Independent Scientific Review Panel

for the Northwest Power & Conservation Council; 851 SW 6th Avenue, Suite 1100; Portland, Oregon 97204

Preliminary Step-Two Review of the

Chief Joseph Dam Hatchery Program Master Plan

Project # 2003-023-00

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

Richard Alldredge
Robert Bilby
Peter Bisson
John Epifanio
Linda Hardesty
Charles Henny
Colin Levings
Eric Loudenslager
Kate Myers
Tom Poe
Bruce Ward

ISRP 2008-2
March 7, 2008

Preliminary Step-Two Review of the Chief Joseph Dam Hatchery Program Master Plan

Contents

Preliminary Step-Two Review of the Chief Joseph Dam Hatchery Program

Background

At the Northwest Power and Conservation Council's November 2007 request, the ISRP reviewed the Confederated Tribes of the Colville Reservation (Colville Tribes) Step-Two submittals for the Chief Joseph Dam Hatchery Program, Project # 2003-023-00. This is a Step-Two review in the Council's Three-Step Review Process and is the fourth time over the past six years that the ISRP has considered this project either through the project selection or step review process.

This project was originally formed from two proposals submitted for the 2002 Columbia Cascade Province project selection process to address fish propagation, fish harvest, and research monitoring and evaluation needs in the Okanogan subbasin -- Proposal #29040 *Develop and Propagate Local Okanogan River Summer/Fall Chinook*, and #29033 *Design and Conduct Monitoring and Evaluation Associated with the Reestablishment of Okanogan Basin Natural Production.* These proposals received favorable ISRP reviews[1] and support from the Council, CBFWA, NOAA, and eventually BPA. Subsequently, the Colville Tribes, Council, and Bonneville agreed to add a separable spring Chinook recovery component to the master planning effort.

In 2005, the ISRP conducted a Step-One review of the hatchery program's Master Plan (ISRP 2005-2[2]). Step-One is the feasibility stage, for which all major components and elements of a project should be identified as specified by the Council's step review requirements. In the Step-One review, the ISRP recommended that the Master Plan be revised to better address a number of the required scientific elements of the Council's step review process. Rather than requiring a response before moving on to Step Two, the Council approved the Chief Joseph Dam Hatchery Program Master Plan, and specifically approved the program, including the spring Chinook component and the two research studies, to proceed to implement Step-Two planning and preliminary design in Fiscal Year 2005. In addition, the Council recommended that for the Step-Two review the project sponsor submit additional information to fully address the ISRP's Step-One concerns.

In 2006, the ISRP reviewed the Chief Joseph Dam Hatchery Program's FY 2007-09.[3] The ISRP recommended "fundable in part" for the planning part of the project with construction and implementation being contingent on satisfactory completion of Three-Step Reviews for scientific merit through adherence to the Fish and Wildlife Program's Eight Scientific Principles. Ultimately, the ISRP noted in its final recommendation following the response loop, that the sponsor's response "provides little direct or additional scientific content to satisfy concerns with issues of science." As such, we caution Council that the project has yet to gain the full support of the ISRP based on scientific merit.

[1] http://www.nwcouncil.org/library/isrp/isrp2002-11.htm
[2] http://www.nwcouncil.org/library/isrp/isrp2005-2.htm
[3] http://www.nwcouncil.org/library/isrp/isrp2006-6.htm

This Step-Two review focuses primarily on the response to issues identified in the ISRP Step One review (ISRP 2005-2).

ISRP Recommendation and Review Summary

Recommendation: Response requested. After reviewing the material available in the Master Plan, appendices, Hatchery Genetic Management Plans (HGMPs), and Step-Two documents, the ISRP finds that the project does not adequately address the scientific issues raised in the Step-One review and must do more to meet the scientific criteria required in the Step Review process. Before the Council determines if the program proceeds to Step-Three, the ISRP recommends that the Master Plan document be revised to specifically address the issues raised here and in the original review.

ISRP Review Summary: Step-One approval of the Chief Joseph Hatchery Master Plan by the Council included the understanding that an ISRP recommendation of Meets Scientific Review Criteria at Step-Two would require addressing the ISRP's Step-One review concerns. The current Step-Two document did not adequately address these concerns. The ISRP appreciates the effort that went into crafting the explanations and perspectives (presented primarily in Section 3.4). However, we are looking for *demonstration* of a scientifically-defensible integrated hatchery production-harvest-natural production program consistent with existing environmental conditions and Fish and Wildlife Program principles, rather than an explanation of why or why not particular elements were included.

