discuss the matter and develop alternatives.

Mackey said many interesting points have been raised, and Douglas PUD's position is to continue refining the data. Any analysis of these data includes many data interpretations and application choices that would be unsatisfying to different people.

Gale noted that the YN is not the only party still considering and finding issues with the proposed approach. He asked that expectations be tempered for the next HCP-HCs and PRCC HSC meeting, because there are many policy issues at stake for members of the Joint Fisheries Parties that still need to be discussed internally.

Hillman noted that the HCP-HCs and PRCC HSC are 4 months behind their schedule to complete recalculation, and they should seriously consider either coming to an agreement or elevating this discussion to the Coordinating Committees and Policy Committees. Discussions about broodstock collection protocols are upcoming and will require a significant portion of the Committees time over the next 2 months.

Gale agreed and said if the issue is policy-related and not technical, the Committees should not be reluctant to elevate it. Hillman said the HCP-HCs and PRCC HSC could provide specific questions to the Coordinating and/or Policy Committees. He said that elevating issues to the Coordinating and/or Policy Committees is appropriate when policy-level issues are interfering with technical discussions and precluding progress on recalculation.

Murdoch noted that Gale was suggesting sending the issue to the Policy Committees before coming to a 10-year agreement, which would delay the 10-year agreement by 1 year and keep the current broodstock collection protocols in place for 2022. The other option is to approve a negotiated 10-year recalculation and then elevate the issue to the Policy Committee so that there is direction on which data to collect for the following 10-year period.

Hillman said the Hatchery Committees can discuss next week the need to elevate this issue to the Coordinating and/or Policy Committees.

Sensitivity Analysis

Rod O'Conner shared the sensitivity analysis from the previous recalculation period (initially presented on July 21, 2021). Pearsons said the previous sensitivity analysis summarized factors contributing to recalculation with multiple options. Murdoch said her assumption is that the sensitivity analysis would be conducted using the same methods again; however, there was previously disagreement over whether NNI mitigation is included in the analysis. For example, Chelan PUD would not need to mitigate for Chelan PUD NNI production but may need to mitigate for Douglas PUD's production in the same way that Douglas PUD mitigates effects to fish produced upstream (e.g., the U.S. Fish and Wildlife Service Winthrop Hatchery production). There was a lot of disagreement at the time of the last recalculation over whether NNI mitigation would be included, and there is still some disagreement about the fixed inundation mitigation. The BAMP formula does

not discern between mitigation fish and normal fish, so she said all impacts should be mitigated for. It appears NNI production is not included in Column D of the sensitivity analysis.

Mackey said Column D is additional mitigation that is calculated to achieve the same number of fish leaving the PUD hydrosystem that enter it, and then the mitigation is proportionately allocated to different PUD programs based on unavoidable project mortality. Murdoch asked if federal projects are included. Mackey said yes, and NNI fish are added to compensate for the number of fish entering from top to bottom. He noted that additional mitigating for mitigation would, for example, deter Douglas PUD from allowing Chelan PUD and Grant PUD to rear and release fish in the Methow Basin that would then pass through Wells Dam and Douglas PUD would have the mitigate for—it just does not make sense. Murdoch said a PUD should not have to mitigate for itself, but it should mitigate for impacts to other or related programs. Mackey noted that federal projects were pre-existing when the HCPs were signed. Murdoch said programs for Chiwawa, Dryden, and Carlton, for example, were already in operation when the HCPs were signed. This does not mean that they are not mitigated for.

Scott Hopkins noted that Column D represents the mitigation for federal hatcheries. For programs like Chiwawa, the mitigation is built into the SARs. Fish are subject to unavoidable project mortality through Rock Island and other projects, and in effect, those unavoidable project mortalities reduce the SAR for each project. So, when a SAR is used to calculate mitigation, the mortality is already accounted for. The reduction in SAR makes the numbers whole. Hillman agreed and said the SAR would be different if each program was assessed individually.

Murdoch said this approach makes sense if the BAMP method is used for recalculation, because the calculation takes the number of adults at the project, applies juvenile project mortality, and uses SARs from the hatchery when fish are released to determine adult mitigation. This approach makes NNI clear. However, when it is only used for the NOR component, and different components are taken out, it becomes confusing.

Willard agreed that it can be confusing and shared a presentation, *Mitigation for NNI Production Described* (Attachment D). Slide 3 demonstrates how NNI hatchery production compensates for NOR fish. Murdoch thanked Willard for the information and pointed out that if the BAMP formula were used for every program, there would not be this same issue. The residuals described on Slide 9 are applied to federal projects, which makes sense, but the rest of production is being missed. The fixed inundation compensation should therefore be included in the sensitivity analysis. If the residual concept were applied to all programs, it would be NNI.

O'Conner explained that Column B and Column D are linked, so additional mitigation in Column D makes up the difference between the two. Mackey and Hopkins described an example, showing that the project mortality is applied proportionately across the PUDs' mitigation. Truscott said the total PUD mitigation is Column B plus Column D. Mackey agreed and said the Sensitivity Analysis option for each project/population/program that was negotiated then determines the mitigation. Truscott

asked if a retrospective analysis could be done showing what programs the additional mitigation is mitigating for. Mackey said he can try to put an example together. Murdoch agreed this would be helpful. Gale suggested also adding a listing of the hatchery programs in Column B.

