



Independent Scientific Review Panel
 for the Northwest Power & Conservation Council
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Memorandum (ISRP 2009-6)

March 18, 2009

To: Tony Grover, Fish and Wildlife Division Director, Northwest Power and Conservation Council

From: Eric Loudenslager, ISRP Chair

Subject: Step One Review of the Mid-Columbia Coho Restoration Master Plan (#1996-040-00)

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Background

At the Council’s December 2008 request, the ISRP reviewed the Yakama Nation’s Mid-Columbia Coho Restoration Master Plan (11 November 2008 revised version), as Step One of the Council’s Three-Step Review process. The ISRP has participated in numerous reviews of the coho restoration Master Plan and feasibility study including annual reviews of proposals for funding through the Fish and Wildlife Program for fiscal years 1998, 1999, and 2000; a partial step review in 2000¹; a provincial review² for fiscal years 2003-2005 funding; and a concurrent Step-One Master Plan review and FY 2007-09 proposal review in 2006.³

We provide the following excerpts for additional context:

Excerpt from ISRP 2006-5: These reviews have been constructive with improvement of the project’s justification noted in each iteration, though not without debate on such issues as a change in the project’s emphasis from the Methow to the Wenatchee basin. This Step-One review marks the evolution of this project from a feasibility study to fuller implementation with increased production and releases of smolts (a peak of 2,155,000 in 2012) coupled with proposed investment in new facility development including a small adult holding and incubation site in the Wenatchee subbasin, two constructed habitats for rearing in the Methow subbasin, and a combination of five acclimation sites involve varying degrees of construction.

¹ ISRP 2000-5: www.nwcouncil.org/library/isrp/isrp2000-5.pdf
² See the project under CBFWA’s proposal finder: www.cbfwa.org/solicitation/components/forms/Proposal.cfm?PropID=223
³ ISRP 2006-5: www.nwcouncil.org/library/isrp/isrp2006-5.htm

Excerpt from the YN November 2008 Cover Letter submitting this review: We are submitting a revised version of the Mid-Columbia Coho Restoration Master Plan for review by the NPCC and ISRP. The original version was submitted in January 2006. At the Council's request, the ISRP reviewed both the original Master Plan, as part of Step-One of the Council's Three Step Review, and the 2007 - 2009 solicitation proposal for this project (# 1996-040-00). Although the ISRP recommended partial funding in August of 2006, the Council determined that budget limitations in the Columbia Cascade Province would not allow funding. The project continued to operate using transitional sources of funding.

In May 2008, the Yakama Nation signed a Memorandum of Agreement (2008 MOA) with Bonneville Power Administration, the U.S. Army Corps of Engineers, and the Bureau of Reclamation. The three federal agencies agreed to 10 years of funding for actions to benefit fish and wildlife (e.g., habitat improvements, hatchery actions, and research, monitoring and evaluation). The Mid-Columbia Coho Reintroduction Project was specifically named in the agreement as it has strong endorsements from NOAA Fisheries, WDFW, USFWS, mid-Columbia PUDs, and the congressionally designated Hatchery Scientific Review Group.

Project proponents reviewed the ISRP's comments in 2006 and responded to them during the Fix-it Loop process. Since then, they have revised the 2006 Master Plan in several ways. Perhaps most significant is that the habitat improvement component of the project has been removed because habitat actions are being funded separately under the 2008 MOA. Thus, a number of ISRP comments from 2006 relating to the habitat portions of the Master Plan no longer apply to this project.

We have reviewed the ISRP comments on the original Master Plan and have selected a representative sample from those that were submitted to demonstrate how the plan has changed in response to the comments. Because many of the comments repeated similar concerns, because many addressed habitat issues that are no longer part of the project, and because some were essentially editorial, we did not reproduce the entire 27 pages showing a response to each comment.

2009 ISRP Recommendations and Comments

Recommendation: Does Not Meet Scientific Review Criteria

This most recent version of the Mid-Columbia Coho Reintroduction Master Plan is a largely unchanged update of the 2006 draft Master Plan. Habitat restoration elements that were in the 2006 draft plan have been removed and the proportion of hatchery-origin adults spawning naturally has been increased from 60 to 65% in the Natural Production Support Phase II.

The ISRP raised several concerns in the 2006 review of the Master Plan that have not been sufficiently addressed in this revision. Nevertheless, the ISRP remains supportive of a well-designed and monitored effort to reintroduce coho to these areas where they have been effectively extirpated for many years. The ISRP is willing to meet with the project sponsor in-person or by teleconference to discuss our comments and concerns.

The primary criticism raised in this 2009 review is a lack of empirical or theoretical justification for the hatchery strategy employed in the phases of the coho reintroduction effort. The sponsor has not sufficiently used existing empirical data or theoretically based assumptions to examine a range of alternative hatchery production scenarios and then select an alternative most likely to lead to success.

The Yakama Nation has been involved with coho reintroduction into the Wenatchee and Methow subbasins since the mid 1990s, and has succeeded in establishing a naturalized hatchery stock that returns primarily to the middle reaches of the Wenatchee River (between Dryden Diversion Dam and Tumwater Dam). The project sponsors now want to initiate phased steps to increase the numbers of coho migrating above Tumwater with the goal of establishing a self-sustaining population of 1500 natural-origin fish.

The primary goals of interest are whether a self-sustaining population can be established, whether production can be moved to river reaches above Tumwater, and whether the associated numerical abundance can be achieved.

Coho reintroductions in the Yakima River (Yakama Tribe project), Clearwater River (Nez Perce Tribe project), and Umatilla River (Confederated Tribes of the Umatilla Indian Reservation project) have similarly succeeded in establishing hatchery supported runs to the tributaries but have not achieved natural-spawning populations that are self-sustaining. In each of these subbasins (including the Wenatchee and Methow) if the hatchery program were to cease, coho would most likely become extirpated again. Given this observation, the ISRP concludes that the likelihood of success in achieving a self-sustaining population of any size in either of these subbasins is not large. Therefore, the effort is best undertaken as a carefully designed adaptive management experiment. The basis for an adaptive management program is that information drives decisions.