The CJHP Master Plan refers extensively to HGMPs which are appended to the Step-One Master Plan submission. The summary of the detailed information in the HGMP presented in the master plan chapter 9.1 for the integrated summer/fall Chinook recovery program and in chapter 9.5 integrated summer/fall Chinook harvest program is not sufficient to understand the entirety of the Master Plan's proposal. The number of fish needed for broodstock (Table 10), the proportions of natural- and hatchery-origin salmon in the broodstocks (Table 11), the production schedule for juveniles, and estimates of the current capacity of the Okanogan River are not reconcilable. The summaries in the document can be brief, but they need to demonstrate that the Master Plan objectives can be achieved given existing productivities and abundance of hatchery and natural populations of summer/fall Chinook in the Okanogan River Subbasin. The ISRP stresses that this is not simply a matter of style. The Master Plan has broader audience(s) than the ISRP and Council that will benefit from a clearly presented plan with all of the "what, where, when, why, and how."

The primary deficiency of the CJHP Master Plan is a lack of adequate linkage between the environmental assumptions and the objectives of the program. To address this deficiency, the ISRP highly recommends that the project be included in the upcoming review by the Columbia River Hatchery Science Review Group (HSRG) and that the results of that review and All-H Analyzer (AHA) outcomes are incorporated into the Master Plan. Sub-models within AHA include components for demographics, genetics, and harvest, all important elements of the CJHP. The modeling should provide reasonable expectations for natural and hatchery recruitment consistent with limitations on carrying capacity due to habitat availability and improvement, hydrosystem operations, and downstream and oceanic harvest. Ultimately, the results of these

efforts for both the Integrated Harvest and Integrated Recovery parts of the program will shape facility design criteria and engineering in both the hatchery and for acclimatization sites. While acclimatization sites must be included in the models, the ISRP questions the need for these sites, unless their purpose is to provide locations for harvest of hatchery fish. The ISRP also recommends to Council that the project sponsors be invited to present (to the ISRP and other parties as appropriate) an overview of the HSRG/AHA analyses within the context of provincial production. The presentation would enable a more productive dialogue between the sponsors and the ISRP regarding the program and any ongoing concerns.

The demographic sub-model needs to be constructed based on the available empirical Chinook population dynamics from the Okanogan or neighboring Columbia Cascade watersheds. This model will use existing juvenile survival, adult abundance, watershed summer/fall Chinook capacity, to establish the hatchery smolt production objectives and link these to desired future abundance for both natural and hatchery-origin adults. The genetic sub-model needs to balance the natural and hatchery production based on guidelines on anticipated genetic effects from the domestication during the hatchery phase of the life-cycle. These can be drawn from Ford (2002) or Lynch and O' Hely (2001). The AHA simulations provide ranges of hatchery and natural production via modeling that could not otherwise be obtained during planning. The hatchery and natural adult production become the program objectives and serve as the benchmark to evaluate the program's success over time. The output from the sub-models establishes the basis to create decision trees and the monitoring and evaluation needed to collect the information for evaluation. This is particularly important for this planning stage because information on the program feasibility and likelihood of success can affect hatchery design and engineering structure, including fish rearing and acclimatization sites. It remains to be demonstrated based on current empirical evidence (e.g., SARs, return and stray rates for the Wenatchee, Methow, Entiat, and Similkameen based on monitoring data from Wells Dam and other areas) that the proposed hatchery production will deliver fish for recovery and harvest, given the current or expected environmental conditions downstream. Finally, a direct assessment of the effectiveness of the acclimation sites should be easily attained from available data and the modeling exercise. These results and analyses need to be presented.

The Integrated Recovery Program for summer/fall Chinook) employs supplementation as a strategy to maintain the demographic status of the summer/fall Chinook population. This strategy is has no well-documented track record of success in the Columbia River basin. Supplementation as a model for recovery or maintenance of salmon diversity and demographic health has received considerable scientific review over the past decade (NRC 1996, ISAB 2003, Goodman 2004, Waples, 2007), and its usefulness to produce a demographic boost in natural abundance is not established. The sponsors appear to recognize that scientific information on natural recruitment from hatchery fish spawning in the wild is lacking (see last paragraph, pg 3-22). It remains to be demonstrated that hatchery supplementation can successfully contribute to the re-building of natural recruitment. This emphasizes the experimental nature of the proposed plan. The sponsors provide no explanation of why the runs are not re-building based on current releases and how additional releases would lead to this rebuilding.