Gale asked whether Columns F and G are calculated the same as the federal hatchery mitigation, if the same methods for mortality are applied. Mackey said yes, the inundation programs were not included in other PUDs' mitigation because upstream inundation programs are not mitigated for by downstream projects. These fish are replaced because the inundation is added to each PUD's total value of what they mitigated for.

Tonseth said having a clearer definition of the columns would be helpful. Overall, he agrees with the approach for the sensitivity analysis. He suggested removing Columns C and E based on previous HCP-HCs and PRCC HSC discussions because they are not pertinent. Willard said the PUDs make use of those metrics, so they will continue calculating them.

Murdoch provided another suggestion. She said the data summary document lists project mortality, including Chelan and Douglas PUDs' yearling and subyearling project mortalities. The BAMP calculations for NOR summer Chinook salmon should use the subyearling mortality. Then, if the subyearling mortality is replaced by a yearling Chinook salmon program, the yearling SARs can be used to determine a production number. Grant PUD, however, does not have one listed in the data summary. Pearsons thanked Murdoch for pointing this out and said he will revise it accordingly.

Truscott noted that subyearling survival is tied with steelhead survival (estimated subyearling survival is based on steelhead survival minus 3.6%). Murdoch said this is true for Grant PUD with steelhead, but this less than 93% and the hatchery mitigation is specifically 7%, so anything less than 7% is made up for through the NNI fund. For summer and fall Chinook salmon, the 7% value would be used rather than the steelhead value minus 3.6%, which is not a very significant difference.

III. Administrative Items

A. Next Meetings

The next regular HCP-HCs and PRCC HSC meetings will be held on Wednesday, December 15, 2021; Wednesday, January 19, 2022; and Wednesday, February 16, 2022, by conference call and web-share until further notice.

IV. List of Attachments

Attachment A   List of Attendees

Attachment B   Comparison of Analysis Methods for NOR Component of BAMP Method

Attachment C   Email from Keely Murdoch to HCP-HCs and PRCC HSC representatives re: Questions and Comments on the New Dataset

Attachment D   Mitigation for No Net Impact Production Described

Attachment A
List of Attendees

Name	Organization
Sarah Montgomery	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
Katy Shelby	Washington Department of Fish and Wildlife
Mike Tonseth*‡	Washington Department of Fish and Wildlife
Keely Murdoch*‡	Yakama Nation
Bill Gale*‡	U.S. Fish and Wildlife Service
Matt Cooper*‡	U.S. Fish and Wildlife Service

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

Priest Rapids Project

Summer Chinook Hatchery Mitigation

NOR component using BAMP Method

Comparison of SAR calculations

Method used in 2014 (CWT only) vs Hybrid Method (CWTs and PIT tags)

Methow Su Chk SAR = 0.38% v 0.83%

Dryden Su Chk SAR = 0.61% v 0.80%

Similkameen Su Chk SAR = 1.92% v 2.08%

Distribution of hatchery releases based on 2014 Recalculation SOA

Component	Release based on CWT SAR (previous method)	Release based on Hybrid	Difference	Adult returns
Carlton	293155	174,123	-119033	-585
Dryden	219,296	168,134	-51,162	-3134
CJH	105,196	97,222	-7974	-153
Total	706,137	439,478	-178169	-1052

Rock Island Dam Summer Chinook

Summer Chinook Hatchery Mitigation

NOR component using BAMP Method

Comparison of SAR calculations

Method used in 2014 (CWT only) vs Hybrid Method (CWTs and PIT tags)

Dryden Su Chk SAR = 0.61% v 0.78%

Similkameen Su Chk SAR = 1.92% v 1.99%

Distribution of hatchery releases based on 2014 Recalculation SOA

Component	Juvenile Release based on CWT SAR (previous method)	Juvenile Release based on Hybrid	Difference	Adult Returns
Dryden	196,794	154,267	-42,527	-261
CJH	94,402	90,844	-3557	-68
Total	291,196	245,111	-46,085	-329

Rocky Reach Dam Summer Chinook

Summer Chinook Hatchery Mitigation

NOR component using BAMP Method

Comparison of SAR calculations

Method used in 2014 (CWT only) vs Hybrid Method (CWTs and PIT tags)

Chelan Falls Su Chk SAR = 1.55 % v 1.79%

Similkameen Su Chk SAR = 1.921% v 1.99%

Distribution of hatchery releases based on 2014 Recalculation SOA

Component	Juvenile Release based on CWT SAR (previous method)	Juvenile Release based on Hybrid	Difference	Adult Returns
Chelan Falls	84,881	73,500	-11,381	-176
CJH	51,715	49,766	-1949	-37
	136,596	123,266	-13,330	-213

Priest Rapids Project Spring Chinook

Spring Chinook Hatchery Mitigation

NOR component using BAMP Method

Comparison of SAR calculations

Method used in 2014 (CWT and PIT for Chiwawa, CWT only for other) vs Hybrid Method (CWTs and PIT tags)

Chiwawa/Nason Spring Chk SAR = 0.56 % v 0.60%

Methow FH SAR = 0.48% v 0.53%

Distribution of hatchery releases based on 2014 Recalculation SOA

Component	Juvenile Release based on Previous	Juvenile Release based on Hybrid	Difference	Adult Returns
Nason	21,860	20,079	-1781	-8
Methow FH	15,049	13,838	-1211	-6
CJH	12,322	11,331	-991	-5
Total	49,231	45,248	-3983	-19

