



Independent Scientific Review Panel

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Review of the March 2008 Yakama Nation's Klickitat Anadromous Fisheries Master Plan

Step One of the Three-Step Review
(YKFP-Klickitat Design and Construction, Project #1988-115-35)



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June 17, 2008
ISRP 2008-6

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Klickitat Anadromous Fisheries Master Plan**

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ISRP Review of the Yakama Nation's March 2008 Klickitat Anadromous Fisheries Master Plan

Background

Per the Northwest Power and Conservation Council's April 2008 request, the Independent Scientific Review Panel (ISRP) reviewed the Yakama Nation's Klickitat Anadromous Fisheries Master Plan, March 2008 revision. The Yakama's revised Master Plan is intended to address the Council's Three-Step Review Process (Council document 2001-29¹) and past ISRP review concerns.

This is the latest in an iterative review process for this project that began in the 2000 Provincial review, when the ISRP reviewed the Klickitat Fisheries program in depth along with the Yakima subbasin fisheries program (ISRP 2000-9; December 1, 2000²). In that review, the ISRP raised numerous issues with the Klickitat program that were partially addressed in an initial Step 1 Review (ISRP 2005-7; February 19, 2005³). Specifically, some proposed actions seemed positive and in line with previous ISRP concerns and suggestions, such as the marking of hatchery-origin fish, reductions in coho releases, and use of wild natal broodstock for steelhead components of the Master Plan. However, the ISRP also found that the initial Master Plan outlined significant changes in terms of policy, biology, and cost from previous Klickitat fisheries program proposals. Specifically, the ISRP found that many components of the Master Plan needed further consideration and development to meet the ISRP standards of scientific soundness and consistency with the Fish and Wildlife Program's Scientific Principles. The ISRP described seven primary concerns with the Master Plan.

In an August 25, 2005 letter to the Council, the Yakama Nation responded to each of the seven ISRP concerns. The ISRP reviewed these responses and recommended that the Klickitat Subbasin Anadromous Fishery Master Plan remain in the Step 1 stage of the Three Step process until adequate scientific detail and biological justification for the proposed activities are given, including responses to many of the previously identified technical shortcomings of the Master Plan (see ISRP 2005-16⁴). In sum, the ISRP concluded that foundation assessments for the changes to artificial production in the Klickitat subbasin were not yet completed. Consequently, the ISRP recommended that a revised and complete (i.e., stand-alone) Master Plan be developed prior to moving to a Step-2 review.

Based on that ISRP 2005 final review and follow-up discussions with the Yakama Nation, Bonneville Power Administration and Council staffs determined that the Master

¹ www.nwcouncil.org/library/2001/2001-29.htm; see also www.nwcouncil.org/library/2006/2006-21.htm

² Final Review of Fiscal Year 2001 Project Proposals for the Columbia River Gorge and Inter-Mountain Provinces: www.nwcouncil.org/library/isrp/isrp2000-9.htm

³ www.nwcouncil.org/library/isrp/isrp2005-7.htm

⁴ www.nwcouncil.org/library/isrp/isrp2005-16.htm

Plan would need to be revised to address the Step 1 review elements. In a March 15, 2006 memo, the Council confirmed that this understanding recognized that the revised Master Plan should adequately address the ISRP concerns. Therefore, our review focuses on the Yakama Nation's March 2008 Klickitat Anadromous Fisheries Master Plan and its response to the Step 1 review elements (Section V. Review Elements, A and B; also see pages v, and Chapter 3 pages 17 - 28 of the Master Plan for cross-references to the step questions).

2008 Review Summary and Recommendation

Recommendation: Meets Scientific Review Criteria (Qualified).

The Yakama Nation's March 2008 Klickitat Anadromous Fisheries Master Plan is a well-balanced, relatively thorough plan. It includes a large appendix that covers the steps in the Three-Step Review process and explains the Plan's relationship to the Council's Scientific Principles, as required.

The Klickitat Anadromous Fisheries Master Plan meets ISRP scientific review criteria and Three-step review criteria with a qualification that elements of the steelhead and spring Chinook natural and artificial production plans need a more detailed explanation. These should include formal decision analysis and consequence tables (i.e., decision trees) to evaluate the program and identify the performance thresholds that would trigger termination. These are needed for both the spring Chinook and steelhead components. These details need to be addressed in the Step review process and can likely be developed for Step 2 rather than in another Step 1 iteration.