The most relevant issues raised by these supplementation reviews as they pertain to the CJHP and Master Plan are the expected declines in fitness of natural salmon in supplemented (that is,

treatment) populations relative to unsupplemented (that is, untreated) counterparts and whether supplementation provides a demographic benefit. In terms of fitness effects, the recent publication by Araki et al. (2007) in Science measured the relative reduction in genetic components of fitness of Hood River steelhead attributable to hatchery rearing. This builds on earlier work by Ian Fleming and others for Pacific and Atlantic salmon on the fitness consequences of escaped farm fish or released hatchery fish into wild fish populations, as in supplementation. To address the second issue, two operational scale projects are currently underway in the Columbia Basin to examine and evaluate the success of supplementation. An important example of this is the Idaho Supplementation Study, which pairs treatment (receiving hatchery smolts) and reference reaches (not receiving smolts) to control for extraneous variables. There may be additional data or project information available to the sponsors through other agencies. In light of these ongoing concerns, recent empirical demonstrations should be reflected in the basic assumptions used to predict the outcome from employing a supplementation strategy.

Hatchery production of salmon does have a record of providing harvest, so the Integrated Harvest Program is more likely to have some success than the Integrated Recovery Program. Furthermore, the ISRP appreciates that harvest from the CJHP is proposed as mitigation to meet an unfulfilled legal obligation. The anticipated benefit from an integrated harvest program is contingent upon the life-stage survival of fish in this specific environment. It is not apparent from the Master Plan what the harvestable component might be. With the information provided the ISRP is not able to conclude that the biomass of adult Chinook salmon returning to the subbasin will exceed that of the juveniles passing downriver from both natural and hatchery sources. Further specifics on the predicted range of returns (i.e., target returns) based on realistic within subbasin and out-of-subbasin environmental conditions are needed for establishing the Integrated Harvest Goal of the program. Moreover, for this goal, basic empirical information from other programs on the hazards presented by straying and other impacts on non-target populations would improve the plan. For the CJHP's primary goal of harvest mitigation, the latter sub-model should be indicative of the needs given targets (numbers of fish to be harvested, and where) and reference points (harvest levels where decisions on alternative strategies might be considered).

Additional ISRP Comments on Sponsor Responses to ISRP Step-One Concerns

As noted above, the Council specifically identified six concerns (Major Project Review Elements) that required additional explanation or discussion during the preliminary design phase of the project. These were highlighted in Section 3.4 of Chapter 3 of the Chief Joseph Hatchery Program (Step-Two Submittal, November 2007), which contained the sponsor's responses to the issues raised in the ISRP's Step-One review. These six issues are listed below, and each issue is followed by the ISRP's comments on the sufficiency of the project sponsor's responses.

1. a specific time-frame and an clear decision process (i.e., decision tree) that outlines the expected range of the various production scenarios (Section 3.4.1);

ISRP response: The sponsors indicate that the decision process and set of contingency actions is located in Appendix C, Volume 2 of Step-One – including sections within the Hatchery Genetic Management Plan, included with the Step-One submission – especially for the set of contingency actions should the program fail to meaningfully achieve projected production and return thresholds. The information with the HGMPs, in particular, is helpful in understanding the status of artificial production and salmon runs in the upper Columbia River Basin. Nonetheless, a set of specific linkages to other documents and succinct summary of the expected production, partitioned into harvest, broodstock, natural spawning, and the anticipated life-stage survivals of smolts through the hydrosystem into the ocean and back through the system as adults would provide an important synopsis for the Council and other interested parties who may not be intimately familiar with the full scope of conditions and challenges articulated in the Okanogan Subbasin Plan.

Also, the cited sections do not clearly explain these expected return thresholds. Instead a few, broad outcomes are identified along with a nonspecific set of actions. For example, two conditional outcomes are cited as examples: "significant adverse ecological interactions with natural populations" and "unsatisfied harvest demand of tribal or recreational fisherman." Aside from the lack of definitions for these outcomes (i.e., what is or is not adverse and what level(s) of "demand" is expected or acceptable are undefined), these example outcomes have no associated thresholds for action. Moreover, the plan does not provide responses to different thresholds, or a process to select among the alternatives. What is required are target values, the numbers or expected range of numbers of fish that will be used as reference points for the decision process. For example, the sponsors must identify the numbers of fish required to meet their native harvest at specific locations, how those numbers will be effectively monitored, and what decision or consequences arise given various harvest scenarios at, above, or below these thresholds.