Rock Island Dam Spring Chinook

Spring Chinook Hatchery Mitigation

NOR component using BAMP Method

Comparison of SAR calculations

Method used in 2014 (CWT and PIT for Chiwawa, CWT only for other) vs Hybrid Method (CWTs and PIT tags)

Chiwawa Spring Chk SAR = 0.53 % v 0.58%

Methow FH SAR = 0.48% v 0.53%

Distribution of hatchery releases based on 2014 Recalculation SOA

Component	Juvenile Release based on Previous	Juvenile Release based on Hybrid	Difference	Adult Returns
Chiwawa	14,319	13,080	-1,239	-7
CJH	6,217	5,717	-500	-2
Total	20,536	18,797	-1740	-9

Rocky Reach Dam Spring Chinook

Spring Chinook Hatchery Mitigation

NOR component using BAMP Method

Comparison of SAR calculations

Method used in 2014 (CWT and PIT for Chiwawa, CWT only for other) vs Hybrid Method (CWTs and PIT tags)

Chewuch/Methow Spring Chk SAR = 0.43 % v 0.52%

Methow FH SAR = 0.49% v 0.51%

Distribution of hatchery releases based on 2014 Recalculation SOA

Component	Juvenile Release based on Previous	Juvenile Release based on Hybrid	Difference	Adult Returns
Chewuch	8039	6713	-1326	-6
CJH	6755	6447	-308	-1
Total	14,795	13,160	-1634	-7

Wells Spring Chinook

Spring Chinook Hatchery Mitigation

NOR component using BAMP Method

Comparison of SAR calculations

Method used in 2014 (CWT and PIT for Chiwawa, CWT only for other) vs Hybrid Method (CWTs and PIT tags)

Twisp/Methow Spring Chk SAR = 0.36 % v 0.40%

Methow FH SAR = 0.48% v 0.51%

Distribution of hatchery releases based on 2014 Recalculation SOA

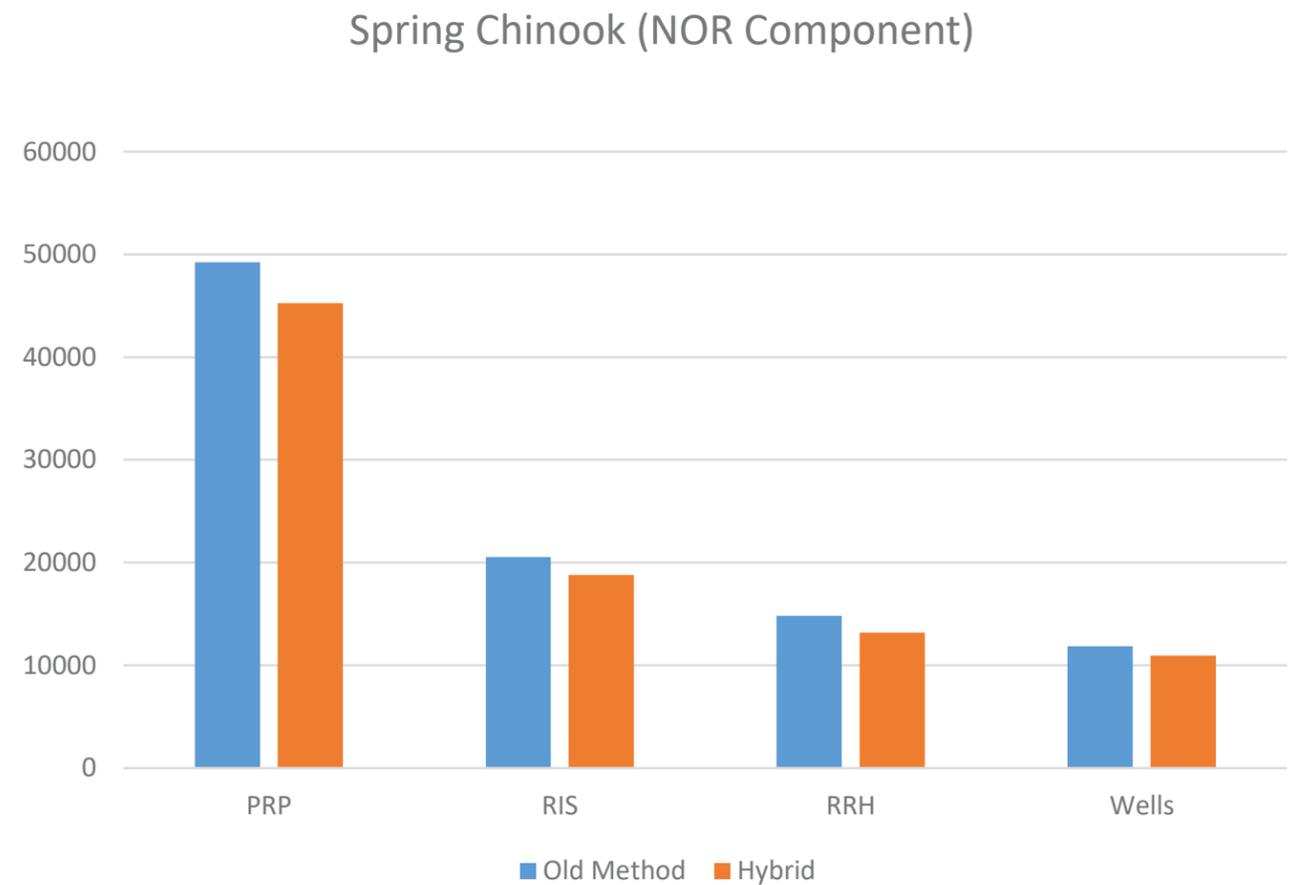CWTs from Twsip, PITs from Methow

Component	Juvenile Release based on Previous	Juvenile Release based on Hybrid	Difference	Adult Returns
Twisp	6464	5847	-617	-2.2
CJH	5403	5100	-303	-1.5
Total	11,867	10,947	-920	-3.7

