



**Independent Scientific Review Panel**

for the Northwest Power and Conservation Council

851 SW 6<sup>th</sup> Avenue, Suite 1100

Portland, Oregon 97204

[www.nwcouncil.org/fw/isrp](http://www.nwcouncil.org/fw/isrp)

Response Review of the  
Yakima Subbasin Summer and Fall Run  
Chinook and Coho Salmon Hatchery  
Master Plan

Project # 1988-115-25

**Step One of the Northwest Power and Conservation Council's  
Three-Step Review Process**

Richard Alldredge  
Robert Bilby  
David Heller  
Colin Levings  
R. Scott Lutz  
Robert Naiman  
Greg Ruggerone  
Dennis Scarnecchia  
Steve Schroder  
Carl Schwarz  
Chris Wood  
Eric Loudenslager, PRG

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# ISRP Response Review of the Yakima Subbasin Summer and Fall Run Chinook and Coho Salmon Hatchery Master Plan

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# ISRP Response Review of the Yakima Subbasin Summer and Fall Run Chinook and Coho Salmon Hatchery Master Plan

## Background

At the Northwest Power and Conservation Council's February 27, 2013 request, the ISRP reviewed a response from the Yakama Nation regarding the *Yakima Subbasin Summer and Fall Run Chinook and Coho Salmon Hatchery Master Plan*, a component of Project 1988-115-25, *Yakima Klickitat Fisheries Project, Design and Construction*. The Yakama Nation's response was provided to address issues identified in the ISRP Step 1 review of the Master Plan ([ISRP 2012-13](#)).

As described in the Master Plan, the Yakama Nation proposes to implement hatchery strategies that will contribute primarily to harvest and secondarily to cultural/conservation goals identified for Yakima coho and summer and fall Chinook. No substantial new production is proposed, according to the proposal. Two Chinook hatchery programs with distinct and separate purposes are proposed. One addresses the goal of reestablishing a locally adapted, naturally spawning summer/fall Chinook population in the Yakima River upstream of Prosser Dam. The other addresses the need to improve the performance of the Upriver Bright (URB) fall Chinook harvest program in the lower Yakima River (downstream of Prosser Dam). Two coho programs are proposed: a segregated harvest program in the lower Yakima River and a reintroduction program in the upper Yakima River.

In the 2012 Step 1 review, the ISRP's overall recommendation was as follows:

The Yakama Nation prepared a comprehensive and fairly thorough Master Plan for its Yakima Subbasin summer/fall Chinook salmon and coho salmon hatchery programs. This plan builds upon the existing hatchery system by improving the hatchery infrastructure and modifying the program goals and objectives to better fit the needs of the Yakama Nation while also addressing most Scientific Principles in the Council's Fish and Wildlife Program. The ISRP requests a response from the Yakama Nation prior to Step 2. This response should provide key information that is currently lacking in the Step 1 documents and address inconsistencies in the proposed integrated salmon projects with the Council's Fish and Wildlife Program.

The Yakama Nation's response identified and addressed 11 primary ISRP concerns. The ISRP's review below follows the Yakama Nation's response format listing the 11 concerns.

## Review Summary and Recommendations

Coho Program: Meets Scientific Review Criteria (Qualified)

Summer/Fall Chinook Program: Meets Scientific Review Criteria (Qualified)

Qualification: Questions and concerns presented in this review should be addressed in Step 2.

The Yakama Nation (YN) prepared a detailed response to address ISRP questions and concerns raised in its initial review of the Master Plan. Nevertheless, some key questions still remain and should be addressed in Step 2.

Key issues include:

1. the transition from Phase 3 to Phase 4
2. management of harvests and spawning escapement
3. the likelihood of implementing the expected habitat restoration plans (Integrated Plan)
4. management of the overall program in light of high uncertainty in the extent of habitat actions and fish responses to actions
5. the need for a robust monitoring and evaluation program to support a management decision framework, and
6. overall program size.

The YN coho and Chinook hatchery programs propose to improve opportunities for salmon harvests while also improving the status of natural origin coho and Chinook salmon in the upper Yakima watershed. The YN is certainly justified in their insistence on fulfilling tribal treaty harvest obligations, but the Fish and Wildlife Program's artificial production strategies require programs to "fit" the environmental constraints of the watershed. The ISRP comments focus on the conservation and rebuilding of the natural spawning coho and Chinook populations in light of the overall program.

A key uncertainty is the extent to which habitat restoration will be implemented under the Yakima River Basin Integrated Water Resource Management Plan and the degree to which anticipated benefits will be achieved by projects that are implemented. The Program's Phase 4 seems to depend on the outcome of the Integrated Plan, which has an estimated \$4 billion cost if fully implemented and has yet to receive funding. Conservation and harvest benefits from these restoration projects were estimated using EDT and AHA modeling. Significant gains in productivity and capacity are expected by the YN to occur due to ongoing and planned habitat restoration. In Step 2, the ISRP requests additional information about the inputs into these models. Were they based on empirical data specific to the Yakima Basin or was expert opinion frequently relied upon to populate the models? More specifically, the ISRP is inquiring if the model was populated as indicated in the 2011 document "Yakima River Basin Study, Fish Benefits Analysis Memorandum, Plan of Study Task 7." This document was deeply embedded within the Yakima Basin Integrated Plan website but not mentioned in the Yakama response to

the ISRP. If this contains the documented sources of the habitat-fish projections (scenarios) using EDT, it should be referenced in the Master Plan and in the YN response. Also, this document does not reference any primary literature in developing Level 2 metrics, which suggests that little or no basin-specific (or other) empirical data beyond expert opinion was used to populate the EDT model and that projected benefits of restoration activities are largely speculative. Clarification is needed. Step 2 should model a scenario that is more likely to occur in the next 25 years than the ambitious option three and describe the anticipated Phase 4 outcome of a more likely habitat scenario, perhaps option one.