Careful thought and planning was evident in the Klickitat Master Plan, which included avenues for adaptive management. The 2008 Master Plan reflects some important advances (compared to the previous drafts reviewed by the ISRP) in thinking from traditional enhancement projects. Goals and targets were presented but require further elaboration and justification in Step 2; for example, it is not clear how the escapement goals, harvest rates, and numbers were derived. Decision management tools would aid that process, along with Consequence Tables to guide management actions and deal with variability and uncertainties in measured and monitored results and actions, including regime shifts and climate change.

One progressive attribute in the Plan is the inclusion of a general suite of habitat improvement strategies for each target species of interest at a variety of scales and levels of complexity (i.e., from headwaters to main channels, from in-channel to floodplain and riparian areas, and from flows, temperatures, and other physical parameters, and so on). Moreover, the Plan includes some thought and apparent analysis (which is not specifically presented, but should be) about the specific habitat improvement activities planned in the Subbasin and within specific stream reaches.

Another progressive attribute is the concession that hatchery supplementation carries some risks that warrant attention as well as the tacit concession that supplementation may fail to achieve its objectives to increase natural productivity. Other conceptual improvements in the Plan include the decisions to delay potential releases of steelhead above Castile Falls for nine years, thus allowing natural colonization a chance to succeed.

Another positive attribute of the Plan is the decision to move away from out-of-basin stocks and toward more local stocks as hatchery broodstock. This is crucial for aboriginal species or stocks (such as native steelhead and spring Chinook) and may also benefit non-native, but desirable introduced species (such as coho and fall Chinook) that are capable of straying to nearby systems. The sponsors have also indicated an interest in creative “incentives” to reduce the take of native steelhead in tribal catch via a 2-for-1 trade of hatchery fish for each native steelhead released unharmed.

Treatment of Major Previous ISRP Review Recommendations

1. Need for a Watershed Assessment

Past reviews: In a 2000 review of the Klickitat Anadromous Fisheries Master Plan, the ISRP identified the need for a watershed assessment to inform development of the Master Plan. In 2005, the ISRP recommended that the Master Plan be revised to describe goals for total fish production from all sources and to partition that production into hatchery and natural components that are consistent with the goals in the subbasin plan, and consistent with habitat condition and capacity developed in the Subbasin Plan.

Current review: The 2008 Klickitat Anadromous Fisheries Master Plan includes a very general watershed assessment that incorporates improvements to the focal species status from opening habitat isolated by Castile Falls and from habitat improvement actions. There is a brief consideration of abundance, productivity, and capacity for the naturally reproducing, native focal species (steelhead and spring Chinook). The information, which is from an Ecosystem Diagnosis and Treatment (EDT) analysis, is provided in appendix C; however, there is no partitioning of the production into sub-units within the Klickitat River subbasin.

Abundance and productivity goals identified in the body of the plan are generally consistent with Appendix C. Appendix C references a (NOAA-Fisheries 2007) Klickitat Salmon Recovery Plan that is not provided or cited, and we are unable to locate this plan via the web. The Master Plan (Chapter 6) would be improved by incorporating the EDT analysis into the respective sections on steelhead and spring Chinook.

Estimates of increased productivity and capacity were based on an EDT analysis yet appear overly optimistic (i.e., up to an 85% increase for steelhead, 124% for spring Chinook). There is generally lack of support for such increases here and in the scientific literature, given the actions proposed, which would require several years for implementation and response. Therefore, some further justification and evidence from

data collection in this watershed (i.e., increased adult return to improved reaches, smolt yield or at least juvenile abundance) should be indicated. Table 6-2 summarizes habitat actions taken over the last ten years. An important question that would be critical to answer is “how many additional wild spawning fish can be attributed to these efforts?” with some description of methods to estimate this increased production.

2. Need for Scientific Justification

Past reviews: Previously, the ISRP noted that there was a lack of sound scientific evidence for the actions proposed, which needed to include sufficient detail in the monitoring assessment to provide adequate review. An EDT or similar analysis was needed to provide information on capacity production for salmonids.

Current review: In general, the 2008 Klickitat Anadromous Fisheries Master Plan provides adequate justification for their proposed actions. We provide detailed comments below under Point 4, Justification for Proposed Artificial Production Activities.

3. Linkage Needed to Council’s FWP Scientific Principles

Past reviews: In previous reviews, the ISRP recommended that the Master Plan needed to be explicitly linked to the Council’s Scientific Principles in the Fish and Wildlife Program (FWP).

Current review: The 2008 Klickitat Anadromous Fisheries Master Plan adequately addresses the Council’s Scientific Principles.