Comparison of NOR Mitigation Calculations

Summer Chinook

Summer Chinook (NOR Component)

Spring Chinook

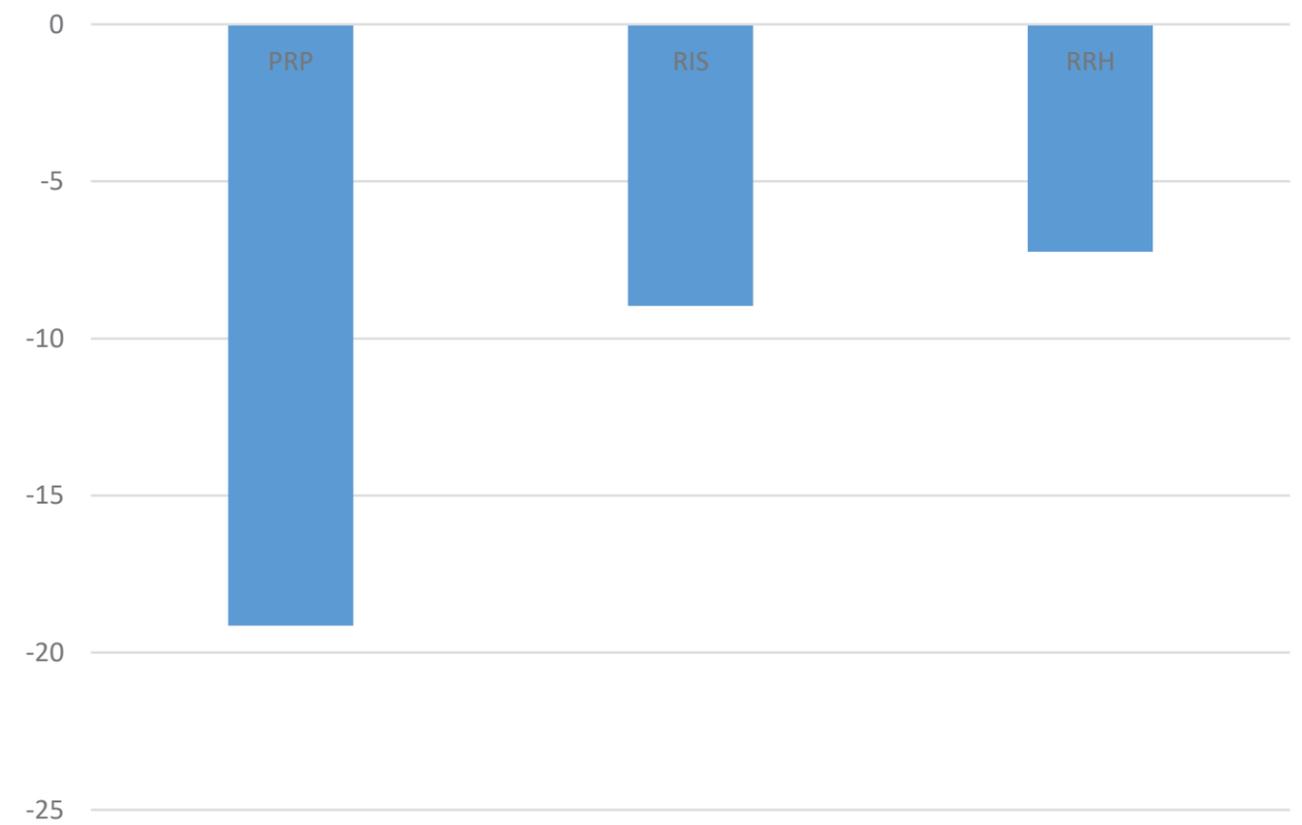Spring Chinook (NOR Component)
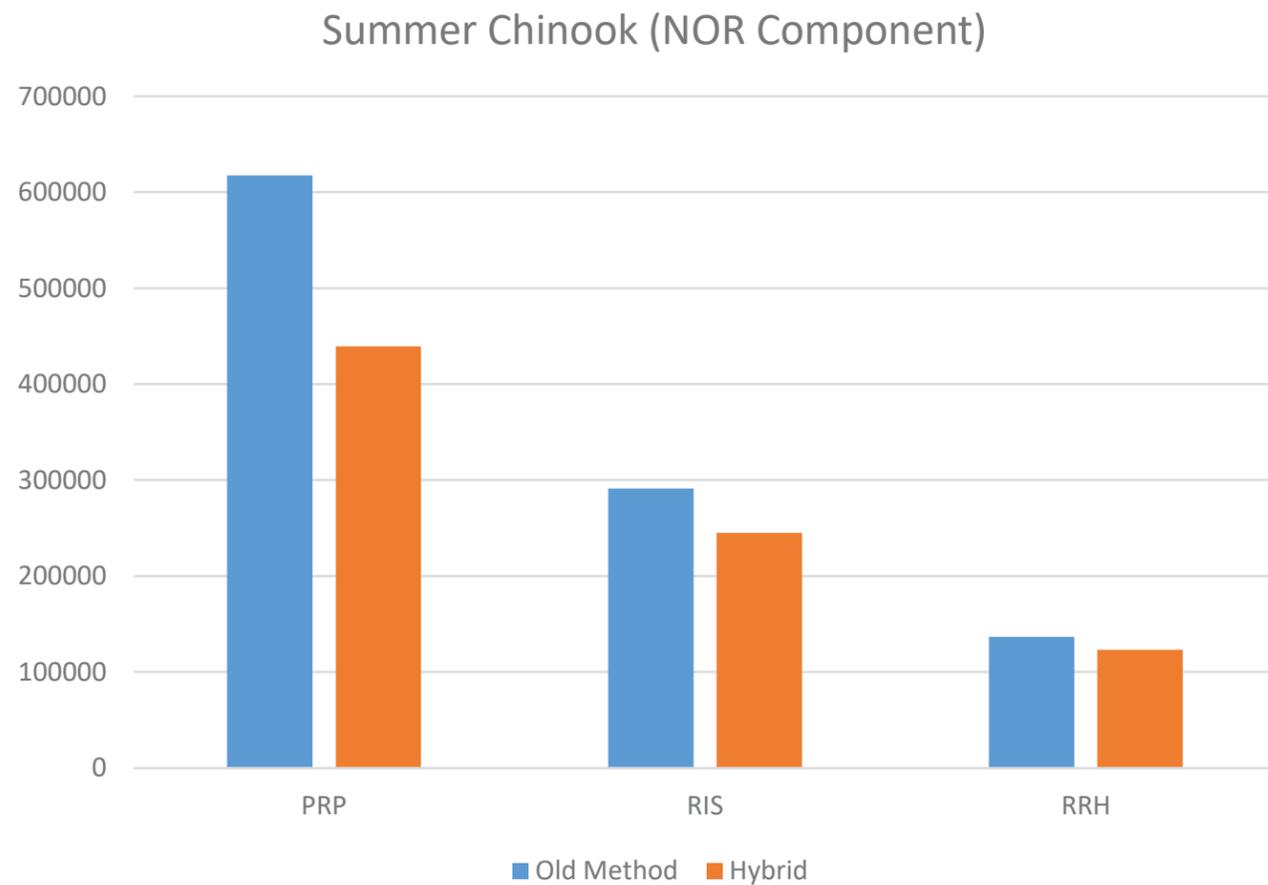
Difference in Adult Returns