The M&E plan developed for the coho and Chinook programs should be designed to test, validate, or refine the assumptions and data used in these models, given the high uncertainty in the actual outcomes. For example, Step 2 should indicate whether the regional monitoring programs ISEMP, CHaMP, and/or Action Effectiveness Monitoring (AEM)<sup>1</sup> will be used to evaluate the effects of the habitat restoration work. If these programs/methods are not going to be employed, then the proposed procedures should be described, including a description of how the monitoring effort will test and evaluate the assumptions used in the Step 1 analyses. A robust monitoring and evaluation plan is needed to support a management decision framework.

The Master Plan mentions that a stepping stone process will be used when broodstock is brought into the coho programs. Step 2 should provide details about how this process will work. The YN has established clear PNI goals and indicated desired pNOB and pHOS levels. In some cases, details were also provided on how HORs could be removed from the Yakima River to achieve desired pHOS rates. These are important first steps. Step 2 should address how the integrated programs will transition to these desired endpoints.

A number of questions remain on how the terminal fisheries will be managed to ensure a sustainable natural population while also producing harvest from the integrated and segregated programs. A minimum escapement goal for the upper river, as mentioned in the YN response, may be a reasonable approach.

Straying of hatchery fish has become an important issue throughout the Columbia Basin. The YN initially indicated that all fish in both their segregated and integrated programs will be marked and/or tagged, but the YN response indicated that the summer portion of the integrated Chinook program would not be visually marked. Step 2 should indicate whether these fish will be otherwise marked or tagged. Furthermore, Step 2 should include information on how straying rates will be determined, both in and out of the basin, while considering the proposed marking of hatchery salmon.

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<sup>1</sup> Integrated Status and Effectiveness Monitoring Program (ISEMP) (Project #2003-017-00); Columbia Habitat Monitoring Program's (CHaMP) (Project #2011-006-00); and the Bonneville Power Administration's Action Effectiveness Monitoring of Tributary Habitat Improvement (AEM); see [ISRP 2013-2](#).

In our earlier review, we requested performance data for the Tribe's existing coho and fall Chinook programs. Some of the information we requested was provided but not all. This performance information should be included in Step 2.

Step 2 should describe how the YN plans to assess possible competition and predation interactions between project coho and summer Chinook on spring Chinook, steelhead, and other juvenile fishes in the basin. Water reuse at Marion Drain and Holmes Ranch along with salmon incubation at those same sites may increase the risk of disease. How will fish health at these sites be monitored and addressed? Step 2 should also address the status of the surface water supply at Prosser as well as a final location for the Upriver Bright (UBR) fall Chinook rearing and acclimation site in the lower River.

In conclusion, the YN response provides important information, but the ISRP needs additional clarification to be able to reasonably conclude that the proposed actions are likely to succeed and meet the Fish and Wildlife Program's artificial production strategy guidelines. Additional questions related to each program can be found in the comments below.

## **ISRP Comments**

### Coho Program

***ISRP 2012 Comment 1:** Habitat capacity standards for coho salmon were developed, but the values need clarification. In the Master Plan (page 90) habitat improvement is identified as having the potential to increase Yakima River coho production by 26 percent. In Appendix E, recent past productivity is given as 34 coho smolts per spawner and capacity of smolts is 72,059. Under Phase 4, smolts per spawner is 93 and capacity is 256,720 smolts. This future performance is substantially more than the 26 percent increase that was estimated on page 90. The Master Plan needs to provide a reasonable likelihood that habitat restoration will lead to this level of improvement or modify the future production values.*

### **ISRP 2013 Response Comment 1:**

The sponsors state that two factors – habitat improvement and fitness gains in coho caused by implementing an integrated hatchery program – will significantly increase the capacity of the Yakima River to produce smolts. Estimates for how habitat improvements in the Yakima River may increase coho smolt abundance were based on data presented in the Yakima River Basin Integrated Water Resource Management Plan. In the Integrated Plan, the potential production of coho in the Yakima River was estimated for three different levels of habitat restoration. In the first instance, it is assumed that the Integrated Plan is not implemented but that ongoing restoration activities are continued. In the second scenario, the habitat restoration actions in the Integrated Plan are implemented but fish passage into the basin's upper reservoirs has not taken place. The final estimate assumes that all seven parts of the Integrated Plan have occurred including passage into upper reservoir habitats. A gain of 36% from a baseline figure

of 8,806 adult coho is predicted to occur under option one while gains of 63.5% and 71.1% are expected to occur under options two and three. The Master Plan assumes that option three will occur. This assumption is highly uncertain because implementing the full Integrated Plan is expected to cost \$4 billion and depends upon federal funding that has yet to be secured. The YN also assigned a 50% fitness value to the current coho salmon used in the restoration program and anticipates a 91% fitness value when the integrated program is fully implemented with a PNI of 0.75 and pHOS of 30%.