4. Justification Needed for Proposed Artificial Production Activities

Past reviews: In previous reviews (2000 and 2005), the ISRP expressed concern that the restoration of endemic natural populations within the Klickitat subbasin was put at risk by the supplementation activities proposed in the Master Plan. The distribution, diversity, abundance, status, and productivity of the wild populations were not well described; thus, judgment on the role, scale, impact, and need for supplementation remained deficient. The ISRP recommended that the Master Plan be revised to include a comprehensive evaluation of all the artificial and natural production in the subbasin that is transparent and reproducible and provides scientifically defensible alternatives for consideration by decision-makers.

The limited information on escapement and capacity levels presented in the 2000 and 2005 Master Plans suggested that the number of spring Chinook and summer steelhead adults might already fully seed available habitat to capacity. Hatchery production to supplement this production appeared unwarranted, and directed primarily at harvest. The ISRP recommended that if harvest was the key objective, as stated by the planners, then a

different strategy of hatchery production should be analyzed and presented in the Master Plan – one where releases are targeted at harvest, and interference with wild production is reduced, consistent with artificial production and subbasin assessment protocols, and scientific principles agreed within the FWP’s basinwide provisions. The ISRP further recommended that the Master Plan should be revised to provide an assessment of the coho and fall-run Chinook programs. The assessment should include a summary of the Artificial Production Review and Evaluation (APRE) findings on the programs and perform an assessment of whether isolating this production in the lower river could lead to improvement in steelhead and spring-run Chinook populations.

Current review: The 2008 Klickitat Anadromous Fisheries Master Plan adequately addresses most of the ISRP’s concerns described above. Comments are provided individually on each of the four artificial production initiatives in the Master Plan – steelhead, spring Chinook, coho, and fall Chinook.

Steelhead – Elimination of the scatter planting of Skamania stock summer steelhead from the Washougal River hatchery is a positive element of the Master Plan. Stocking an out-of-subbasin, multi-generation hatchery steelhead stock is inconsistent with the Fish and Wildlife Program and the Artificial Production Review (APR) principles, as well as an emerging scientific consensus from the region (Hatchery Scientific Review Group, Independent Scientific Review Board, etc). The 2008 Master Plan proposes to replace out-of-basin production with an integrated hatchery program using local broodstock to provide harvest and possibly begin a supplementation program above Castile Fall, if after nine years, natural colonization of steelhead above Castile Falls has not reached a benchmark of 150 adults.

The Plan is not clear as to why nine years and 150 steelhead adults were chosen as the threshold numbers for initiation of steelhead supplementation activities and outplanting above Castile Falls, but this should be justified. There is not sufficient consideration of variable smolt-to-adult return rates (SARs) and regime shifts in any component of the Plan, nor is there detailed recruitment analyses of the available data, which is admittedly weak and based on redd counts. A recruitment analysis that incorporates variability in freshwater (including potential improvements) and ocean productivity and capacity is required to estimate potential allowable harvest on the wild stock. This should be developed in Step 2.

The proposed use of both resident rainbow trout and anadromous steelhead broodstock if required above Castile Falls is new and somewhat unorthodox. After more thorough development and review of this option, further research and pilot testing is recommended prior to full implementation. Specifically, if wild fish cannot re-colonize or establish a viable population above Castile Falls, given access, why should we expect hatchery fish to perform any better or in some way different from a “put and take” mode? Are summer-run steelhead currently passing Castile Falls? Is so, the population should increase naturally as a consequence, unless there is some other limitation. None was identified.

A distinction in the biology, recruitment relationships, and management plans for summer-run and winter-run steelhead is necessary. Radio-tagging of returning spawners may assist in delineating spawning and rearing areas for both. Currently, the Plan assumes overlap and no distinction between summer-run and winter-run steelhead. These should be treated as two distinct populations, with sub-population structure within each.

The Master Plan considers three alternatives and makes a general statement regarding whether each individual alternative meets the plan objectives of improving the status of the native focal species and providing harvest. More detail is provided in Appendix C – EDT and All-“H” Analyzer (AHA) modeling of the system. Appendix C does not appear to have actually modeled harvest potential, and natural abundance, productivity, and such under a scenario without artificial production. This should be provided as a basic reference or comparative standard. We also recommend that the modeling comparison of the three alternatives be put in a side-by-side tabular form in Chapter 6.