The Mid-Columbia Coho Master Plan is deficient because:

1. The performance metrics at each stage of the project are insufficient;
2. The reporting of the feasibility studies does not provide explicit status of the appropriate metrics at this time;
3. The rationale for the design of Broodstock Development Phase 2, Natural Production Implementation Phase, and Natural Production Support Phase I and II are not scientifically supported by the results from the feasibility studies or modeling.

1. Performance Metrics at each stage: For each stage (BDP2, NPIP, NPSP-I, and NPSP-II) goals for natural-origin returns, hatchery-origin returns, hatchery and natural adult-to-adult replacement rates are required.

2. Reporting the results of the feasibility studies. Some information is provided, but it is incomplete. A reconstruction of the fate of fish from each release should be provided. This could be one large table. The numbers of natural and hatchery fish spawning in the streams should be given, along with estimates of natural female-to-female (or egg-to-egg) replacement rate. Data on the numbers and proportions of fish (by sex, age, and source [hatchery or natural]) returning to Dryden Diversion Dam, Leavenworth National Fish Hatchery on Icicle Creek, and Tumwater Dam are required.

3. Based on empirical results similar to the smolt-to-adult rate (SAR) for lower and mid-Columbia hatchery fish released into the Wenatchee and Methow rivers (Figure 3.2) and comparison of survival to McNary by lower-Columbia River coho and mid-Columbia River coho in paired releases in the Wenatchee River (Figure 3.3), the sponsors need to determine the generational gain in the abundance and productivity of natural fish returning to the Wenatchee and Methow subbasins. In the Wenatchee, the appropriate census location is Tumwater Dam or above, since the goal is to have a self-sustaining population of 1500 fish above that point. It would be most useful to have an estimate of the number of natural fish reaching Tumwater that are progeny from coho spawning above Tumwater. This estimate can be compared to an estimate of natural coho that are progeny of coho that spawned below Tumwater. It would also be useful to know if hatchery coho that reach Tumwater produce progeny that return to Tumwater in larger proportions than hatchery coho that do not reach Tumwater.

Whether this sort of data exists is not clear. If it does not, the feasibility studies should continue, and these data need to be gathered. An implementation design that provides estimates of important genetic and environmental components for the abundance and productivity metrics is required.

Once these data are available it should be possible to estimate the genetic (and generational) gain in the metrics of interest – natural spawning female-to-female (or egg-to-egg) replacement rate, abundance at Tumwater, and proportions of coho returning to Tumwater. Once these genetic parameters are bounded, alternative hatchery programs can be compared to evaluate which one is most likely to move the population from its current status to the desired end state.

The current program is one potential option. This plan uses constant smolt releases during each phase (albeit the number decreases from Natural Production Implementation to Natural Production Support I and II). Also, in this plan the proportion of natural coho used in the broodstock (pNOB) and hatchery coho permitted for natural spawning (pHOS) during Natural Production Implementation Phase and Natural Production Support Phase I result in a PNI below 0.50. Consequently, selection from the natural environment is not larger than selection from the hatchery environment.

The ISRP is concerned that inclusion of large proportions of hatchery fish on the natural spawning grounds, coupled with small proportions of natural fish in the hatchery broodstock will retard progress toward achieving the objective of a naturally spawning female-to-female replacement rate of greater than 1.0. The ISRP is concerned that inclusion of 50%, or perhaps more, of coho salmon that are returning to the lower reaches of the Wenatchee will retard progress toward achieving the objective of having a substantial return above Tumwater Dam. The objective may be reached sooner with smaller releases of fish with stronger selective pressure applied to the population.

To these ends and to more fully and appropriately integrate quantitative genetic concepts and approaches, the sponsors might consult with conservation genetics experts at NOAA-Fisheries (in the NW Science Center) or the USFWS Abernathy Fish Technology Center, as well such experts within the academic community, WDFW, and CRITFC.

The Hatchery Scientific Review Group (HSRG) report for this program recommended that the program move quickly to establish a PNI of greater than 0.50. The ISRP concludes that the phased program proposed is likely insufficient and not consistent with the HSRG recommendation.

The ISRP believes that coho salmon reintroduction above Bonneville Dam is an important conservation effort, on par with wolf reintroduction, grizzly bear recovery, and California condor breeding and release. Establishing a reintroduction strategy based on a full consideration of the scientific knowledge from our understanding salmon quantitative genetics, population demography, and hatchery and natural salmon interactions is likely to improve the potential for success.

2009 ISRP Comments on Yakama Nation Responses to 2006 ISRP Review Issues

1. ISRP 2006 Comment: Provide text that explicitly addresses the relationship and consistency of this proposal with the Council's eight scientific principles.

YN 2008 Response: This was done. See Section 1.5.

ISRP 2009: The sponsor has provided descriptive text within the revised Master Plan. The consistency with several of the NPCC's principles remains unmet. For example, identification of the metrics for biological objectives is critical for robust M&E, and M&E is critical for adaptive management.

Moreover, appropriate definition and measurement of local adaptation is implied as part of an ecosystem perspective (that is, local populations may be part of a network of related populations, called meta-populations).

2. ISRP 2006 Comment: Provide more specificity and clarity on the habitat protection and enhancement portion of the Master Plan.

YN 2008 Response: The habitat and enhancement portion of the Master Plan has been removed. Through all the coho restoration project phases, project staff will work with other entities in the subbasins to implement habitat improvement and protection projects as identified in several major programs, including Habitat Conservation Plans of three public utility districts, projects funded by the Upper Columbia Salmon Recovery Board (UCSRB), and Yakama Nation's habitat improvement projects funded under the 2008 Memorandum of Agreement between Bonneville Power Administration, Bureau of Reclamation, and Army Corps of Engineers. These habitat projects will benefit coho as well as listed species (spring Chinook, steelhead, and bull trout) and are expected to be a significant effort towards remedying the second challenge to coho reintroduction as identified in Section 1.1.1 of the Master Plan.