EDT modeling was used to estimate the productivity and capacity of the habitat to produce coho under each phase of the Integrated Plan. These estimates were used in the All-H Analyzer (AHA model) to predict the effects of various levels of habitat restoration on coho abundance. The reliability of these estimates depends upon the quality of the data inputs used. In Step 2, the analysis should identify whether the inputs into the model were based on empirical data or expert opinion. In either case, the gains in coho abundance presented in the Integrated Plan should be regarded as hypotheses and not certainties. Additionally, restoration actions specifically designed for coho were not included in the Integrated Plan. Instead, estimated benefits to coho abundance were based on the presumed effects of habitat actions in the Yakima steelhead recovery plan.

The Master Plan includes the untested assumption that locally adapted coho from an integrated hatchery program would be twice as fit as coho from out-of-basin populations. Currently, coho returning to the Yakima River originate from parents that came from out-of-basin populations or were produced by fish that had returned to the Yakima River and were allowed to spawn naturally or were used as hatchery broodstock. The YN anticipates that an integrated hatchery program will facilitate the incorporation of locally adapted traits into the Yakima River coho population which will bring about an increase in their overall productivity. Based on these assumptions, the YN estimates that the current smolts-per-spawner of 34 fish would increase to 58 fish through habitat improvement and implementation of integrated water management ( $34 \times 1.71$ ). If using an integrated hatchery strategy with a PNI of 0.75 improves relative fitness from 0.50 to 0.91, the anticipated smolts-per-spawner would be 105. The YN should reference literature on wild coho smolts per spawner, including populations of wild coho that meet or exceed the assumed 93 smolts per spawner.

The response to the ISRP provides an adequate explanation for the basis for improved capacity and productivity under Phase 4, assuming the Integrated Plan was fully implemented. However, because the habitat improvements identified in the Integrated Plan may not be fully implemented or may not provide the anticipated benefits to fish, the ISRP concludes that an experimental framework for decision-making and fish production should be employed to establish limits to artificial production consistent with guidelines based on empirical evidence from within the subbasin. Similarly, the guidelines used for fitness improvement under an integrated hatchery strategy were extracted from HSRG assumptions. These assumptions have not been subject to empirical testing or rigorous modeling. There is evidence from the Mid-Columbia coho reintroduction project that selection (re-adaptation) is taking place, but the pace of improvement and level where performance will plateau are unknown. Consequently, at

this time, it is unknown what size the natural population might be under restored conditions. Under the Fish and Wildlife Program's artificial production strategies, hatchery releases need to reflect the capacity and productivity of habitat and reintroduction should lead eventually to self-sustaining natural production. Furthermore, under an integrated harvest program with PNI >0.50, the size of the artificial production program is limited by the size of the natural population. The harvest plan should demonstrate how harvest rate will be adjusted to match varying levels of productivity of natural-origin coho. These uncertainties and constraints need to be considered in the Master Plan and decision framework, and described in Step 2.

In Step 2, the sponsors need to clearly indicate how their Monitoring and Evaluation (M&E) plan will be used to test the results of their earlier modeling efforts and assumptions. How much habitat has been restored, and did the habitat restoration activities actually provide expected benefits? Will ISEMP, CHaMP, and/or AEM methods or programs be employed in the basin to help quantify the effects of the habitat restoration activities that have taken place? If not, how will the relationships among habitat restoration efforts and salmonid abundance be examined and assessed? Additionally, the M&E plan should indicate the statistical designs or approaches that will be employed to measure the degree of fitness benefit actually gained by Yakima River coho by using an integrated hatchery program.

For completeness, the Master Plan should describe and provide background information on the data that were used to support the EDT and AHA modeling efforts. For example, as indicated above, a baseline abundance level of 8,806 coho was used for the basin in the Integrated Plan. Where did this value come from? The HGMP for coho shows that the greatest number of adult coho returning to the Yakima based on counts at Prosser Dam was 6,424 fish which occurred in 2010 (Table 3, page 18 in the HGMP; Master Plan Volume 2). Conversely, Table 2.4 (page 15 in Master Plan Volume 1) has different values for total coho returns for years 2008 – 2010. In this Table, almost 10,000 adult coho returned to the Prosser Dam in 2008 and a little more than 8,000 returned in 2010. Which values are correct?

***ISRP 2012 Comment 2.** Additionally, the assumed SAR of 5% for natural coho production during Phase 3 (Table 3-2) is considerably higher than the observed SAR (avg. 3.6%) during 2000-2010. This assumption likely leads to an overestimation of project benefits.*

**ISRP 2013 Response Comment 2:**

The sponsors clarified that the 5% SAR is pre-harvest, whereas the currently observed 3.6% SAR for coho includes a harvest rate of ~40% (20% below Bonneville and in ocean fisheries and 20% above Bonneville). Consistent use of terminology is needed in the Master Plan and in the response to comments (e.g., Fig. 2). For example, in the Columbia Basin smolt to adult survival (SAS) is typically used to describe survival prior to harvests, whereas SAR is typically reserved for survival after most harvest and dam passage.