Summer Chinook

Summer Chinook Diffference in Adult Returns
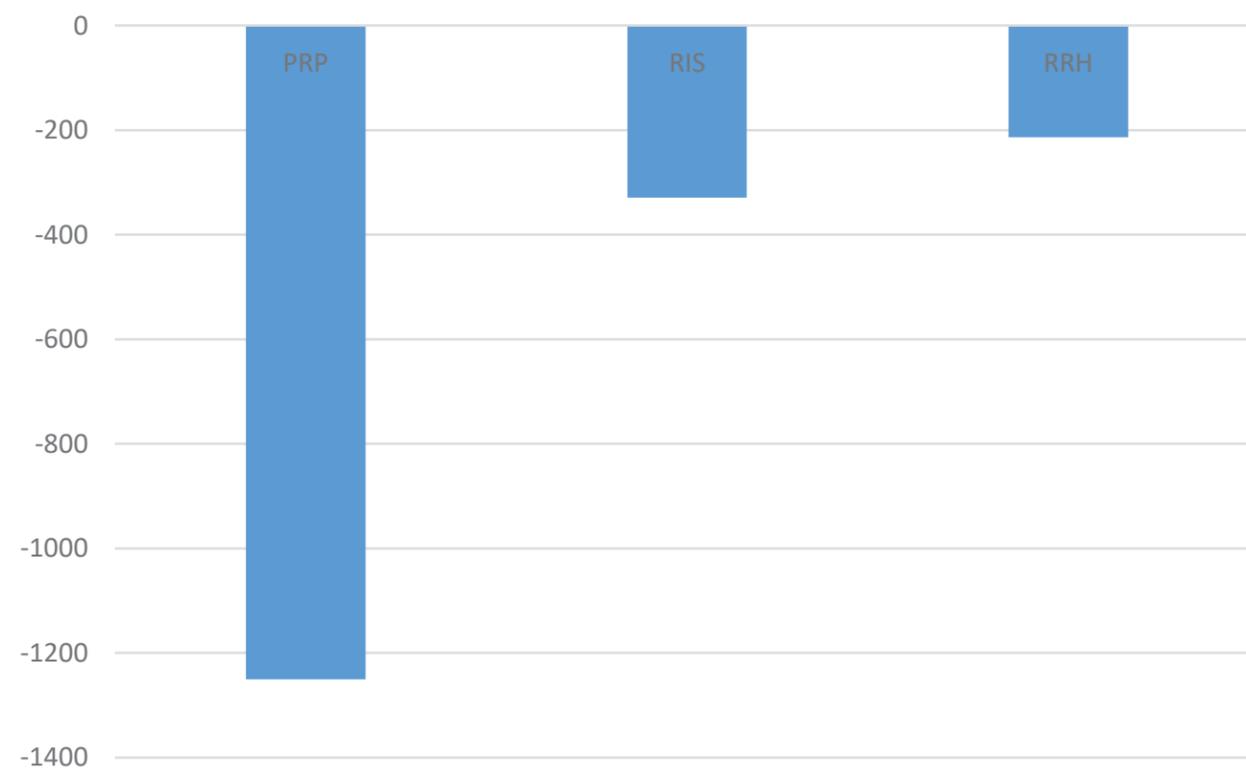
Spring Chinook