Two "scenarios" were included to further explain the sponsor's approach. First, where wild summer/fall Chinook salmon increase - thus negating the need for production toward restoration - two potential reactions are presented – a) reduce overall production for wild fish restoration (i.e., supplementation) or b) shift production capacity toward harvest in the terminal fishery. The sponsors provide two alternative actions, but in fact, avoid indicating which alternative they would execute and when and how it might be triggered, and measured. As such, this example highlights exactly the kind of decision that would benefit from a decision tree or other decision management framework with specified thresholds or reference points. Moreover, the sponsors indicate that there is no perceived circumstance where production would be terminated (either because of program success or program failure, or if other related mitigation activities were implemented to improve natural production). While the ISRP recognizes that presentation of every possible contingency is unwarranted, there are classes of outcomes that can be predicted (e.g., wild population increases, decreases or remains unchanged as a response to supplemental releases). In the second scenario for the spring Chinook salmon, the sponsors indicate that should production create a conflict with recovery, the production would be terminated. Again, while presentation of the universe of possible conflicts is not warranted, some well-grounded risk categories (e.g., genetics, demographics, and disease transmission) and objective thresholds can be identified and addressed.

Finally, if comparable survival data from the Wenatchee, Entiat, Methow, and Similkameen can be used to establish the range of anticipated harvest production and demand in the Okanogan subbasin, these data and projections would provide evidence and increase the ISRP's confidence that the level of proposed harvest production has a reasonable likelihood to achieve its objective. While ultimately this kind of assessment will not address whether supplementation or reintroduction (of spring Chinook) are likely to succeed, it would establish some likelihood for the harvest augmentation portion of this project.

In the current submission, the environmental assumptions are dispersed throughout the Master Plan. Moreover, it is not transparent how these assumptions are used to establish the production plan, such as what level of harvest is desired or expected; what is the desired or expected level of natural production in the Okanogan River; and what the adult production will be from hatchery rearing. For example, Chapter 5 of the Master Plan provides an abbreviated summary of data on the current summer/fall Chinook population status (section 5.1.1), the proportion of natural and hatchery-origin adults, the habitat capacity (section 5.1.4), and survival rates from Rocky Reach and Wells hatcheries (section 5.1.5), but not from the Similkameen Ponds. Chapter 9 summarizes the fish rearing program but does not transparently link to the environmental conditions (fish survival and subbasin capacity in Chapter 5). Other important details are also omitted. For example, Table 11 provides the proportions of natural-origin Chinook in the hatchery broodstock, but the first column is the maximum percent of the broodstock of natural-origin. The critical consideration is the minimum proportion. The sponsors state in the Step-Two materials that they plan on using a Proportion of Natural Influence (PNI) of 0.70. This bounds the entire program and is not reflected in the production component of the plan. Ultimately, the program design should use what is known or realistically deduced about natural habitat capacity and natural Chinook abundance and productivity, hatchery smolt survival, and desired harvest.

Among the expected results from predictive modeling efforts (such as AHA) is a result suggesting that the fitness of the natural population in subsequent generations will be substantially lower than an unsupplemented counterpart. Such a result is expected to shrink a population over time, in conflict with the stated goal. Given that wild recruitment for the subbasin's populations are observed below replacement (data must be presented to confirm or refute this stipulation), and that the future population will have lower fitness, it is very unlikely that hatchery fish will be successful in rebuilding wild population status by spawning with or in the area of wild fish. Indeed, supplemented fish may not be successful at all. The supplementation aspects of the Step-Two plan must be considered experimental, particularly in light of current evidence elsewhere in the Columbia Basin (e.g., Imnaha). The initial phase must involve modeling (e.g., AHA, or similar) but also requires some careful pilot testing and experimentation before the program merits full-scale implementation. The modeling should also consider variation of freshwater and marine survival conditions as well as domestic (including choice of domestic stock) versus wild broodstock, and combinations of commencing with wild brood and augmentation with hatchery returns in subsequent brood collections – all possible as an experiment on a computer but costly, unduly lengthy, and probably impossible in the real world, but very informative.

2. Use of a reference population is essential (3.4.2)

ISRP response: The Chief Joseph Hatchery Plan sponsors state that the opportunities to establish reference populations for evaluation of the supplementation components of the plan are not widely available in the Columbia Cascade province. The sponsors then identify that the Entiat is being considered a reference location for the province and that the Okanagan subbasin in Canada could potentially also serve this purpose. An ad hoc supplementation workgroup has been generating potential sites that could serve as reference locations for steelhead and Chinook across the Columbia River Basin. The ISRP recommends that the sponsors avail themselves to this information and to potential analytical models for using the reference sites. This will be an essential element to any evaluation of the integrated recovery portion of the program.