**ISRP 2012 Comment 3.** *The objective of >5,000 coho spawners during Phase 3 should identify the proportion of NOR and HOR spawners that is consistent with the transition to an integrated program.*

**ISRP 2013 Response Comment 3:**

The response to the ISRP identifies that under Phase 3, on average, 2,541 natural-origin and 4,881 hatchery-origin adults will return to spawn in the Yakima River (from Figure 2. Key assumptions and outcomes for the Yakima River integrated and segregated coho programs (based on AHA analysis)). The ISRP is unable to reconcile Figure 2 in the response with Table 3-1 on page 24 of the Master Plan, as described below. Further, the ISRP finds the biological objective(s) vague with regard to a definition of “coho spawners,” and finds inconsistencies in objectives in various places in the Master Plan and response.

Specifically, the reference to >5000 (NOR+HOR) spawners does not indicate whether this is spawning escapement, spawning escapement plus hatchery broodstock, or some other composite of natural spawning fish, hatchery broodstock, and terminal harvest. This confusion stems from inconsistent numbers. Figure 2 shows a terminal run of hatchery-origin adults of 6779, with 4881 allowed to spawn naturally, 655 hatchery broodstock, and 904 hatchery surplus. But, this does not sum:  $6779 - 4881 - 655 = 1243$ , not 904. Further, the Expected Catch All Fisheries value of 13,896 in Fig. 2 is very different from the value 203 in the Master Plan Appendix E, without explanation for the change.

The Master Plan and response do not provide a clear path from a Phase 3 program releasing 700,000 smolts with a PNI of 0.32 to a Phase 4 program releasing 300,000 smolts with a PNI of 0.75. The Master Plan indicates the transition will begin when 5000 NOR adults are returning to the watershed, but there is no justification for this number. It is assumed that during Phase 3, 7422 coho will be spawning naturally, whereas during Phase 4, only 5347 coho will be spawning naturally. How were these target numbers for Phase 3 and 4 determined, and are they consistent with the capacity of the habitat? The plan to have more spawners during Phase 3, when habitat is not yet restored, in comparison to Phase 4, requires explanation. The initial production assumptions used in the Master Plan indicate that spawning abundance is near optimal at somewhat over 2000 adults.

It would be very helpful in Step 2 to elaborate further on the “stepping stone program” that will be used to provide broodstock to each of these programs. For example, it is indicated that a pNOB of 30% would be targeted during Phase 3. Does this mean that NORs would be incorporated into the segregated program when it was initially established, and if so for how many years would this occur? The PNI for Phase 3 is expected to be 0.32 while in Phase 4 a 0.75 PNI goal has been established. How will this transition take place; in other words how will pNOB and pHOS be adjusted over time? Additionally, HORs originating from the integrated and segregated programs will apparently be used as broodstock in the segregated program. Step 2 should indicate what proportion of the broodstock in the segregated program will originate

from each of these sources and whether that proportion will change over time. Some discussion about why the proportions of integrated and segregated broodstock were chosen would also be helpful. Providing the above information would help clarify how the coho program will transition from Phase 3, which is primarily a harvest augmentation effort, to Phase 4 which is a harvest and conservation endeavor.

The YN response states that approximately 2500 NOR and 4900 HOR coho will spawn naturally each year (7400 total), on average, during Phase 3. These spawners are expected to produce 72,059 smolts (Fig. 2), which yields only 9.7 smolts per spawner, a productivity estimate that is much lower than the assumed Phase 3 estimate of 34 smolts per spawner. Even with a 0.5 fitness factor this value does not make sense. Fig. 2 in the response is confusing because the 5% SAR for natural production is the SAS value (prior to fisheries), whereas the 1.27% SAR for hatchery fish must be a value after removing harvested fish ( $700,031 * 1.27\% = 8,890$ ), which is much lower than the reported harvest in all fisheries: 13,896 coho). Complete and consistent reporting of the statistics for natural and hatchery coho is needed so that the entire life cycle can be easily tracked and evaluated to make sure the values are consistent, reasonable, and comparable with values determined during monitoring and evaluation.

***ISRP 2012 Comment 4.*** A response is also requested for a succinct and complete summary table showing recent program performance for coho and Chinook salmon along with a table that provides proposed program metrics. The summary table should include metrics such as numbers of broodstock required, anticipated fecundity and eggs required, numbers of progeny produced and released, required post release life-stage survival. These data requirements, or “report card” metrics, were recently summarized by the ISRP in its review of the Lower Snake River Compensation Plan’s spring Chinook program ([ISRP 2011-14](#)). An example of the information needed by the ISRP are Tables 8, 9, and 10 on pages 33, 34, 37, and 38 in the Revised Master Plan for the Hood River Production Program (see Tables below). Some, but not all, of this information is distributed throughout the Master Plan. One of the ISRP’s responsibilities in conducting a Step Review for a hatchery master plan is to confirm that the values (numbers) provided for abundance, SARs, and harvest fractions are computationally accurate across life stages. This confirmation is not possible when the necessary information is presented across different sections of the plan. For example, it is not possible for the ISRP to establish a conclusion for initiation of phase 3 of the Lower Yakima Segregated Coho Program using Tables 3-1, 3-3, 2-4, and the discussion of the coho program in section 5.2.2. Additionally, when reporting status and trends of the program such as in Table 3-10, a comparison of observations with the program objectives should be provided so that program progress can be readily monitored. Finally, the Master Plan claims that the proposed programs will not lead to increased hatchery production, but this is not clearly shown in the Master Plan because there is no table directly comparing recent with proposed production of hatchery Chinook and coho salmon.