ISRP 2009: Removal of the habitat portions of the Master Plan is counterproductive to the ecosystem-level goals in the province. The rationale for the sponsor's action is unclear. While the ISRP appreciates that other entities, including PUDs, will fund these projects, the projects appear to be quite critical and foundational for the success of the proposed program. The ISRP asserts that a greater emphasis on and linkage to these habitat actions is needed. A key way in which this will play out is in AHA modeling used at the different project phases. Productivity is listed as increasing, which is in part a response to habitat gains. Thus, a major premise for the increased productivity on the spawning grounds is tied to the habitat protections and enhancement activities as foundational for the proposed project to succeed. Therefore, clear articulation and accounting of these activities is warranted with significant focus on when milestones will be reached for the benefit of natural productivity.

3. ISRP 2006 Comment: In the Master Plan, evaluate artificial production options with alternate PNI schedules, and variable production levels. The sponsors evaluate (propose) a single artificial production option that has fixed smolt release schedules (albeit they decrease through time) that would maintain moderately high proportions of hatchery-origin adults both on the natural gravels and in the hatchery. Then the schedule abruptly switches to full natural production. The ISRP suggests one alternative schedule that they believe should be evaluated. Sponsors may think of others, and they should also be presented and evaluated.

YN 2008 Response: The natural production phase schedule has been modified. Please see Section 4.3.1, summarized in Tables 4-1 and 4-2.

ISRP 2009: Our initial comment requested the sponsors to explore alternative release levels, PNI ratios, and pHOS, etc. for the purposes of modeling expected outcomes. The sponsor's response expands their explanation of how the smolt release numbers will change, but no consideration is given to alternative PNI schedules. The tables and information do not address how productivity and abundance is required to increase during the life of the Master Plan and how a combination of artificial production and habitat improvement tasks will lead to this improvement.

4. ISRP 2006 Comment: Biological objective 1 and 2 . . . are not appropriate. Biological Objective 1: Develop locally adapted, naturally spawning coho stock in the Wenatchee and Methow river subbasins by 2026 is undefined. One could argue that this has already been achieved. No generally agreed on criteria exist for determining that a population has become "locally adapted."

An appropriate Biological Objective would be "A population of coho salmon self-sustained by natural reproduction with a 3-year mean escapement of 1500.... The critical points here are self-sustained, natural, and 3-year mean escapement. This defines the biological state - self-sustained by natural reproduction, and a quantity (1500 per subbasin) that is unambiguous and can be used to track progress.

Biological Objective 2. Evaluate the efficacy of coho reintroduction in Mid-Columbia tributaries adds nothing beyond the first Biological Objective. It is simply the monitoring of whether Biological Objective 1 is achieved. Biological Objective 2 could be dropped.

YN 2008 Response: The ISRP's suggested Objective #1 merely incorporates the project's stated goal #1 as part of the wording of the objective. The ISRP does not suggest that our stated goal is not appropriate; in fact, the reviewers state: "The numerical performance standards (1500 per subbasin), while ambitious, are not out of the realm of achievement for the subbasins, given historical run sizes. . ." The project has provided measurable standards by which to evaluate success, which is the purpose of including objectives and goals in the plan.

As for Objective 2, we disagree that it should be dropped. It is important to acknowledge that an important part of this project is to evaluate whether goals are achieved, and whether the methods used contribute to the success or need to be modified.

ISRP 2009: In the 2006 review the ISRP pointed out our perspective that the goals and objectives were intermixed for biological objective 1 and that biological objective 2 was essentially monitoring to determine whether objective 1 had been achieved. Perhaps the critique was not perceived as being as constructive as it was intended. The Master Plan provides a pretty clear picture of what the sponsor intends to accomplish, and the ISRP does not want to pursue what could be an unproductive exchange. Additional points on each objective are provided below.

Biological objective 1. The "goal" statement associated with biological objective 1 are sufficient to meet the criteria established in the 1996 amendment that the ISRP uses to evaluate proposals. The measurement of success needs to use VSP type criteria - abundance, productivity, distribution, and diversity. These then serve as unambiguous benchmarks that proponents and reviewers understand. These should be highlighted as the biological objectives. Otherwise, there can be disagreement as to whether a project has achieved its purpose. For this plan, it would be appropriate to identify productivity (at least a natural spawning adult to adult replacement rate) and distribution objectives as well as the abundance objective already established.

Biological objective 2. It is essential to conduct thorough M&E for the project. In its current form it is not clear what quantitative measures are associated with determining whether progress is being made toward the objective of successfully reintroducing coho to the Wenatchee and Methow subbasins.

5. ISRP 2006 Comment: Ultimately, if recolonization is to succeed, issues such as mainstem and subbasin passage, appropriate flows, habitat availability, and so on must be continually and directly addressed.

YN 2008 Response: The ISRP may well be correct in this and other comments emphasizing that program success depends on improvements in habitat at all life stages, not just the freshwater stage. The plan acknowledges that these other elements are important, but the proponents are not in a position of having either the resources or the regulatory authority to identify problems and propose solutions in the mainstem, estuary, or ocean. We believe that if the program to develop a locally adapted stock can see 17,000 adult coho return to Rock Island Dam within 10 years, as it has done, it appears that this freshwater effort, in conjunction with others' efforts to restore and improve habitat elsewhere, is worthwhile.

ISRP 2009: The ISRP did not require or suggest that project sponsors take actions beyond their capability or authority. Rather, these situations are part of the current realities against which the project will be undertaken. Thus, if downstream or out-of-basin conditions seriously hinder return rates or recruitment, or if tributary habitat conditions are unsupportive of natural recruitment, then artificial production will have little hope of creating or adding to a viable and naturally producing population. Therefore, the purpose of our 2006 review comment had to do with whether models predict recruitment and productivity sufficient for natural self-sustaining populations (and at what feasible levels) given the environmental conditions.