3. additional discussion of the Chief Joseph Hatchery Program in context and comparison to alternative forms of mitigation and supporting activities (Section 3.4.3);

ISRP response: The sponsors indicate that several significant out-of-basin stresses (e.g., the hydrosystem, oceanic, and down-river intercept harvest) as well as in-basin stresses (i.e., habitat degradation within the Okanogan Subbasin) currently limit natural production and the reserved-right fisheries they would support. In addition to the response to Section 3.4.1, provided above, the ISRP recognizes the dominant effect of these stresses as monumental in scale and scope. The ISRP also recognizes that addressing and overcoming these stresses is not trivial, immediate, inexpensive, or amenable to tinkering. Finally, the ISRP recognizes the legal basis for the sponsor's rights, authorities, and mitigation expectations. Therefore, a full examination of alternatives and necessary complementary actions is a worthy investment of time and planning effort. Some demographic modeling might indicate the level at which the values for smolts/adult and/or adults/smolt may have to increase to provide the desired benefits. The question then becomes one of finding the capacity to achieve those results, if possible. Unless limits to production within key life stages are addressed, success other than for harvest mitigation might not be realized, and even then, with limitations.

Central to this examination, is whether or not (or more likely, at what level) a reserved-right harvest can be sustained while simultaneously progressing toward restoration of one Chinook salmon ESU (i.e., summer/fall Chinook) and recovery of a second (spring Chinook) regardless of the wild or hatchery source. Well-founded answers to this central question require some basic data and analysis with AHA and EDT, for example. Therefore, the ISRP seeks transparent presentation of such analyses and continues to find that in its absence, the program has little scientific basis.

4. additional specific detail on how the proposed program relates to the Biological Assessment and Management Plan, or BAMP (Section 3.4.4);

ISRP response: The sponsors provide additional explanation of how the draft Biological Assessment and Management Plan for mid-Columbia River summer/fall Chinook would form the basis for this project's HGMP. The sponsors add additional detail regarding production objectives for early and late-arriving Chinook.

5. better integration is needed with other Council documents (i.e., the Okanogan Subbasin Plan) and other basin-wide documents (Section 3.4.5, 3.4.6, and 3.4.7);

ISRP response: The sponsors indicate that the CJHP "is fully integrated with the final Okanogan subbasin plan." The ISRP finds that the CJHP goals are consistent with the vision and strategic themes in the Okanogan Subbasin Plan. Unfortunately, the Okanogan Subbasin Plan does not address the critical out-of-basin stresses that greatly affect salmon viability and productivity (discussed in the next section). However, the sponsors provide additional information, informed by EDT and the Okanogan Subbasin Plan, including limiting factors in the subbasin and a hierarchical table (Table 3-1) of competing hypotheses and treatments from the Subbasin Plan. In addition, the sponsors provide a suitable context for the spring Chinook recovery plan from NOAA Fisheries recovery documents. From this latter document, hatchery production is consistent with recovery goals under specific conditions which are addressed in the sponsor's Integrated Recovery Program.

6. providing the basic information regarding the in-basin and out-of-basin assumptions concerning survival (Section 3.4.8);

ISRP response: The intent of the ISRP's initial review comment had to do with smolt-to-adult ratios (SARs) assumed in the initial presentation. There appeared to be some internal inconsistency of this assumption given statements of high mortalities out of basin. Ultimately, the source of the "conflict" came down to whether SARs for production fish would be sufficiently greater than estimates for wild fish or other stocks to expect the return rates predicted and presented. Ultimately, the ISRP seeks presentation of the data and calculation that led to these assumptions as a basic requirement of rigorous analysis.