#### **ISRP 2013 Response Comment 4:**

##### Coho

Tables, such as in the Hood River program, are needed by the ISRP, and we believe they would serve the sponsor in future program evaluation and adaptive management.

Some of the requested data and project goals were reported for coho. For example, adult escapement of NORs and HORs to Prosser Dam from 2000 through 2010 was shown in Table 3, but no estimates of the number reaching the spawning grounds in the Yakima basin were provided. Goals for broodstock collection by phase are provided, but specific numbers used in the past and the ratio of out-of-basin fish (or eggs) to in-basin fish are not provided. No information on harvest numbers is given although expected harvest rates in various parts of the Columbia, starting at the mouth and working up to terminal areas are given for each phase of the project. No data are given for pre-spawning mortality, but 5% was assumed for Phases 3 and 4. Smolt production for both NORs and HORs from 2000 to 2010 is presented along with index SAR values. No specific data on hatchery egg-to-smolt survival was provided for either NOR or HOR parents although 70% is assumed for Phases 3 and 4. An average fecundity value is provided and a range of egg numbers used in the past along with goals for Phases 3 and 4 are shown. In Step 2, the sponsors should combine the information they provided into one or two tables per the examples given and include, whenever possible, the additional information requested.

A critical issue is the need for, first, a clear statement of whether the program is currently able to go to Phase 3 using only adults returning to the Yakima River for broodstock while maintaining a PNI of 0.32 with pHOB of 20%; and second, a decision framework for the size of the program based on NOR and HOR abundances. How the program will transition from PNI = 0.32 to PNI = 0.75 has not been explained. A plan with a scientifically justified rationale is required for various levels of hatchery and natural origin coho abundance and the anticipated harvests of those fish.

It is not clear from Table 1 and Fig. 2 how a broodstock of 655 coho (equal male/female ratio according to Master Plan) with fecundity of 3,000 and pre-spawn mortality of 5% yields 1.1 million eggs. Assuming an equal sex ratio, the reported values only produce 0.93 million eggs, on average. The assumed values for this project need to make sense across all life stages.

##### Fall Chinook

The Master Plan and response needs to summarize the program for at least the last decade, and more years if data are available. The text on page 10 indicates that fall Chinook were first scatter-planted from Priest Rapids production, then produced at Marion Drain and Prosser Hatcheries, and that some broodstock is currently collected in a fish wheel in Marion Drain. Table 2-2 on page 11 provides some information on NOR smolts and adult returns. The ISRP needs to understand the development of the program including how many fish have been spawning naturally; how many have been collected within basin for broodstock; how many eggs have been transferred from Priest Rapids; and how many fish have been direct stocked from

Priest Rapids and other locations? The ISRP needs to see that the results from those efforts provide an empirical justification for the program assumptions in Figure 3 in the response (and Appendix E in the MP).

The projected number of eggs does not follow from the values in Table 4, assuming 50% of broodstock are female, as suggested in the Master Plan. Only 1.5 million eggs are produced rather than 2.1-2.9 million.

As with coho, the plan requires a substantial increase in productivity (smolts per spawner) in response to habitat improvements and fitness (increased PNI) in order to achieve the long term goals. There is high uncertainty in achieving these goals. References to other cases of wild Chinook producing 209 to 271 smolts per spawner would be useful. What percentage of natural smolts is assumed to be subyearling?

Biological and harvest goals were provided for the integrated summer/fall and segregated up-river bright fall Chinook programs. No harvest data were provided, and only a summary or range of values was given for the current fall Chinook program. The integrated summer/fall Chinook program is new so no actual performance data are yet available for this effort. However, in Step 2, the sponsors should create two tables for their fall Chinook program. One should document harvest rates while the other one should include data on SARs, number of broodstock used, eggs incubated, survival from eyed egg to release, and numbers released as originally requested.

The Master Plan claims that the proposed programs will not lead to increased hatchery production. Data presented in Figure 2 of the sponsor's response to our questions indicates this is the case for the coho programs. However, Figure 3 in the YN response shows that the Chinook program will increase from an historical high of 2.4 million to 2.7 – 3.2 million. This increase appears to be driven by the new summer/fall program and its proposed releases of up to a million subyearlings. Such releases will not occur until local broodstock become sufficiently abundant to supply the necessary eggs for such a program. Consequently, in the near future release numbers of Chinook will likely be similar to those that have occurred in the past. This comparison was not clearly indicated in the Master Plan. For clarity, Step 2 should include a table that shows historical release numbers by species and the number of fish that the proposed integrated and segregated hatchery programs for coho and Chinook will release into the Yakima River. These hatchery production values should be consistent with the capacity of the environment to support both hatchery and natural-origin salmon.