7. ISRP 2006 Comment: 7.3. M&E for adaptation. The crucial data for evaluating adaptation will come from monitoring life-stage survival and abundance.

7.3.1. Life history and morphometrics along with changes in productivity should be sufficient to evaluate adaptation.

7.3.2. No clear need exists to evaluate genotypes at neutral loci. At this time the ISRP considers this the least important of the monitoring. It would not hurt, but there would be no useful interpretation, regardless of whether or not allele frequencies changed. If concerns develop about population bottlenecks, or other specific questions arise that have clear hypothesis that can be addressed with this data, then genotyping fish can be reconsidered. It would be appropriate to collect tissues from representative individuals for DNA extraction and genotyping in the future, should the need arise.

7.3.3. Cryopreservation is not necessary. If the program is not producing enough males for a breeding program, then the sponsors can conclude that reintroduction was unsuccessful.

YN 2008 Response: We are removing cryopreservation from the monitoring program but are keeping the other two genetic monitoring projects in the proposed program. We agree that the program does not depend on this monitoring; on the other hand, collecting the data is not costly, and could prove highly valuable to future studies. For the foreseeable future and as you suggest, we will only be collecting genetic samples for potential future evaluation. If analysis is deemed necessary, we will then process the samples.

ISRP 2009: The response appears consistent with ISRP's 2006 review comment.

8. ISRP 2006 Comment: The framework of the plan is encouraging, but the repeated reference to options to continue early phases if the returns are not sufficient is counterproductive, in the ISRP's view. The timelines for the phases should be established by the plan, and adhered to. If the returns of hatchery or natural fish do not live up to expectations, the numbers of fish spawned, reared, and released should be adjusted. The time period for the phases should not be extended. The program should move through to the next phase with a reduced stocking level.

YN 2008 Response: While this project is an experiment in some ways, it is also a management action. One option, as you suggest, may be to reduce the size of the program if data analysis suggests this is the solution. However, data may suggest that another solution is an extension of a phase. Phase timelines depend on the rate at which local adaptation occurs. This rate is uncertain, making fixed project timelines risky.

ISRP 2009: Some flexibility is an important element of adaptive management. However, the ISRP's concern with the approach here and elsewhere in the Basin, is that it ultimately becomes a "keep producing hatchery fish no matter the outcome." An important positive feature of this Master Plan is that it is term-limited (that is, it states a desire to end releasing hatchery fish after a specified number of generations).

The ISRP is skeptical whether an introduced gene pool can become functionally "locally adapted" in a few generations. Conceptually, local adaptation is the result of long periods in which populations essentially "track" local environmental conditions over many generations. In part, our skepticism results from uncertainty about whether down-river (lower) Columbia River Coho populations (sources) are sufficiently phenotypically plastic and genetically variable to quickly adapt their phenotypic and life-history traits to mid-Columbia conditions, such as the extra energy stores required to increase migratory distances and still have sufficient bioenergy for maintaining gamete quantity and quality.

Before extending the fish release time periods, the Master Plan needs a method to determine whether or not they are successful, and under what circumstances they should alter production. That decision framework is not yet in place. The framework needs to establish the data sets and analysis that will be used to make the decision on whether additional artificial production is appropriate.

The ISRP recommends consulting with quantitative geneticists (i.e., those that focus on breeding designs and selection experiments) in the Basin to assist designing a robust and monitored approach to permit truly adaptive management (see summary comments in the recommendation).

9. ISRP 2006 Comment: Chapter 3. Summary of feasibility study results and resolution of critical uncertainties is not well prepared and editing this chapter would improve the Master Plan appreciably. The summary of the fish culture activity that served as the feasibility study is not presented in sufficient detail.

YN 2008 Response: The chapter has been updated to reflect results of ongoing project monitoring since the first draft of the Master Plan was written. However, as the project proponents state in bold type, Chapter 3 only summarizes conclusions from the extensive reports of feasibility study results. It is not cost-effective to repeat the details of those studies in this plan; the feasibility study reports are cited extensively so that reviewers may consult them if they want a deeper understanding of the methods and procedures used.

ISRP 2009: The summary of feasibility studies does not provide a sufficient summary of the status of coho salmon in the Wenatchee subbasin following pilot reintroduction efforts from 1996 to the present. There should be summary tables that identify all the fish that were released, from where, and the fate of the returns from those releases. Tables should be included that identify how many natural fish are returning to the system from spawning by the reintroduced coho and give some estimate of the female-to-female replacement rate. The tables should identify how many (what proportion) of the adult coho are now returning to Tumwater Dam. This will provide a basis to evaluate the progress made to date, and consider whether the goals for 2028 are within reasonable possibility.

10. ISRP 2006 Comment: This section [2.4.1 Habitat Descriptions from Subbasin Plans] contains a better description of habitat problems. There are some aspects to clarify. [examples provided]

YN 2008 Response: As indicated by the title, these descriptions come directly from the subbasin plans; additional clarification as requested is not available from these publications.

ISRP 2009: The sponsor's response indicates that the subbasin plan is the only source of information and that ISRP was seeking a cut-and-paste response. In fact, the ISRP asked the sponsors to provide information that links historical limits of natural productivity (and likely causes of extirpation) to current activities aimed at correcting these limits. From these, the sponsor should provide an evaluation of the reasonable outcome(s) of reintroduction and supplementation, and whether it will result in a self-sustaining population(s).

11. ISRP 2006 Comment: The ISRP remains concerned about the environmental conditions that may develop from feed and feces that could accumulate in semi-natural acclimation ponds that are not as easily cleaned as traditional raceways. Additional discussion of the specifics of this type of fish culture issue would improve the Master Plan.

YN 2008 Response: Project proponents share the ISRP's concerns. These aspects of the proposal will be evaluated in the Environmental Impact Statement that is part of Step 2, and in the NPDES permit process. The YN and BPA have already engaged the Washington Department of Ecology in preliminary discussions concerning water quality issues.