CJHP sponsors identify that they anticipate operating the hatchery and natural phase of their integrated program with a PNI of 0.7 following the guidance of the Puget Sound HSRG. The basis and rationale for the HSRG guidance has considerable merit for situations beyond Puget Sound, and the ISRP encourages this approach. The ISRP notes, however, that the sponsors state "to be risk averse until better information become available, the CJHP Step I master Plan includes threshold to strictly limit the proportion of hatchery-origin fish in the natural spawning population unless such fish are needed for demographic benefits to bolster depressed escapements in years of low survival." In this instance it is not clear to the ISRP how demographic benefits are to be anticipated or measured, what range of acceptable increase in hatchery fraction might be, and how to decide when the natural population is so depressed as to warrant action. The ISRP (ISRP 2005-15) has recommended that these programs operate with a fixed design to facilitate evaluation. Furthermore, if the supplementation is cycled "on and off" in an unsystematic way, comparison to reference locations and other projects is untenable. There is little if any evidence in the literature, and none presented here, to suggest that there are demographic benefits to the wild population at low levels when supplemented by hatchery fish – indeed, the opposite may be true. Simply putting more hatchery fish on the spawning grounds does not equate to an improvement in subsequent recruitment to the next generation and may in fact detract from the very positive recruitment of wild fish that might be realized at low levels of escapement and Beverton-Holt recruitment.

7. specific detail on methods, designs (including comparative reference streams or other controls), and hypotheses need to be incorporated in the monitoring and evaluation plan (Section 3.4.10).

ISRP response: The sponsors concur with the ISRP that a rigorous M&E plan is warranted and should be implemented with the operation of the Chief Joseph Hatchery. Some progress on additional development of the conceptual M&E plan in Step One is included in Step Two, Appendix H. The sponsors propose that final development of the M&E plan will be done during Step Three (along with revision of HGMPs, to take into account the HSRG's anticipated review in 2008). Moreover, the sponsors conclude that preparing a full M&E before Step Three could "result in ineffective use of Fish and Wildlife Program funds should the project not proceed to construction."

The ISRP believes that a final, well-designed M&E plan is an important iterative activity (and wise investment) occurring during planning and at the outset of any program's conception to permit programmatic and therefore facility design specifications. The ISRP identified this during Step-One review and again during the project proposal review.

The primary monitoring questions raised in Appendix H need to be directly linked to the projects biological objectives and decision trees for alternative actions if specific thresholds are not achieved. In some instances, Appendix H appears too complicated and conservative; for example it is not obvious or explained why an objective of a 100% progeny per parent advantage for hatchery over natural production is needed. The needed hatchery benefit should be based on a more inclusive consideration of the life-stage survival for both the hatchery and natural phases, the broodstock management desired in the hatchery and on the spawning grounds, and the harvest expected in various fisheries. In other instances, the details of measuring the desired performance metrics are not explicit. For example, comparing progeny per parent for hatchery spawning is reasonably straight forward, but to determine either the number of smolts, or the number of adults from natural spawning requires rigorous data. The details of the field data collections are not explicitly described. Conditions in the Okanogan River system may not easily permit collecting this data. There also seems to be confusion between performance measures and input data. On page 18 of Appendix H, performance measures to evaluate M&E Objective 1A include things like juvenile abundance at Wells Dam, age structure, and smolt to adult return rate. These are data used to calculate the performance measure of relative hatchery survival (RHS), not the performance measure itself.

The focus of the monitoring plan in Appendix H is hypothesis testing for a threshold performance by hatchery fish. The ISRP encourages the sponsors to redirect their attention to estimating parameters and calculating vital statistics, rather than hypothesis testing. The most important parameters for this type of program can be found in the ISAB supplementation report (ISAB 2003-3). If the sponsors can reasonably estimate the adult-to-adult replacement rate for hatchery and natural production, then the limitations of the management constraints for this system can be determined. Here, the management constraints are the proportion of natural production that can be collected for broodstock, the proportion of hatchery fish in the hatchery

broodstock, and the proportion of hatchery fish on the natural spawning grounds. From this latter proportion, the numbers of fish that might be available for harvest can be determined.

The ISRP recommends integrating M & E of present and future oceanic conditions as an appropriate out-of-basin consideration into the conceptual framework of this plan, even if hypothesis testing and adaptive management feedback loops beyond the spatial scale of the Columbia River Basin may not be feasible at this time. Regardless, tagging and marking programs that permit ocean harvest monitoring and stock identification of CJHP fish in these out of basin fisheries should be explicitly addressed in this M & E plan. The sponsors can evaluate whether they are releasing sufficient numbers (and proportions) of marked or tagged fish to obtain accurate estimates of contributions to ocean and in-river fisheries, as well as to evaluate the effect of non-terminal fishery removals on the success of their terminal harvest and natural spawning restoration efforts.