*ISRP 2012 Comment 5. How will the program keep hatchery salmon straying to less than 5%, and what is the disposition of returning hatchery adults that are not used for broodstock in the hatchery?*

**ISRP 2013 Response Comment 5:**

The response identifies that the YN will use release locations, weirs, and harvest policies to reduce straying. The final bullet point states that a reduction in production will be considered if pHOS is not kept within limits. Production levels, and how that might be used to limit pHOS in critical Yakima River and tributary habitats, need to be included in a Step 2 decision framework. The ISRP recognizes that contemplating reduced production is undesirable, so the time to do it is before the hatchery and production levels are approved and implemented.

The response indicates that a unique water source will facilitate homing, HOR fish can be culled at Roza Dam and downstream locations, and hatchery fish (segregated stock) may be selectively harvested using the adipose fin clip. Surplus hatchery fish may be used for subsistence or for stream nutrients. Will YN fishers use selective gears in which hatchery fish (coho marked with adipose clip) are retained and unmarked fish are released when there is a need to maintain escapement of unmarked salmon? Selective fishing in the terminal area is implied in the response, but it is not clearly stated.

All the coho produced from the segregated program will be adipose clipped and some will receive CWTs. As the program progresses, CWTs will not be applied. We suggest that some level of tagging continue to help document possible straying of these fish into other portions of the Columbia basin. Additionally, the YN may wish to collect DNA from all the parental fish used in their coho programs. This material could be archived and used in future Parent Based Tagging programs to further document the straying rates of project fish. Coho from the integrated hatchery program will not be adipose clipped. However, 100% of these fish will receive CWTs linked to their release location. Acclimation sites will be used in the integrated program to help reduce straying. Second, fish trapping facilities exist at Prosser Dam, at the Prosser Hatchery Denil ladder and trap, and at the Sunnyside and Roza dams. At Roza 100% of the fish are examined before they are allowed over the dam making it possible to remove unwanted hatchery origin coho. Third, the sponsors state that they will work with WDFW to develop harvest strategies in the Yakima that target hatchery origin coho. And finally, if necessary, the number of smolts released can be reduced to decrease the occurrence of strays. An important monitoring goal should be to monitor straying rates both inside and outside of the Yakima basin. In Step 2, a monitoring plan for hatchery strays and a decision framework should be described.

***ISRP 2012 Comment 6.*** *What is the current level of mini-jack production, how do they affect existing population metrics, and what efforts are being used to reduce mini-jacks?*

**ISRP 2013 Response Comment 6:**

We agree that the occurrence of precociously maturing coho in hatchery programs is extremely rare and infrequently or never monitored. However, we urge the YN to evaluate the occurrence of mini-jacks in the yearling summer Chinook they are planning to release as part of the summer/fall integrated program. Whenever possible, these examinations should be based on plasma levels of the reproductive steroid ketotestosterone (11-K-T). Males with 11-K-T levels greater than 0.8 ng/ml are considered to be maturing mini-jacks. A less sensitive method, determination of the gonadosomatic index (GSI) of sampled male smolts, may also be employed. GSI values are ascertained by dividing the testes weight by the body weight of a male and multiplying the quotient by 100. Individuals with GSI ratios  $\geq 0.1\%$  are considered to be maturing males. At present it is unknown if precocious development will occur in the project's yearling summer Chinook. Nevertheless, a discussion about how the presence of such Chinook would be considered when population metrics for the project are being determined should be included in Step 2.

***ISRP 2012 Comment 7.*** *How will harvest rates be controlled in order to rebuild the natural populations in the upriver basin? What is the planned harvest rate in relation to run size and how will this objective be achieved? Is there a plan to allocate harvests in the Yakima River to non-tribal sport anglers as well as Tribal anglers?*

**ISRP 2013 Response Comment 7:**

The YN response indicates that annual harvest rates will be set with WDFW each year, including allocations to non-tribal fishers. Coho harvest rates will be set to ensure 5,000 NOR + HOR spawners in Phase 3 and 3,500 NOR spawners in Phase 4 are achieved whenever possible. In Step 2, scientific justification for these spawning targets and detailed harvest rate and harvest allocation decision rules for varying levels of hatchery and natural origin salmon abundance should be described.

The ISRP agrees that a good approach will be to establish a minimum spawning escapement goal for both coho and Chinook such that harvests in the lower river will be greatly reduced if the returns to the upper Yakima River appear to be at or below the escapement target. However, it is not clear how the fishery will harvest the segregated stocks co-mingling with upriver stocks if non-selective fishing methods are used. This should be described in Step 2.