The overall philosophy of the integrated harvest program for steelhead is consistent with contemporary scientific understanding of best practices for artificial production. However, the “cost” of these programs to the natural population remains unknown, and this should be acknowledged in the plan. Monitoring data should be developed to help reduce this uncertainty. Specific detail of the steelhead harvest program needs to be included in Step 2, particularly information on how fast they intend to develop the program. On page 57, the Plan identifies that “*A 6 to 7 year feasibility study will be conducted as part of the Master Plan to investigate broodstock collection and juvenile rearing strategies, expected smolt to adult survival rates, and risks with current steelhead hatchery practices.*” The potential harvest benefits from the program are contingent upon the steelhead SAR, which is highly variable and changes dramatically with ocean regimes. This feasibility study needs to be presented in detail in Step 2, and final sizing of the program needs to be based on the outcome from the feasibility study. Then a clear outline of the program needs to be established. As it now stands, there is ambiguity in the outline. For example, while there is a goal of having a Proportion of Natural Influence (PNI) of 0.9, with a minimum of 0.67, this can be achieved using a variety of combinations of proportions of hatchery-origin fish that spawn naturally (pHOS) and hatchery broodstock derived from natural-origin fish (pNOB). The choices of these operational guidelines should be provided. There are also some basic scale issues that surround any PNI guidelines. Specifically, if the return estimates were to grow to a large run, even a 0.9 PNI would beg the question as to why the program should continue (i.e., it succeeded at “supplementing” the wild run). While our next point gets at a low end of the scale, there are some high end of the scale considerations as well.

Also, on page 61, there is a statement “*Adults returns from the juvenile releases will be used as broodstock only if wild run size back to the Subbasin is less than 320 fish. This action ensures that hatchery broodstock collection does not exceed 25% of the total wild run.*” The specific program – breeding make-up and smolt production level – for different natural run sizes should be established as part of the plan. Finally, the cost of broodstock mining to the natural population needs to be modeled as part of the Master Plan assessment. The Master Plan indicates that the abundance and productivity of the

natural population is uncertain. Collecting vital parameters for the natural population should be part of the feasibility studies and incorporated in the monitoring program. The primary concern is that the steelhead population in the Klickitat River is a member of an Endangered Species Act (ESA) listed Mid-Columbia ESU. The harvest component is going to subtract breeding adults from this population for the single purpose of creating a return of adults for harvest. This possibly raises issues under ESA management, but most certainly principles in the Fish and Wildlife Program and Artificial Production Review require that this mining not increase the extinction risk for this independent population.

Spring Chinook. Conversion of the current segregated spring Chinook hatchery production to an integrated program with a PNI of 0.67 is consistent with current best practices. On this basis this conversion meets scientific review criteria. This conclusion is qualified because more detail on the conversion is needed. The timeframe for the transition period is not provided but needs to be.

The spring Chinook stock assessment is difficult to reconcile with the data provided, and the linkage between the stock assessment and design of the artificial production program and harvest is not transparent. Table 6-9 on page 66 provides the number of natural spawners each year from 1984 through 2000, and reports the subsequent number of adult recruits from this spawning. An average of 332 adults returned in each brood year, produced an average of 801 adult progeny for a recruits/spawner of 3.5. A graphical (confounded) spawner-recruitment analysis based on the data of Table 6-9 indicates high variability, with possible indication of regimes of production (e.g., data from 1984 to 1989 versus later), and possible “outliers” from La Niña events or other. Some discussion and treatment of this variability is required and should form part of the decision analysis and consequence for management actions.

The table and text do not identify the fate of the difference between these averages. Were these fish harvested? Further, it is not clear how unmarked hatchery fish were dealt with in the assessment. The beginning paragraph on page 67 states that most hatchery fish were not marked, yet only a small proportion of the natural fish were believed to be of hatchery origin. What is the basis of this conclusion? The basis for the estimate of harvest in the mainstem Columbia River is provided in a footnote, but the counts and methods for the terminal tribal and sport fishery are not given. In the Plan and Appendix C productivity for spring Chinook is estimated as 6. How this was calculated from what data is not clear, particularly because abundance and recruits per spawner are confounded with hatchery production.

In the AHA analysis, the spring Chinook program is supposed to have two release components –a release of 200,000 juveniles, and another of 600,000. However, there is no explanation of two releases. Page 74 mentions only an 800,000 fish release. At this point in the assessment/plan, it would be beneficial to incorporate the AHA analysis to identify the broodstock needs, the hatchery production, expected harvest, and such. On page 74, not enough information is provided to understand why 800,000 fish need be released to yield an anticipated 4,000 fish harvest. As an example, on page 76, the plan identifies that the hatchery program must have a recruits/spawner of 9.5 to be successful.

Information is needed on how the release sizes, recruits-per-spawner, and harvest was determined. In addition, more information is required on plans to balance broodstock collection, hatchery smolt yield, and anticipated SAR with the harvest and stock conservation. This should be completed in Step 2.

Coho – The Plan anticipates reduction in coho salmon releases in the Klickitat River from 3.7 to 1.0 million smolts, and conversion from annual importation of eggs to production of eggs using coho that return to the subbasin. This alteration improves on the current artificial production practices and meets scientific review criteria. Three phases of development for the reformed production program are identified, with goals and decisions associated with each. This text could be developed into a formal decision diagram that would be helpful to show the three phases and to better anticipate outcomes and management actions. This type of consideration of alternatives should serve as an example for the steelhead and spring Chinook programs.