Spring Chinook Diffference in Adult Returns

Attachment C
Email from Keely Murdoch to HCP-HCs and PRCC HSC representatives re:
Questions and Comments on the New Dataset

Keely Murdoch

HI all,

I have a list of questions/comments I have encountered while working my way through the data set.

1) Summer Chinook SARs for CJH:
a) Is Similkameen really the most appropriate value to use here? In most cases the PUDs mitigation at CJH includes both a yearling and a subyearling Chinook component. The Simillkameen SAR in particular does not seem appropriate for subyearling mitigation; a Wells Subyearling SAR might be a better surrogate value for CJH subyearlings. Hatchery mitigation values should be adjusted by using the appropriate SAR for the life stage released (subyearling vs yearling).
b) Are there any CWT data for any years from CJH that could be brought into the data set instead of using Similkameen specific data. Are there any PIT tag data from CJH that could be brought into the data set? .

2) Wells Summer Chinook: The Final SOA for the DPUD NNI Recalculation and Implementation Plan Approved on 14 December 2011, shows DCPUD Summer Chinook NNI mitigation being met at CJH, however there is no PIT SAR data in the data document for Summer Chinook to Wells, only Spring Chinook. Summer Chinook PIT data to Wells should be used to calculate the DCPUD NNI component

3) Twisp Spring Chinook.   There is no PIT tag data listed for Twisp spring Chinook in the data document. We have CWT data for Twisp Spring Chinook in the annual report. It appears Methow FH PIT data is being substituted. We should use the Twisp CWT data and Twisp PIT data (is there Twisp PIT data?).

4) Chewuch Spring Chinook. There is no PIT tag data listed for Chewuch spring Chinook in the data document. We have CWT data for Chewuch spring Chinook in the annual report. It appears Methow FH data is being substituted. We should use the Chewuch CWT data and Chewuch PIT data for that release site (is there Chewuch PIT data).

5) Nason Spring Chinook: When available we should use Nason specific SARS (I think this may be just brood years 2013 &2014) instead of Chiwawa data.

6) Rocky Reach NNI Mitigation: NNI mitigation is calculated separately for Rocky Reach and Rock Island Dams. The Final SOA for Chelan PUD Hatchery Compensation, Release year 2014-2023 approved December 14, 2011 indicates which hatchery components are mitigation for which projects. However for summer Chinook only a PIT SAR to RIS is provided. A PIT SAR to RRH should also be provided for calculating the mitigation for RRH. For spring Chinook both a PIT SAR for RIS and Wells is provided but a PIT SAR to RRH is needed to calculate RRH mitigation under the PIT method proposed by the PUDs.

These are my thoughts on the data set so far,

Thanks,

Keely

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Mitigation for NNI Production

- NNI Hatchery Production to Compensate for **Natural Origin Fish**
  - Uses adult equivalents and hatchery-specific SARs (i.e., "BAMP")

- NNI Hatchery Production for **Hatchery Origin Fish**
  - Uses juvenile project survival (determined through survival studies) applied to juvenile production numbers from subject facilities
  - The same approach could be used for **Natural Origin Fish** if smolt numbers were used instead of adult equivalents
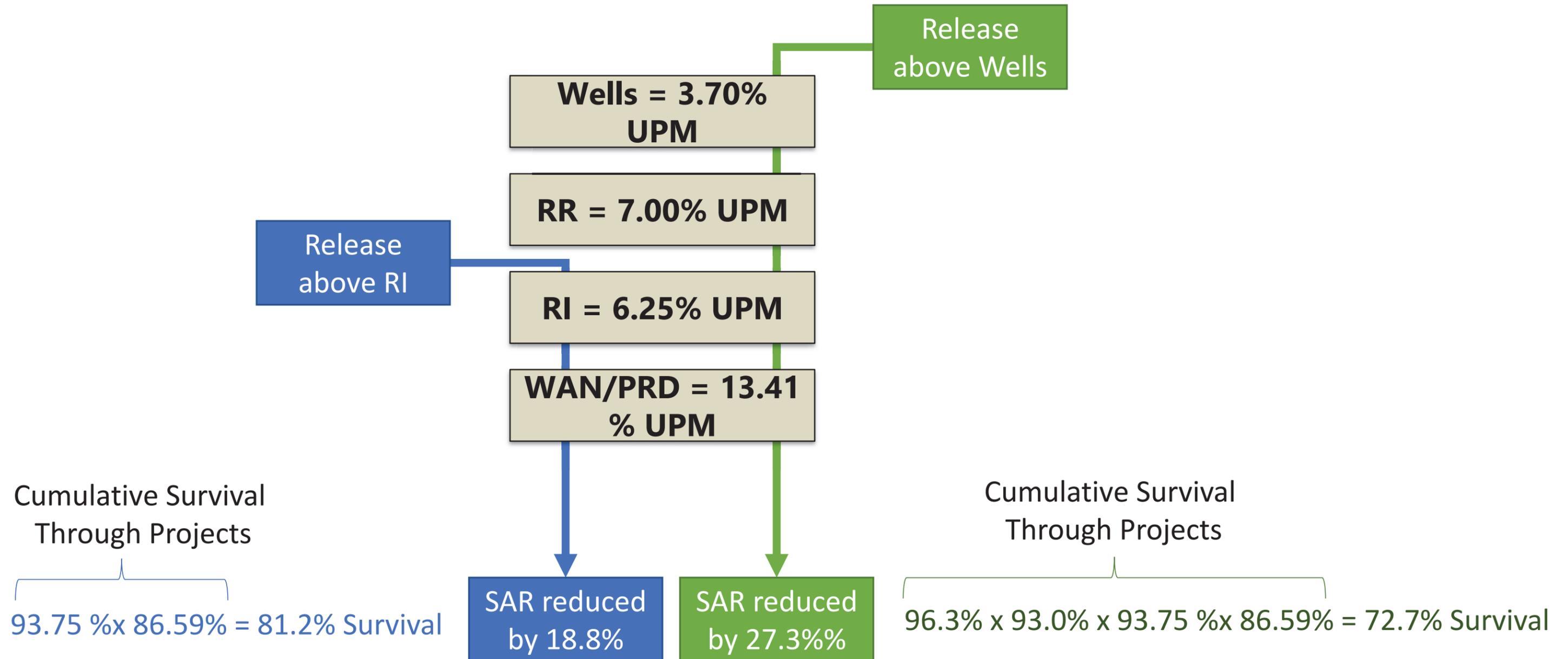
NNI Hatchery Production to Compensate for **<u>Natural Origin Fish</u>**