ISRP 2009: This issue will be flagged for coverage in a future Step-Two submittal. Inclusion of a letter of support or other appropriate NEPA documentation from WDOE will be warranted as appended material.

12. ISRP 2006 Comment: “The ISRP recommended in the preliminary proposal review and in the Master Plan Step-One review that the sponsors alter the primary biological objective from ‘biologically sustainable’ to ‘naturally self-sustaining population.’ Sponsors provide an adequate summary of the history of the development of the primary objective and use of the term ‘biologically sustainable.’ They provide their rationale for using the term:

Our use of "biologically sustainable" does not make any assumptions about whether future hatchery supplementation will be required. Very early versions of the Master Plan included the term "self-sustaining" in the vision statement. The term was eliminated after much consideration by the Mid-Columbia Coho Technical Work Group because no other species of anadromous salmonid within the upper Columbia currently is self-sustaining. All other species of salmon and steelhead receive supplementation of some kind. Inclusion of the term "self-sustaining" may unintentionally predispose the project for failure in terms of whether or not a realistic vision is achieved.

This rationale is exactly the reason the ISRP continues to recommend changing ‘biologically sustainable’ to ‘self-sustaining by natural reproduction.’ The ISRP recognized that biologically sustainable could be interpreted to mean supported indefinitely by hatchery-origin adults. In the present case, however, the project proponents have clearly designed a program that implies it is going to proceed to entirely natural production. It is the hedges that appear occasionally in the Master Plan and in this reply that back away from the schedule to attain self-sustaining status that is of concern to the ISRP. It is worth attempting to reintroduce coho and achieve self-sustaining status. If that is the goal, a production and habitat restoration plan needs to be designed to accomplish that task. If it does not work, then the program can be altered at the end of the experimental phase. This might be a harvest augmentation program, as the sponsors identify in the Master Plan, or it might be some other integrated hatchery program.”

YN 2008 Response: The Mid-Columbia Coho Restoration Master Plan has a clear goal, and a clear endpoint, but acknowledges that flexibility in timing is needed to adapt to monitoring results. This project is not solely an experiment, it is also a management project, and the rigid schedules of a purely experimental project are not appropriate in this case.

Project proponents do not think that their recognition that some kind of unspecified supplementation or harvest augmentation program for coho could continue beyond 2028, funded by sources other than BPA, implies that they are backing away from the goal of proceeding to natural production. Coho salmon are a ‘plan’ species covered under the Chelan and Douglas Habitat Conservation Plans (HCPs) and the Priest Rapids Settlement Agreement. Therefore, the mid-Columbia PUDs will continue to mitigate for the loss of juvenile coho at their hydro-projects in order to achieve No-Net-Impact (NNI) for the duration of the HCP agreements (fifty years). Because of these mitigation obligations, we expect a hatchery program of unspecified size and strategy to persist beyond 2028.

ISRP 2009: The ISRP recognizes that artificial production of coho in the Wenatchee and Methow subbasins for the purpose of harvest could continue following reintroduction and be consistent with the Fish and Wildlife Program. The 2008 Fish and Wildlife program states that supplementation should have a goal of establishing self-sustaining natural populations in a specific time period. To be consistent with best management practices for hatcheries, an integrated harvest program requires a natural population that is self-sustaining. A segregated harvest program is consistent with best practices and the Fish and Wildlife Program under a limited set of circumstances.

In this specific instance, it appears that an integrated harvest program would be consistent if a self-sustaining natural population is established. A segregated harvest program may be consistent if a self-sustaining natural population is not established.

The ISRP believes the appropriate objective for this Master Plan is “naturally self-sustaining.” If this level of productivity cannot be achieved, supplementation into the foreseeable future is not consistent with best practices or the Fish and Wildlife Program.

Under that circumstance a segregated harvest program should be evaluated and considered.

Review of Step Elements: Consistency with Council’s Requirements

Many of these review elements are discussed in this memo’s previous section, so there is some redundancy between the sections.

Master Planning Guidelines

In accordance with Section 7.4B of the Fish and Wildlife Program (NPPC 1994), the Master Plan is intended to address Council Master Planning guidelines.

Council Requirement 1

Address the relationship and consistencies of the proposed project to the eight scientific principles.

Principle 1. The abundance, productivity and diversity of organisms are integrally linked to the characteristics of their ecosystems.

YN: Project proponents expect that re-establishing coho into the ecosystem as a naturally reproducing species will improve the abundance, productivity, and diversity of many organisms in the target subbasins and beyond. Spawmed-out coho carcasses will add nutrients to streams at a critical time for a variety of species as they approach winter. Adult and juvenile coho provide a food source for other listed and sensitive species such as grizzly bears and bald eagles. The habitat improvements being undertaken as part of other projects will increase the ability of coho, as well as other fish and wildlife species, to re-establish self-sustaining populations.

Principle 2. Ecosystems are dynamic, resilient and develop over time.

YN: During feasibility studies, project proponents tested the hypothesis that a lower Columbia River coho population could, over time, become adapted to certain new environmental conditions—specifically, much longer migration times. The coho reintroduction program has taken, and will continue to take, the time to develop a locally adapted coho population. The proposed project has been designed to recognize the current limitations of the ecosystem but to respond to improvements as they are made.

Project facility design and operation will allow the reintroduction effort to adapt to ecosystem changes. The use of a variety of fish production and release methods and the emphasis on existing natural ponds for acclimation adds program flexibility. Rearing methods, release locations, and release numbers can efficiently be altered to adapt to a number of inputs, including changes at ecosystem levels.

Principle 3. Biological systems operate on various spatial and time scales that can be organized hierarchically.