Reducing the number of coho smolts released and moving the release location to a point lower in the subbasin is hoped to have a beneficial effect on spring Chinook and steelhead production. The sponsors note that they will explore opportunities to move the coho program out of the Klickitat subbasin to a new location that would provide and meet Tribal harvest goals. If this is the case or if the anticipated rebuilding in the steelhead or spring Chinook programs does not occur, the coho program in the Klickitat subbasin proper might be terminated.

Fall Chinook – The Master Plan anticipates transitioning to egg take within the Klickitat River subbasin, rather than importing eggs from Priest Rapids hatchery. The production level of 4 million underyearling smolts will remain, but 2 million individuals will be reared and released at Wahkiacus hatchery. This is intended to reduce deleterious interactions between non-native fall Chinook and native spring Chinook and steelhead.

The conversion from egg importation to development of a local broodstock and program modification in the hope of reducing predation and competition meet scientific review criteria and are consistent with best practices.

Even with the reductions in coho releases and relocation of fall Chinook releases, the ISRP believes that spring Chinook and steelhead can still be affected negatively from the large-scale fall Chinook and coho programs that provide harvest but do not provide conservation benefit to the native species. Consequently, the Master Plan does not provide scientific justification for the fall Chinook and coho hatchery programs, rather the Master Plan justifies these programs based on US v. Oregon obligations.

5. Linkage Needed Between Production Activities and Habitat Improvements

Past reviews: In previous reviews (ISRP Report 2000-9; ISRP Report 2004-13), the ISRP has commented on the need to link habitat restoration projects in the Klickitat subbasin to proposed artificial production activities. The subbasin Assessment (pp. 130-

131) described pervasive long-term negative effects on habitat and riparian condition in the upper river section from over 60 years of intensive grazing, as well as legacy effects of logging and floodplain road building. The ISRP recommended that the revised Master Plan should provide details on the location, sequencing, and timeframe for habitat improvements throughout the basin, and particularly in the upper basin above Castile Falls. This would integrate the production program and habitat program.

Current review: The 2008 Klickitat Anadromous Fisheries Master Plan contains substantial information on habitat actions taken and proposed. There is a general table (Table 6-2) that lists 28 habitat projects that have occurred over the last ten years that should benefit steelhead and spring Chinook production, as well as Table 6-13 (Relationship between spring Chinook habitat strategies and key geographic areas) and Table 6-14 (Habitat limiting factors for Klickitat spring Chinook by geographic area). Appendix A also contains a comprehensive table of proposed habitat actions that include timeframe, costs, and anticipated benefits (in general terms, rather than in measurable metrics).

What is clear from the 2008 Klickitat Anadromous Fisheries Master Plan is that substantial investment in habitat restoration is planned or is underway. However, the Master Plan lacks any meaningful summary and synthesis of what ecological benefits have occurred from these actions thus far as well as descriptions of what metrics and monitoring and evaluation protocols will be used to assess the efficacy of these multiple projects. This information should be included in the Master Plan. It needs to be included in the Step-2 submittal.

6. Monitoring and Evaluation

Past reviews: The ISRP was quite critical of the monitoring and evaluation plan in early versions of the Klickitat Step-1 plan. The monitoring and evaluation component of the plan was weak and severely lacking in detail. Details on risk assessments, marking strategies, stock assessment methods, and related issues were lacking. Much of the detail requested by the ISRP was provided in Appendix G of the 2005 Klickitat Subbasin Anadromous Fishery Master Plan; however, the specific details of the protocols remained missing.

Current review: The 2008 Klickitat Anadromous Fisheries Master Plan generally addresses the ISRP's previous concerns adequately. The Plan includes a monitoring chapter that identifies that survival of hatchery fish, contribution to fisheries, demographic analysis, and pedigree analysis will be conducted. As general guidance, the monitoring section identifies the major data types that need to be collected. It is not possible to confirm that tagging rates and tag recovery rates will be sufficient for statistical validation of important vital parameters. This should be elaborated in Step 2. It is not clear that pedigree analysis to determine the relative reproductive success of hatchery and natural-origin salmon and/or steelhead is required from this study. Additional justification would be needed to make that determination. These data would

be interesting but perhaps not essential to evaluating the Klickitat program as envisioned in the Master Plan.

A predation index (page 105, Section 7.1.3) is planned to evaluate the extent of predation by hatchery releases from the Klickitat on native spring Chinook and steelhead. This information could be useful, but direct predation is not the only source of interspecific interaction that could influence the abundance and productivity of steelhead and spring Chinook. A more robust consideration of the impacts is needed.