Summer/Fall Chinook Program

***ISRP 2012 Comment 8.*** *As currently framed, the integrated summer/fall run Chinook and coho salmon reintroduction and harvest programs are not consistent with guidelines in the 2009 Fish and Wildlife Program (hereafter "Program"). For the summer/fall Chinook*

*program, there is not clear evidence that the habitat will be suitable to maintain a self-sustaining population for the foreseeable future. Also the Master Plan clearly identifies that anticipated overall harvest level of 63% (transition phase; based on values in Table 3-7) is likely incompatible with restoring a self-sustaining population, and is therefore inconsistent with the Program. As described in the Program under Artificial Production Primary Strategies (pages 18-19), integrated programs can be used to complement habitat improvements by supplementing populations up to the sustainable carrying capacity of the habitat. For restoration, the Program states, “that eventually, after appropriate habitat improvements, they [the populations] will become self-sustaining.”*

AND

*Under these guidelines, the ISRP expects that Ecosystem Diagnosis and Treatment (EDT), or some other modeling, will be used to demonstrate a reasonable likelihood that habitat restoration will lead to capacity sufficient for the population to be self-sustaining. Under Harvest Strategies (pages 19-20), the Program states “there is little point in recommending funding for implementation of a subbasin plan when the objectives of the plan cannot be reached under current harvest regimes. If, for example, a wildlife mitigation project aims to re-establish an elk herd in a subbasin and existing regulations allow for overly aggressive harvest of the herd while it is first being established, there is good reason to doubt that the project will succeed.” Under monitoring and reporting in the Harvest Strategies section the Program states “manage harvest to ensure that risk of imprecision and error in predicted run size does not threaten the survival and recovery of naturally spawning populations.”*

*Therefore, the Master Plan should describe an experimental approach to evaluate natural spawning by hatchery returns and natural fish with recent hatchery pedigree to gain the information needed to determine a sustainable harvest rate for the natural population.*

**ISRP 2013 Response Comment 8:** Some of the ISRP comment was not included in the YN response, so we included the text in the ISRP comment above.

EDT values, which are typically based on expert opinion, were presented as a means to justify the recruitment curves for transition and long-term periods. A modest increase in productivity and a large increase in capacity are expected, if the \$4 billion Integrated Plan is implemented. EDT results should be viewed with a high degree of uncertainty, especially when they are linked with a very expensive Plan that has yet to be approved for funding. For the current period, EDT values indicate a sustainable Chinook summer/fall population (Table 6). It would be worthwhile to estimate adult return per spawner for natural Chinook and coho salmon that exist today and compare this with values assumed by EDT (e.g., approximately 3 for the fall Chinook run according to Table 6—a fairly productive stock). Are these stocks sustainable today and at current harvest rates, and if not, when will a sustainable population occur?

The YN response agrees that the harvest rate on summer run Chinook will be very high and likely not sustainable in the near term. However, they suggest the overall run, which includes the summer and fall components, will be maintained with hatchery fish. This approach does not meet Fish and Wildlife Program guidelines because the early component of the salmon run would be over-harvested. Harvest rates should be tailored to the productivity of each component of the run during both the transition phase and the long-term phase.

However, the YN response also states that it will work with WDFW to ensure a minimum early (summer) Chinook escapement of 500 fish in the transition period and 1000 fish in the long-term. An escapement goal approach, such as this, is preferable because it provides some protection for the sustainability of the natural population. The escapement goal approach is also consistent with the Fish and Wildlife Program. But it is not clear how an escapement goal approach would be implemented while also harvesting surplus hatchery fish produced by the segregated programs. In Step 2, the harvest strategy for coho and Chinook (integrated and segregated programs) should clearly demonstrate that the natural populations will be sustainable, including all migration timing components.

Fig. 4 shows an assumed long-term exploitation rate of 67.7%. It would be worthwhile to check this assumption by providing references for wild Chinook populations that support a 68% harvest rate over the long-term, e.g., 30 or more years. Harvest rates must be based on populations that have accurate escapement counts rather than indices that often underestimate escapement leading to high harvest rate estimates.

The YN cite results from the Integrated Plan that estimate proposed habitat improvements in the basin will provide a 123% increase in baseline numbers of summer Chinook. This latter estimate assumes that all the habitat restoration actions proposed in a recovery plan for Yakima steelhead have been implemented. A small gain in summer Chinook from a baseline value of 3,308 to 3,694 (~12%) was predicted if only ongoing habitat improvements were completed. The Master Plan should consider both of these possibilities instead of assuming that full habitat restoration will occur.

Finally, the sponsors indicate that continued releases of Wells Dam Chinook will occur, if necessary during the transition phase, to maintain the summer or early portion of the summer/fall integrated program. The Master Plan indicates that the summer/fall integrated program has two goals: 1) to mitigate for lost harvest opportunities and 2) to reintroduce summer Chinook back into the Yakima River. As we understand it, Chinook salmon captured at Wells Dam will be the summer run founders. As progeny from these fish return to the Yakima River, some will be allowed to spawn naturally and others will be used as hatchery broodstock. Fish used as broodstock will be mated with individuals with similar maturation timing. Over time, fish originating from summer Chinook collected at Wells are expected to cross with early returning fall Chinook to create a single homogenized summer/fall population. As indicated above, harvest rates and other factors may significantly reduce early run fish necessitating a continual reinsertion of hatchery fish to keep this life history strategy present in the Yakima



River. The Master Plan should indicate what contingencies will be implemented to restore harvest opportunities if a natural summer or early run of Chinook cannot persist in the Yakima River. Will the early run be discontinued, or will the early run program rely entirely on hatchery production?