YN: The project recognizes that a number of factors affect the viability of coho populations in the mid-Columbia region, factors that exist beyond the home subbasins and during periods of time when the project is not directly managing coho. As we state in Section 1.1.1, challenges to coho reintroduction include the absence of locally adapted populations, in-basin habitat degradation, survival through the migration corridor, and variability of ocean environmental conditions. The proposed reintroduction program directly addresses the first of the four challenges, but the project proponents are actively working both directly and indirectly to help improve local habitat, as well as help make improvements on a larger scale in the region. At the same time, we recognize that the local improvements made by our project can positively influence a wider environment and can have cumulative biological effects over the long term.

Principle 4. Habitats develop, and are maintained, by physical and biological processes.

YN: The project as currently proposed relies on the physical improvements to habitat that have been made, and will continue to be made, by other projects and entities in the region. In some cases, the proposed facilities will themselves contribute to developing and maintaining habitat for other species of fish and wildlife as well as for coho. At the same time, project proponents recognize that the process of reintroducing coho into the habitat is contributing to biological changes in that habitat due to the presence of increased biomass in basin streams and changes in nutrient levels of streams resulting from the presence of salmon carcasses.

Principle 5. Species play key roles in developing and maintaining ecological conditions.

YN: This project recognizes the role both juvenile and spawning coho might play in providing food sources for other species, as well as changing nutrient levels and other ecological conditions in streams. See Section 4.5, among others.

Principle 6. Biological diversity allows ecosystems to persist in the face of environmental variation.

YN: The coho reintroduction program has already increased the biological diversity in the region with its increasing numbers of coho adapted to the long migrations required to return to mid-Columbia subbasins to spawn, which they are doing naturally, also in increasing numbers. While numbers have fluctuated from year to year, depending in many cases on environmental conditions beyond the control of project managers, the coho have continued to return—an excellent demonstration of Principle 6.

Principle 7. Ecological management is adaptive and experimental.

YN: The proposed project has been an experiment in adaptive ecological management from its inception. Beginning with the hypothesis that a lower Columbia river stock of coho salmon could be gradually adapted to the much longer migration times required for them to reproduce naturally in mid-Columbia river subbasins, the project has monitored, documented, and changed broodstock collection, spawning, rearing, and acclimation practices over the years, and in the process, has demonstrated success where previous attempts had failed. The proposed project

would continue the adaptive, experimental approach to achieving the long-term goal of reintroducing harvestable numbers of naturally reproducing coho in mid-Columbia subbasins.

Principle 8. Ecosystem function, habitat structure and biological performance are affected by human actions.

YN: This project has recognized, and will continue to recognize, the importance of human actions on both success and failure of ecosystems and the biological performance of reintroduced coho, while at the same time keeping in mind the goal of minimizing or eliminating human intervention in the long term. The original hypothesis tested by the project, as well as its proposed future as described in this Master Plan, demonstrate that recognition. Program benefits and risks, many of which depend on human actions, are discussed in Sections 4.4 and 4.5; they will be evaluated in detail during the NEPA/Environmental Impact Statement process and in the analyses and consultations that are required under the ESA.

ISRP 2009 Comment on the Eight Principles: The sponsor has given considerable consideration to the eight principles and responded descriptively to each. Perhaps the most important parts that remain for consideration are the adaptive/experimental nature of the program, which requires a robust M&E plan, including well-defined performance metrics. Additionally, as reintroduction is largely an unproven approach (or at least has had a record of limited success) at reestablishing viable, self-sustaining populations, there are lingering uncertainties about the justification for the scale of the program and whether certain expectations (local adaptation) can be achieved.

Council Requirement 2

Describe the link of the proposal to other projects and activities in the subbasin and the desired end state condition for the target subbasin.

YN: Section 1.5 discusses the links between the proposal and other activities in the target subbasins. In brief, project proponents are partnering with numerous entities in the subbasins, not only to reintroduce coho and protect listed and sensitive species in these basins, but, as part of other programs, to make substantial improvements to habitat. The desired end state condition is re-established naturally spawning coho populations in mid-Columbia tributaries at biologically sustainable levels which provide significant harvest in most years (Section 1.2.1).

ISRP 2009: The Sponsor's response indicates that the subbasin plan is the only source of information and that ISRP was seeking a cut and paste. In fact, ISRP was requesting a linkage of the historical limits to natural productivity (and likely causes of extirpation) relative to current activities that are correcting these limitations. From these, what is the reasonable outcome of reintroduction and supplementation, and will it result in a self-sustaining population(s)?

Council Requirement 3

Define the biological objectives with measurable attributes that define progress, provide accountability and track changes through time associated with this project.

YN: Section 1.2.2 defines the following biological objectives and goals:

Biological Objective 1: Develop locally adapted, naturally spawning coho stock in the Wenatchee and Methow river subbasins by 2028.

Goal 1. The 3-year mean escapement of natural origin returns in the Wenatchee (upstream of Tumwater Dam) and the Methow river subbasins exceeds 1,500 per subbasin.

Goal 2. Achieve a total harvest rate of 23%, which includes a 10% mixed stock harvest, 10% mainstem harvest, and 5% terminal harvest in most years.

Biological Objective 2: Evaluate the efficacy of coho reintroduction in Mid-Columbia tributaries.

Section 4.3.1 and Chapter 5 lay out the specifics of how these goals and objectives will be met. Chapter 7 (the monitoring and evaluation program) defines how the progress towards meeting these goals will be measured. Section 4.3.5 describes options for adapting or abandoning the program if goals cannot be achieved.

ISRP 2009: In the 2006 review the ISRP pointed out our perspective that the goals and objectives were intermixed for biological objective 1 and that biological objective 2 was essentially monitoring to determine whether objective 1 had been achieved. Perhaps the critique was not perceived as being as constructive as it was intended. The Master Plan provides a pretty clear picture of what the sponsor intends to accomplish, and the ISRP does not want to pursue what could be an unproductive exchange. See earlier comments for additional information.

Council Requirement 4

Define expected project benefits (e.g. preservation of biological diversity, fishery enhancement, water optimization, and habitat protection).

YN: Cultural, socio-economic, and ecological benefits are expected to result from the return of this species to areas where it once occurred in abundance. Section 4.5 defines the benefits in detail.