7. Steelhead Supplementation

Past reviews: Previous ISRP reviews focused on the positive step of discontinuing the use of non-native Skamania stock in steelhead artificial production activities and the need to use natural-origin Klickitat steelhead as hatchery broodstock. ISRP concerns in the 2005 review sequence focused on the proposed 50% broodstock mining rate for natural origin steelhead. The ISRP thought this rate too high and recommended that it not exceed 25%. Finally, the ISRP recommended that the steelhead supplementation program undergo a stock assessment similar to that completed for the spring Chinook assessment (2005 Master Plan, Attachment A).

Current review: The 2008 Klickitat Anadromous Fisheries Master Plan anticipates monitoring natural colonization and production of steelhead above Castile Falls for a period of nine years before beginning any supplementation program. We compliment the sponsors on this positive development. The ISRP recommends that proceeding to supplementation should be reviewed by the ISRP before implementation, and that the period of supplementation, if implemented, should be specified in this plan. Conditions for terminating supplementation should also be outlined in a decision tree as part of the Master Plan. This should be developed in Step 2.

Other Specific Issues to be Addressed in the Step-2 Submittal

1. Rationale and justification for the harvest targets/objectives

What are the specific criteria or policies on which the harvest objectives are based? Also, if recruitment and productivity for the native groups increases sufficiently to the point that permits sustainable harvest, then will the program reduce focus on the non-native component (coho and fall Chinook)?

2. Incentive for release of wild steelhead

Rewarding Tribal fishers who release native steelhead is a potentially creative solution to fishing mortality. Ultimately, however, there is no guarantee that it will provide the appropriate incentive to release the fish unharmed and not in fact, lead to some set of unintended consequences. As such, this is an experimental approach that begs for monitoring of compliance rates, and intended and unintended consequences.

3. Postponing steelhead supplementation for nine years

The decision to postpone releases of hatchery-produced steelhead above Castile Falls for nine years is to allow a period during which natural colonization could occur, and if adult escapement reaches 150 wild adults, obviate the need for the steelhead supplementation program. Alternatives beyond what the Master Plan proposes should also be considered. For example, should the decision be made to release produced fish there may be alternatives to simply releasing juveniles. Specifically, there may be opportunities to transport mature adults above Castile Falls that could nest and spawn. Similarly, the transfer of eggs could occur to permit developing young the full set of imprinting cues. Ultimately, there are few criteria (specifics) that will guide decisions. How many parent sets need to colonize to warrant not using a production strategy? These questions tie back to the need for a decision tree with specific decision criteria.

4. Crossing anadromous steelhead and resident rainbow trout

The strategy of crossing and intercrossing anadromous steelhead and resident rainbow trout needs to be treated as a limited-scope experiment with sufficient controls and monitored results that feed into a criteria-based decision tree.

5. Monitoring metrics

The sponsors should be encouraged to report “averages” for recruitment, PNI’s, R/Ss, etc. as running 3- or 5-year averages to demonstrate trends. This will account for variable ages to maturity, iteroparity, and other life-history variations that the various species exhibit.

6. Acclimation sites and methods

The Master Plan includes installation of moveable acclimation raceways. In other master plans, we have supported volitional released acclimation ponds for final rearing. This is the first plan to propose acclimation raceways. Much of the world is moving away from the industrially efficient raceway designs to more “natural-like” settings of acclimation ponds and Natural Rearing Enhancement System (NATUREs) designs.

7. Fish Disease

Although there is a Hatchery Genetic Management Plan for steelhead, there is little mention of the need for disease biosecurity. The steelhead are part of the threatened Mid-Columbia steelhead ESU, and acute or chronic disease issues could devastate the hatchery populations and threaten exposure to recipient wild fish.

8. Klickitat Basin Recovery Plan

There is occasional reference to the Klickitat Basin Recovery Plan, but no specifics or references are provided. Sponsors should provide a summary of the major points of this Plan (if it is sufficiently developed) along with a link or way to access. There needs to be a way to ensure the plans are technically rigorous and complementary.

Three Step Review Questions

The Council has emphasized that an important part of the Three Step Review Process includes an ISRP review of the project sponsors responses to the technical elements listed below. The Council specified that the ISRP apply these elements or similar standards as a reflection of the current state of the science. The ISRP addresses the sponsor's responses to these elements in detail in the review summary above, because the ISRP felt many of issues applied to several technical elements and would be best presented with a summary approach.