8. Other issues – out of basin effects and oceanic influences.

On pages 3-8 of the Step-Two submittal, the sponsors state "[q]uantitative information is not available on the likely effect of the CJHP's added increment of production on the carrying capacity of the Columbia River, Columbia estuary, and the near ocean environment. The Colville Tribes noted, however, that in recent years releases of hatchery fish have been substantially reduced, primarily from the Mitchell Act Program. Also further reductions of hatchery fish are expected in the Columbia Cascade Province as mainstem passage improvements equate to reduced PUD obligations for hatchery mitigation. The increases in proposed CJHP production are small compared to these recent decreases in production."

The potential impact of CJHP fish on carrying capacity is not a simple function of the number of juvenile hatchery fish released, as the above statement would indicate. Distribution, migration timing, residence time, body size and growth rate, abundance of prey, predators, and competitors, and many other factors will each affect carrying capacity individually and in concert. The sponsors' statement also implies that the listed reductions have dropped production well below the system's carrying capacity, which therefore can now accommodate production increases. This speculation requires justification and analytical support. Long term declines in abundance and body size of adult Chinook salmon throughout their natural range has already provided evidence that ocean carrying capacity is limited. Strong scientific justification is needed that proposed CJHP releases will not further reduce carrying capacity and increase risk to wild salmon both inside and outside the subbasin. Ultimately, there are potential issues and concerns associated with non-target species and ESUs out-of-basin (especially in the estuary and in the ocean) that have not been addressed or will not be monitored.

A number of questions remain that might not be considered as directly within the scope of the Three-Step process, but that nonetheless suggest serious constraints on expanded hatchery production within the Columbia Basin. For example, there are a number of ecosystem, ecology, and life history considerations that the plan might address especially in regard to estuary and oceanic conditions and their carrying capacities. Also, some explanation is in order as to how the proposed increase in salmon production at CJH fits into the bigger picture of hatchery production in the Columbia River Basin (as well as other hatcheries in other rivers from

California to Alaska). Further, a summary of evidence is warranted examining the contribution that similar projects have had for restoring wild salmon runs in other places. On the risk side of the equation, what wild salmon populations (non-target) are potentially at risk from CJHP fish at each critical life history stage and habitat?

In addition there are some ongoing research needs to address critical uncertainties such as how the proposed alteration of life-history strategy of summer/fall Chinook from sub-yearling to yearling migrants might affect distribution and migrations patterns, interactions with wild salmon, and susceptibility to harvest and bycatch by distant water fisheries. Given recent reductions in releases by other hatcheries and increases in allocations of hatchery fish to ocean harvest, is it reasonable to assume (or can it be documented from known or projected SARs) that more than a few adult CJHP salmon will ever return to the subbasin? Here, a more holistic modeling approach might allow some exploration of these concerns, and eventually, a Columbia Basin system hatchery model might be useful in exploring consequences of increases and decreases to overall hatchery production to harvest in ocean and freshwater fisheries and to overall survival, ocean carrying capacity, distribution, migration, ecological impact, and related issues. Ultimately, this is not an exhaustive set of inquiries, but it is not too early to be considering these issues and potential limitations to project success.

Literature Cited

Araki, H, B. Cooper, M. Blouin. 2007. Genetic effects of captive breeding cause a rapid cumulative fitness decline in the wild. Science 318:100-103.

Ford, M.J. 2002. Selection in captivity during supportive breeding may reduce fitness in the wild. Cons. Biol. 16:815-825.

Goodman, D. 2004. Salmon supplementation: Demography, evolution and risk assessment. Pages 217-232 in M, J. Nickum, P. M. Mazzik, J. G. Nickum, and D. D. MacKinlay, editors. Propagated fish in resource management. American Fisheries Society, Symposium 44, American Fisheries Society, Bethesda, Maryland.

Independent Scientific Advisory Board. 2003. A review of salmon and steelhead supplementation. ISAB 2003-3; http://nwcouncil.org/library/isab/isab2003-3.htm.

Independent Scientific Advisory Board & Independent Scientific Review Panel. Monitoring and Evaluation of Supplementation Projects. ISAB/ISRP 2005-15; http://www.nwcouncil.org/library/isrp/isrp2005-15.htm.

NRC (National Research Council). 1996. Upstream: salmon and society in the Pacific Northwest. National Academy Press, Washington, D.C.

Lynch, M. and M. O' Hely, 2001. Captive breeding and the genetic fitness of natural populations. Conservation Genetics 2:363-378.

Waples, R. S., M. J. Ford, and D. Schmitt. 2007. Empirical results of salmon supplementation in the Northeast Pacific: A preliminary assessment. pp. 383-403 *in* T. M. Bert, ed. Ecological and Genetic Implications of Aquaculture Activities. Kluwer Academic Publishers.