ISRP 2009 Comment: The sponsor provides an adequate description of the social, cultural, and economic benefits of the project if it succeeds at returning fish to the subbasins. The key for ecological benefits will occur if the populations become self-sustaining.

Council Requirement 5

Describe the implementation strategies as they relate to the current conditions and restoration potential of the habitat for the target species and the life stage of interest.

YN: Habitat in the target basins is evaluated and described using several methods. Section 2.4.1 summarizes habitat descriptions from the Wenatchee and Methow subbasin plans. Using these descriptions, Section 2.4.2 evaluates habitat using the NPCC habitat condition criteria (NPCC

2000). Section 2.4.3 presents the EDT analysis of the Wenatchee and Methow subbasins. The EDT analysis identifies the target tributaries that are most suitable for coho reintroduction.

AHA computations for each release tributary provide natural production goals and expected results as the program transitions from a domesticated hatchery stock to a fully integrated supplementation program, and finally to a self-sustaining, naturally reproducing population. A summary of the AHA calculations for each targeted tributary for coho restoration is in Section 5.4.

The AHA model provides a framework from which the loss of fitness, or domestication, can be addressed in the form of a working hypothesis. The proposed mid-Columbia coho reintroduction plan presents a unique opportunity to test some of the assumptions of the AHA model, as they pertain to domestication and local adaptation, in the absence of genetic risk⁴ to a native coho population.

ISRP 2009 Comment: The sponsor provided information on the carrying capacity of the rivers but did not integrate the results from the feasibility work to inform the *scale* of the program. The modeling results helped to define a range of expectations of what will work under various productivity and environmental conditions, but ultimately empirical data are needed from real experiments. This project can serve as an important experiment for other such management cases where reintroduction has been proposed, if the appropriate design is well-conceived and a robust M&E plan is implemented.

Council Requirement 6

Address the relationship to the habitat strategies.

YN: Proposed habitat improvement programs in the subbasins are described in various subsections of Section 1.5; discussions include how the project proposed in this Master Plan will contribute to or benefit by those habitat activities.

ISRP 2009 Comment: Tributary habitat improvements in the spawning and nursery grounds are critical to local production. Section 1.5 has some description, but the direct linkages to how (and how much) these programs will improve productivity are limited.

Council Requirement 7

Ensure that cost-effective alternate measures are not overlooked and include descriptions of alternatives for resolving the resource problem, including a description of other management activities in the subbasin, province and basin.

YN: Section 1.5 describes other management activities that affect this project. Section 4.2, Chapter 6, and the B and C appendices all describe at various levels of detail the alternatives considered for this project.

⁴ Genetic risk is the probability of an event or activity having an adverse genetic consequence. Adverse consequences include (1) extinction, (2) loss of within population genetic diversity, (3) loss of among-population genetic diversity, and (4) domestication (Busak and Currens 1995).

ISRP 2009 Comment: The information provided is sufficient. Because coho salmon were extirpated from these subbasins, some form of translocation and artificial production is the only method that could put this species back in these subbasins. The sponsor proposes little in the way of new production facilities, so significantly lower cost construction options are not readily apparent.

Council Requirement 8

Provide the historical and current status of anadromous and resident fish and wildlife in the subbasin most relevant to the proposed project.

YN: Section 2.2 describes the historical and current status of coho; Section 2.3 discusses those issues for steelhead, spring Chinook, sockeye, summer/fall Chinook, and bull trout.

ISRP 2009 Comment: The information provided is helpful, but not complete. The specific status of coho salmon is not provided. What is needed is a summary of the Viable Salmonid Population (VSP) standards for both natural and hatchery coho – abundance, productivity, geographic distribution, and diversity.

Council Requirement 9

Describe current and planned management of anadromous and resident fish and wildlife in the subbasin.

YN: Sections 1.5.8 through 1.5.15 describe various fish management activities in the subbasins. Section 2.3 includes a section on the current management strategy for each of the species listed above under Council Requirement 9.

ISRP 2009 Comment: The information provided is adequate.

Council Requirement 10

Demonstrate consistency of the proposed project with NOAA Fisheries recovery plans and other fishery management and watershed plans.

YN: See Section 1.5.

ISRP 2009 Comment: The information provided is adequate within the context of restoring/returning viable populations to the provincial subbasins.

Council Requirement 11

Describe the status of the comprehensive environmental assessment.

YN: An Environmental Assessment and Finding of No Significant Impact were prepared for the feasibility phase of this project in 1999. Before subsequent changes to the program or additional project facilities were developed, supplemental analyses evaluating effects of those actions were

prepared. These documents are described in Section 1.3. Once this Master Plan is accepted, an Environmental Impact Statement on the proposed project will be prepared; that process includes extensive public involvement.

ISRP 2009 Comment: This information will need to be provided and documented in a future Step-Two submittal.

Council Requirement 12

Describe the monitoring and evaluation plan.

YN: Section 4.3.3 summarizes the M&E plan; Chapter 7 describes it in detail.

ISRP 2009 Comment: Effective adaptive management requires a well-conceived decision pathway, a clear and robust project design, and a rigorous M&E program to evaluate effectiveness of the actions (treatment). The current plan more fully defines the M&E program, including performance metrics, that will indicate whether biological objectives are achieved. The plan presently fails to provide (and therefore will not measure) a defensible definition of local adaptation.

Council Requirement 13

Describe and provide specific items and cost estimates for 10 Fiscal Years for planning and design (i.e. conceptual, preliminary and final), construction, operation and maintenance and monitoring and evaluation.

YN: See Chapter 8. Section 8.2 discusses capital costs, which include costs of construction and land purchase; Section 8.3.1 discusses planning and design costs; Section 8.3.2 discusses operation and maintenance costs; and M&E costs are discussed in Section 8.3.3.

ISRP 2009 Comment: The information provided seems adequate within our capacities to evaluate.

Council Requirement 14

Address the relation and link to the Council's artificial production policies and strategies.