A. All Projects

Does the Klickitat Subbasin Anadromous Fishery Master Plan:

- 1) address the relationship and consistencies of the proposed project to the eight scientific principles (see 2000 Columbia River Basin Fish and Wildlife Program, Basinwide Provisions, Section B.2) (Step 1)?

The eight Scientific Principles:

1. The abundance, productivity, and diversity of organisms are integrally linked to the characteristics of their ecosystem.
2. Ecosystems are dynamic, resilient and develop over time.
3. Biological systems operate on various spatial and time scales that can be organized hierarchically.
4. Habitats develop, and are maintained, by physical and biological processes.
5. Species play key roles in developing and maintaining ecological conditions.
6. Biological diversity allows ecosystems to persist in the face of environmental variation.
7. Ecological management is adaptive and experimental.
8. Ecosystem function, habitat structure and biological performance are affected by human actions.

General linkage between the goals and strategies of the 2008 Klickitat Anadromous Fisheries Master Plan to the Council's eight scientific principles is established in Section 3, pages 17 – 24. The descriptions are generally clear and adequate.

- 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 (Step 1)?

There is a statement on page 25 that the 2008 Klickitat Anadromous Fisheries Master Plan is consistent with the Klickitat Subbasin Plan and the draft Klickitat Subbasin Recovery Plan for the Middle Columbia River. The information provided is not sufficient to establish consistency of specific biological and habitat objectives among the various plans.

- 3) define the biological objectives (see 2000 Columbia River Basin Fish and Wildlife Program, Basinwide Provisions, Section C.2 (1) and (2), and Technical Appendix) with measurable attributes that define progress, provide accountability and track changes through time associated with this project (Step 1)?

Biological objectives in terms of harvest and natural and hatchery production are provided in the 2008 Klickitat Anadromous Fisheries Master Plan. The Master Plan is clearly designed with harvest in mind, but significant hatchery program modifications are intended to improve the status of natural spring Chinook and steelhead.

- 4) define expected project benefits (e.g., preservation of biological diversity, fishery enhancement, water optimization, and habitat protection) (Step 1)?

The 2008 Klickitat Anadromous Fisheries Master Plan is intended to maintain harvest with reduced impact to natural populations. Expected harvest is provided, but quantifiable benefits to native spring Chinook and steelhead from habitat improvement and reduced interspecific interaction is less clear. There is an EDT analysis that provides estimates of each of the Viable Salmonid Population (VSP) parameters following habitat enhancement and improving passage at Castile Falls. The basis for that projection is not well established.

- 5) describe the implementation strategies (see 2000 Columbia River Basin Fish and Wildlife Program, Basinwide Provisions, Section D.2) as they relate to the current conditions and restoration potential of the habitat for the target species and the life stage of interest (Step 1)?

The implementation strategies summarized in Chapter 6 of the 2008 Klickitat Anadromous Fisheries Master Plan are general in nature. The Step-2 submittal needs to provide more detail on (1) the specific elements needed to appreciate the transition from the current to modified production programs and (2) the feasibility investigations.

- 6) address the relationship to the habitat strategies (see 2000 Columbia River Basin Fish and Wildlife Program, Basinwide Provisions, Section D.3) (Step 1)?

The 2008 Klickitat Anadromous Fisheries Master Plan adequately addresses the Fish and Wildlife Program's habitat strategies.

- 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 (Step 1)?

In the 2008 Klickitat Anadromous Fisheries Master Plan, alternatives are considered and the presentation is adequate.

- 8) provide the historical and current status of anadromous and resident fish and wildlife in the subbasin most relevant to the proposed project (Step 1)?

The current status of spring Chinook, steelhead, coho, and fall Chinook are summarized in the 2008 Master Plan along with existing production and harvest activities. The methods used to estimate derived data are not always clear. If the estimates accurately reflect the state-of-nature, then the presentation is sufficient.

Historical discussions about the status of various species in the Master Plan refer only to recent history (the past 20+ years) and only to the history as it relates to artificial production activities, though counts of natural spawners are included. No discussion occurs of estimates of the Klickitat subbasin's natural production capacity for salmonids before human development. Such a discussion would, in a general way, provide insight into how much capacity has been lost due to activities within (and without) the subbasin, as well as provide some sense of what capacity might be regained from the proposed habitat and passage improvements in the Master Plan.

- 9) describe current and planned management of anadromous and resident fish and wildlife in the subbasin (Step 1)?

The 2008 Klickitat Anadromous Fisheries Master Plan does good job of describing current and planned management of anadromous and resident fish in the subbasin

- 10) demonstrate consistency of the proposed project with NOAA Fisheries recovery plans and other fishery management and watershed plans (Step 1)?