- Natural-origin juveniles are compensated for using natural-origin adult equivalents and hatchery SARs

- The hatchery SAR includes mortality from the time of release to the point at which the SAR is measured

- As a result, the SAR includes unavoidable project mortality from other PUD facilities and does not require additional compensation

NNI Hatchery Production to Compensate for **Natural Origin Fish**

How SAR incorporates project mortality...regardless of release location
UPM=unavoidable project mortality

Release above Wells

Wells = 3.70% UPM

RR = 7.00% UPM

Release above RI

RI = 6.25% UPM

WAN/PRD = 13.41 % UPM

SAR reduced by 18.8%

SAR reduced by 27.3%%

Cumulative Survival Through Projects

93.75 %x 86.59% = 81.2% Survival

Cumulative Survival Through Projects

96.3% x 93.0% x 93.75 %x 86.59% = 72.7% Survival

NNI Hatchery Production to Compensate for <u>**Natural Origin Fish**</u>
Effect of SAR on Smolt Production Requirements

- Assume SAR would be 1% in absence of projects
- Assume compensation is for 1,000 natural origin returns at Rock Island (93.75% Survival)
- Therefore, adult equivalents = 67

| SAR reduced by 18.8% | ⇨ | SAR = 0.81% | ⇨ | 67 adults/0.81%= **8,272 smolts** |

| SAR reduced by 27.3% | ⇨ | SAR = 0.73% | ⇨ | 67 adults/0.73% = **9,306 smolts** |

Conclusion…if smolts are released above additional projects, SARs will be reduced and additional smolt production will be necessary to produce the same number of adults. Additional "mitigation for mitigation" is not warranted.

NNI Hatchery Production for <u>Hatchery Origin Fish</u>

- Assume 400,000 Spring Chinook released From Winthrop

- Goal is to ensure that there are 400,000 fish surviving to pass Priest Rapids

- PUD NNI production includes UPM and "residuals"

NNI Hatchery Production for <u>**Hatchery Origin Fish**</u>

Step 1: Determine how many fish need to be released to ensure that there are 400,000 passing Priest Rapids Dam

?