YN: The existing and proposed coho restoration program follows HSRG guidelines, upon which the Council's Artificial Production Review and Evaluation process was based (see Section 4.3.2). The HSRG Recommendations/Observations for the Wenatchee and Methow coho program include:

This appears to be a well-thought-out reintroduction program that emphasizes developing locally adapted populations, first in the hatchery and then in the natural environment. Preliminarily, the program appears to be successful. However, planning to allow a high proportion of hatchery spawners in the second support phase provides no opportunity for the population to adapt to the local environment. A PNI greater than 0.5 is necessary for the natural environment to drive adaptation and increase fitness. (HSRG 2008)

These recommendations have been implemented by the MCCRCP.

ISRP 2009 Comment: While the HSRG appears to applaud the proposed effort we identify areas elsewhere where artificial production strategies, etc. need some attention.

Council Requirement 15

Provide a completed Hatchery and Genetic Management Plan (HGMP) for the target population(s).

YN: Appendix D.

ISRP 2009 Comment: The HGMP is provided as an appendix.

Council Requirement 16

Describe the harvest plan.

YN: In Section 5.4, tables show expected harvest rates for the various target tributaries.

ISRP 2009 Comment: This information is provided; however, modeling results are not provided that show how the levels of harvest will impact production (especially, natural production) at each phase.

Council Requirement 17

Provide a conceptual design of the proposed facilities, including an assessment of the availability and utility of existing facilities.

YN: Chapter 6 and Appendices B.1, B.2, C.1 – C.4.

ISRP 2009 Comment: The information provided is adequate.

1.4.2 Partial Step 2 Review

This section discusses where the Master Plan addresses the information needs identified in the Partial Step 2 review. As stated in the July 12, 2002 memorandum: “The results of Phase I will be used to address program areas pertaining to Master Planning as well as other aspects including National Environmental Policy Act documents. Before initiation of Phase II, this information will be used for a Step 2 review.” (M. Fritsch, NPPC, memorandum to Council, July 12, 2000). The following four categories of information (in boldface type) were requested for the next Council review of the Mid-Columbia coho project. The location of this information in the Master Plan follows each category (in regular typeface).

1) Provide a specific statement of goals in terms of numbers of coho adults and/or of smolt to adult return rates that are expected to constitute success in reestablishment or at least to render unnecessary further hatchery plants or supplementation with artificially reared coho.
Section 1.2.2, Chapters 4 and 5.

ISRP 2009: See comments above on biological objectives and text following the recommendation. The sponsor provides an abundance metric – 1500 natural-origin adults – as the level of production that would trigger a cessation of fish stocking. However, this metric is not sufficient. If the adult-to-adult replacement rate is below 1.0, a halt in fish production would mean an immediate reduction in abundance. No smolt-to-adult return rates were suggested. Expected SARs and adult-to-adult replacement rates are required for each phase.

2) Modify monitoring and evaluation procedures to clarify how time-limited objectives will be measured.
Chapter 7.

ISRP 2009: The monitoring chapter (7) provides a set of performance metrics and explains how they will be measured. Most of the metrics are appropriate for this reintroduction program. Importantly, there is use of the Entiat River as a reference location, comparison of the outcome of the project with reference conditions, and discussion of the role of ISEMP in these subbasins. A significant deficiency is that many of the performance metrics are not defined with specific performance standards, nor is there a time-frame for reaching the standard. One performance metric – adult-to-adult replacement rate continues to be incorrectly estimated. On page 156 the sponsor states that this rate will be estimated using the number of returning adults (including jacks). The appropriate measure, for both hatchery and natural components is female-to-female replacement rate. A more stringent metric would be egg-to-egg replacement rate. Including males, especially jacks, is not correct.

3) Discuss the possibility that further facilities may not be needed and the conditions that would enter into making that decision.
Chapter 6 and Appendices B.1, B.2, C.1 - C.4

ISRP 2009: Chapter 6 summarizes the facilities that the coho reintroduction program proposes to use. There is no summary of the type of program that could be implemented without any new facilities. In both the Wenatchee and Methow subbasins new facilities are proposed for adult capture, and acclimation. In the Wenatchee subbasin new facilities for rearing (Dryden Fish Hatchery, Eightmile Habitat, and Heath Ranch) are being proposed. It is not possible to evaluate what kind of program could be implemented without construction of new facilities.

4) Respond to the general and specific comments relating to:

- **harvest rates as limiting factors** (Chapter 5, AHA calculations; Section 7.1.10)
- **the monitoring and evaluation plan** (Chapter 7)
- **issues (i.e. ecological interactions, quality of rearing habitat and case studies of successes in similar endeavors).**
 - Ecological interactions: Sections 3.2, 7.2.

- Quality of rearing habitat: Section 2.4, Chapter 5.
- Case studies: Section 4.5

ISRP 2009: A summary of evaluations of coho introduction effects on non-target taxa (primarily spring Chinook and steelhead) is provided. The sponsor concludes that investigations in the Wenatchee and Yakima Rivers have not detected an important effect. At this point the critical consideration is that within subbasin monitoring of these other salmonid taxa are sufficient to detect a deteriorated status of these species in time to modify the program. There remains uncertainty in the fisheries community whether routine monitoring is sufficiently robust to detect effects on non-target taxa. No framework is provided to guide alterations in fish production as a consequence of detecting deterioration in the status of non-target taxa.

The status of rearing habitat is summarized from the subbasin plan. It would be helpful to provide empirical estimates of abundance and productivity of coho that have been reintroduced into some habitats as part of the feasibility studies. Evaluating the effective status of the habitat is a critical element of the monitoring plan. Effective status refers to the productivity of fish spawning naturally, which is a function of both the genotype of the fish and the functional status of the habitat. Both are required.

Case studies are briefly presented. None, however, are comparable to the circumstances that are extant in the middle Columbia River subbasins. Similar reintroduction efforts in the Umatilla, Yakima, and Clearwater subbasins are not summarized.