Hatchery Genetic Management Plans (HGMPs) and AHA analysis and the assumptions of harvest and production for the modeling are provided in the appendices of the 2008 Klickitat Anadromous Fisheries Master Plan. A NOAA-Fisheries Klickitat recovery plan is often cited, but does not seem to be available. This is a deficiency that can be addressed in Step-2.

- 11) describe the status of the comprehensive environmental assessment (Step 1 and 2)?

Review of this element is usually associated with the Step-2 submittal component of the Three Step Review Process. This is noted in the Step 1 Master Plan on page 27.

12) describe the monitoring and evaluation plan (see 2000 Columbia River Basin Fish and Wildlife Program, Basinwide Provisions, Section D.9) (Step 1, 2 and 3)?

The 2008 Klickitat Anadromous Fisheries Master Plan has a generally adequate conceptual monitoring plan. It needs to be more fully developed in the Step-2 submittal to address the uncertainties in the production plan identified in the discussion above.

13) describe and provide specific items and cost estimates for ten fiscal years for planning and design (i.e. conceptual, preliminary and final), construction, operation and maintenance and monitoring and evaluation (Step 1, 2 and 3)?

This element is adequately addressed in the 2008 Klickitat Anadromous Fisheries Master Plan.

B. Artificial Production Initiatives

Does the Klickitat Subbasin Anadromous Fishery Master Plan:

1) address the relation and link to the artificial production policies and strategies (see 2000 Columbia River Basin Fish and Wildlife Program, Basinwide Provisions, Section D.4 and Technical Appendix) (Step 1)?

Primary strategy: Artificial production can be used, under the proper conditions, to 1) complement habitat improvements by supplementing native fish populations up to the sustainable carrying capacity of the habitat with fish that are as similar as possible, in genetics and behavior, to wild native fish, and 2) replace lost salmon and steelhead in blocked areas.

The APR standards:

- The purpose and use of artificial production must be considered in the context of the ecological environment in which it will be used. (See A.1 and A.6)
- Artificial production must be implemented within an experimental, adaptive management design that includes an aggressive program to evaluate the risks and benefits and address scientific uncertainties. (See A.12)
- Hatcheries must be operated in a manner that recognizes that they exist within ecological systems whose behavior is constrained by larger-scale basin, regional and global factors. (See A.1)
- A diversity of life history types and species needs to be maintained in order to sustain a system of populations in the face of environmental variation. (See A.1)
- *Naturally selected populations should provide the model for successful artificially reared populations, in regard to population structure, mating protocol, behavior, growth, morphology, nutrient cycling, and other biological characteristics.*
- The entities authorizing or managing an artificial production facility or program should explicitly identify whether the artificial propagation product is intended for the purpose

of augmentation, mitigation, restoration, preservation, research, or some combination of those purposes for each population of fish addressed. (See A.3)

- Decisions on the use of the artificial production tool need to be made in the context of deciding on fish and wildlife goals, objectives and strategies at the subbasin and province levels. (See A.2)
- *Appropriate risk management needs to be maintained in using the tool of artificial propagation.*
- Production for harvest is a legitimate management objective of artificial production, but to minimize adverse impacts on natural populations associated with harvest management of artificially produced populations, harvest rates and practices must be dictated by the requirements to sustain naturally spawning populations. (see B.3)
- Federal and other legal mandates and obligations for fish protection, mitigation, and enhancement must be fully addressed. (See A.10)

See the 2000 FWP for details on Wild Salmon Refuges, Harvest and Restoration Hatcheries, and Experimental Approach.

The 2008 Klickitat Anadromous Fisheries Master Plan, including the HGMP (Appendix B), did not appear to directly address the FWP's APR standards, or the more recent APRE; however, the 2008 Master Plan relied heavily on the hatchery reform principles and recommendations from the HSRG (Hatchery Scientific Review Group 2004).

2) provide a completed Hatchery and Genetic Management Plan (HGMP) for the target population (s) (Step 1)?

Hatchery and Genetic Management Plans (HGMPs) are provided in Appendix B of the 2008 Klickitat Anadromous Fisheries Master Plan.

3) describe the harvest plan (see 2000 Columbia River Basin Fish and Wildlife Program, Basinwide Provisions, Section D.5) (Step 1)?

A harvest plan is presented for each species in the 2008 Klickitat Anadromous Fisheries Master Plan. However, the impact of the harvest on the status of the natural populations, from direct harvest, by-catch/incidental catch, and from interactions with artificially produced fish is not considered in detail.

4) provide a conceptual design of the proposed facilities, including an assessment of the availability and utility of existing facilities (Step 1)?

This is provided adequately in the 2008 Klickitat Anadromous Fisheries Master Plan.