***ISRP 2012 Comment 9.*** *In the long-term phase of the proposed Master Plan, the assumed average harvest rate is 68% on summer Chinook salmon, a level that seems unrealistic even if significant habitat improvements are made in the watershed. The ISRP believes that natural spawning Chinook populations would not be sustainable at this high harvest rate.*

**ISRP 2013 Response Comment 9:** The ISRP appreciates the new analyses to address this issue. We agree that an escapement goal approach, as stated in the response, is preferred as a means to ensure that the early Chinook run is not over-harvested. The Fish and Wildlife Program requires that harvest not impede progress on achieving restoration, and restoration needs to have a self-sustaining natural population as an end point. The ISRP encourages the YN and WDFW to adopt an escapement goal approach, and we look forward to the Step 2 analysis on this subject. In Step 2, the information should identify fisheries and actions that can be used to achieve minimum escapement goals. Scientific justification of the minimum escapement goals is also needed.

The ISRP remains skeptical that this run can sustain a harvest rate of 68% during the transitional or the long-term period. Please provide evidence that wild Chinook can sustain a 68% harvest rate over the long period, i.e., a population with accurate data. As noted above, a detailed harvest strategy that provides for sustainable natural populations is needed for both coho and Chinook.

***ISRP 2012 Comment 10:*** *In the near term, maintaining the current high harvest rate on the integrated population is not compatible with the Fish and Wildlife Program. The Master Plan should demonstrate, using existing data, how it will achieve a PNI of 0.5 or higher through harvest management, broodstock management, and habitat rehabilitation efforts. Objectives for the target proportion of NOR versus HOR on the spawning grounds should be stated and should be consistent with establishing a self-sustaining population (e.g., see Table 3-6).*

**ISRP 2013 Response Comment 10:** The YN response notes that a key assumption is a major improvement in habitat condition that supports higher Chinook productivity and similar or higher SAR in the future. The ISRP remains skeptical that the PNI >0.5 can be achieved along with the high average harvest rates (68%) and 5,000 spawners (average) because it is unlikely that the population, especially the early component, will be as productive as assumed in the analysis. The PNI objective might have a better chance of success if harvest rate is allowed to be lower and escapement levels are maintained above some minimum level. Specific plans for

harvest, population sustainability, and PNI achievement under various hatchery and natural origin salmon abundances should be addressed in Step 2.

***ISRP 2012 Comment 11:** For Step 1, the ISRP would also like data on recent program performance and a general timeframe for achieving the transition to the integrated program. This information can then be used in the Master Plan to describe more realistic potential benefits of the project.*

**ISRP 2013 Response Comment 11:**

The YN provided recent performance data for fall Chinook such as total return (NOR and HOR combined) and SAR values for hatchery summer/fall Chinook since 1998. The program should develop metrics for the natural Chinook component by appropriately marking the hatchery fish (e.g., CWT or thermal marks if adipose clip is not used). The YN noted that NOR could not be estimated because hatchery Chinook were not 100% marked.

The YN response noted that the key assumption in the analysis for the summer/fall program is the improvement in Chinook productivity (survival) in response to habitat restoration. The YN stated that habitat restoration will likely take 25 years assuming consistent and full funding is available. The YN also noted that 5000 spawners (average) are needed to trigger Phase 4 and this could be achieved within 10 years assuming SARs similar or better than present. As stated previously, Step 2 will need to include an M&E plan that can be used to evaluate the reliability of the assumptions used to create these results. Step 2 should also include a more realistic scenario for habitat restoration given that the \$4 billion Integrated Plan has not been funded and it is highly uncertain whether it would be fully funded and implemented in the near future.

**Comments by ISRP that were not addressed in the YN response:**

The YN did not respond to several ISRP comments. These comments are restated here so that they can be revisited during Step 2.

During Step 2, the ISRP anticipates a comprehensive monitoring and evaluation plan that can document progress against the goals and objectives of the program and will provide information necessary for adaptively managing the program. In particular, the ISRP expects that the sponsors will describe how they will assess possible competition and predation interactions between project coho and summer Chinook on spring Chinook, steelhead, and other juvenile fishes in the basin, including predation by warm-water fishes and birds in the lower Yakima River. Water reuse at Marion Drain and Holmes Ranch along with salmon incubation at those same sites may increase the risk of disease; therefore, a plan should include monitoring of fish health at these sites. Step 2 should also address the status of the surface water supply at Prosser and describe the final location for the Upriver Bright (UBR) fall Chinook rearing and acclimation site in the lower River. Results of such work should be incorporated into the Yakama Nation adaptive management plan framework.

The ISRP noted that sockeye may bring IHN into the watershed. However, the YN did not provide a response to this issue, such as the steps needed to protect project fish from this virus and the protocols that will be followed if it is found on fish being reared by the project's facilities.

Proposed new and remodeled infrastructure was described and justified to some extent. However, the ISRP did identify some issues that needed additional information. For example, the Master Plan states that 31 concrete raceways (10' wide x 100' long x 3.5' deep) will be built at Prosser for supporting 500,000 coho salmon. Rationale for 31 raceways should be described, including what the rearing density goal is and why this goal was chosen. Additionally, the YN proposed to add another well at Marion Drain where the current ground water capacity is 800+ gallons per minute. However, the reported maximum use of well water is only 500+ gallons. Additional justification for the new well is needed.

Management plans for spring Chinook, sockeye, and resident fish are not in the Master Plan. The Master Plan should describe the effects of the enhanced in-river salmon fishery on the resident trout population and other salmonids that might co-occur in the fishery.