Wells = 3.70% UPM
RR = 7.00% UPM
RI = 6.25% UPM
WAN/PRD = 13.41 % UPM

⬇
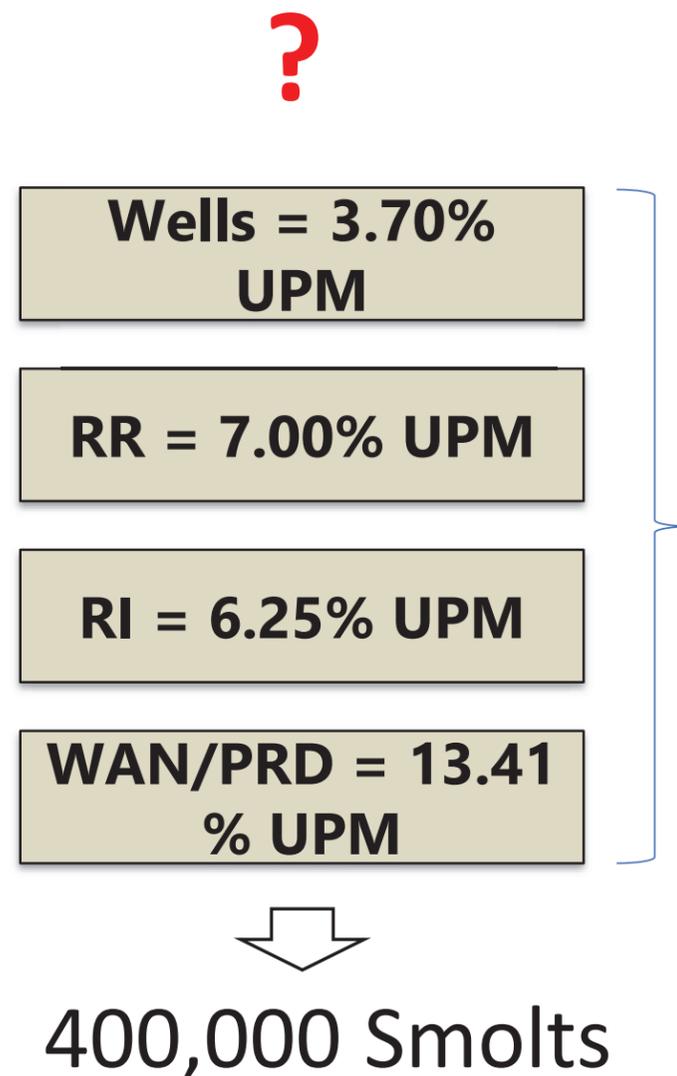
400,000 Smolts

Cumulative Survival Through Projects

96.3% x 93.0% x 93.75 %x 86.59% =
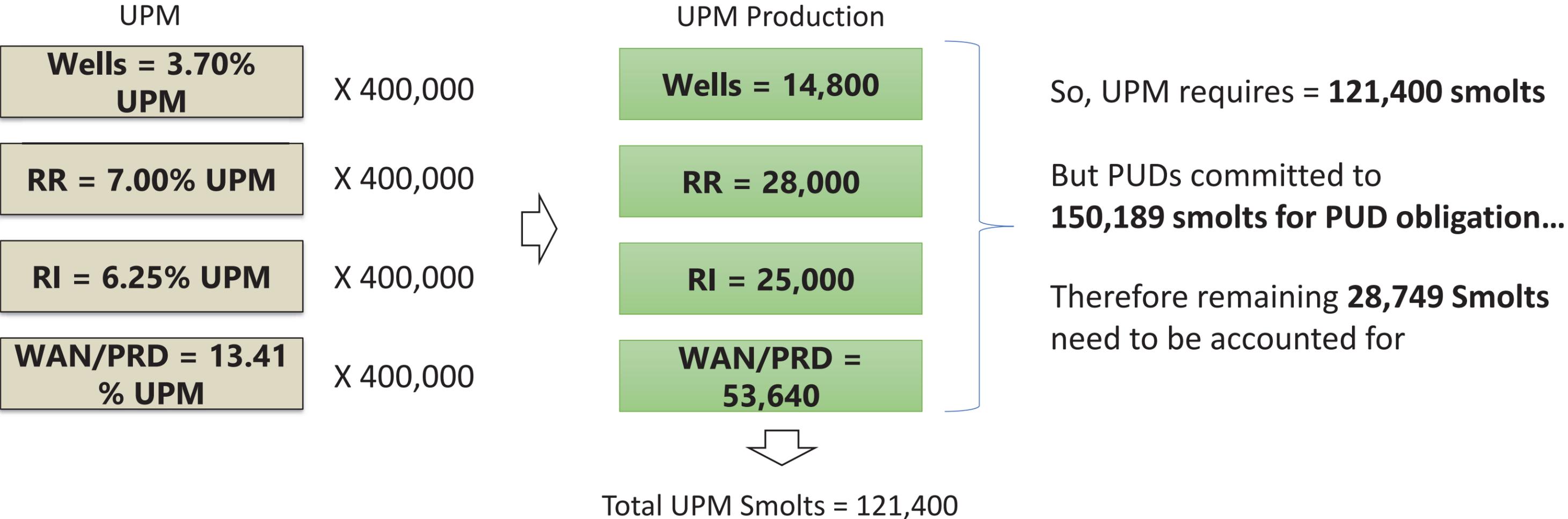**72.7% Survival**

400,000 Federal Smolts/72.7% Survival =
550,189 Total Smolts

550,189 Total smolts - 400,000 Federal Smolts =
150,189 Smolts for PUD obligation

NNI Hatchery Production for <u>Hatchery Origin Fish</u>

Step 2: Determine individual PUD production obligations

UPM

Wells = 3.70% UPM

X 400,000

RR = 7.00% UPM

X 400,000

RI = 6.25% UPM

X 400,000

WAN/PRD = 13.41 % UPM

X 400,000

UPM Production

Wells = 14,800

RR = 28,000

RI = 25,000

WAN/PRD = 53,640

Total UPM Smolts = 121,400

So, UPM requires = **121,400 smolts**

But PUDs committed to **150,189 smolts for PUD obligation...**

Therefore remaining **28,749 Smolts** need to be accounted for

NNI Hatchery Production for <u>Hatchery Origin Fish</u>

Step 3: Account for Residual Production Needed

28,749 Smolts Remain and are apportioned among PUDs by UPM…

Project	UPM	Project UPM Expressed as Percent of total UPM (i.e., 100%)	Smolt Production Obligation
Wells	3.7%	12.187%	3,504
RR	7.0%	23.057%	6,629
RI	6.25%	20.586%	5,918
WAN/PRD	13.41%	44.170%	12,698
	30.36	100%	28,749

Total = 28,749