ISRP Comments on Step Review Elements

The Council has emphasized that an important part of the Three Step Review Process includes an ISRP review of the responses to the technical elements listed below. The Council revised the original review elements, developed in 1997, to better reflect and clearly refer to the 2000 Fish and Wildlife Program (e.g., artificial production and subbasin assessment protocols). The Council specified that the ISRP apply these elements or similar standards as a reflection of the current state of the science.

A. All Projects

Does the Chief Joseph Dam Hatchery Program 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.

ISRP Step-One Comments: The Master Plan addresses the eight scientific principles. The dynamic nature of the ecosystem including the patterns of human intervention or influence within the Okanogan River will be key to achieving program goals.

ISRP Step-Two Comments: The Step-Two Master Plan submission attempts to address the ISRP comments identified in the Step-One review. It also provides additional depth to the approach especially in the design and engineering phase. Taken in total, the ISRP is concerned that the commitment to truly "adaptive" management by the sponsors will not be a part of the long-term operation of the proposed facility and associated program. For example, the sponsors indicate that there is no perceived circumstance where production would be terminated (either because of program success or program failure, or if other related mitigation activities were implemented to improve natural production). Such a position runs the risk of a non-adaptive management philosophy and approach. Furthermore, some of the concerns raised in the review here and earlier regarding the need for a robust M&E when addressed fully, will provide the basic information to evaluate whether the program is achieving its objectives (or not) and whether specific modifications are warranted. Target or reference points for decision analysis must be evident and transparent, and none were provided.

The ISRP did not specifically review the design and engineering specifications as they are generally outside our collective expertise.

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 One)?

ISRP Step-One Comments: The Master Plan does directly link to other activities in the basin, especially Proposal #29040 *Develop and Propagate Local Okanogan River Summer/Fall Chinook*, and #29033 *Design and Conduct Monitoring and Evaluation Associated with the Reestablishment of Okanogan Basin Natural Production.* The Master Plan also links directly to HCPs. Perhaps, though, the most critical linkage not described (in part because of timing of release of each) is the Okanogan Subbasin Plan (other than a simple listing in Table 6; p. 64). Moreover, the linkages between the objectives of this Master Plan and the ISAB's supplementation recommendations and other basin-wide propagation efforts deserve direct discussion.

ISRP Step-Two Comments: The Master Plan links to other activities in the Subbasin. Also, as the Okanogan Subbasin Plan has been approved there are some important linkages to it. Two important linkages will need to be examined through the revision process and subsequent step reviews. Specifically, linkages to the revised HGMPs and HSRG review findings as well as to information on out-of-basin (particularly estuarine and oceanic) conditions are anticipated by ISRP. We still see very little or no reference or consideration neither to the ISAB's supplementation recommendations nor to recent science results and preliminary findings that will very much guide the CJHP. Please see the ISAB's supplementation review and ISRP and ISAB supplementation M&E reports: www.nwcouncil.org/library/isab/isab2003-3.htm; www.nwcouncil.org/library/isrp/isrp2005-15.htm.

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 One)?

ISRP Step-One Comments: Numerical goals are defined for smolt production and release as well as adult returns to the harvest fishery, the hatchery for brood take, and to natural production in the river itself. Whether these goals are reachable and under what circumstances (e.g., levels of ocean survival, downstream/upstream passage and survival, harvest pressure, spawning and nursery habitat availability, genetic and life-history diversity) are not only assumptions, but should also serve as testable predictions of an operational hypothesis.

A conceptual design for Monitoring and evaluation is described in Chapter 10, but lacks detail in terms of specific hypotheses to be tested and design characteristics. Appendix H contains considerably more detail. The M & E design will benefit from integration and further development of M & E in the Subbasin Plan and in the other subbasins of the Columbia Basin. In particular, the M&E plans should be made consistent with and cooperate with ongoing pilot M&E projects, e.g. "Monitoring strategy for the Upper Columbia Basin" (Hillman 2004), and "Monitoring strategy For The Duck Valley Indian Reservation" (Hillman and Dykstra 2004), and

monitoring strategies for evaluation of other hatchery operations, e.g. the Northeast Oregon Hatchery (NEOH) Spring Chinook Master Plan: Monitoring and Evaluation Plan (ISRP 2004).

ISRP Step-Two Comments: The review comments identified in the ISRP's Step-One review remain largely in place for this Step-Two draft.

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

ISRP Step-One Comments: The Master Plan proposes two major benefits of the proposed propagation project: integrated recovery (of at-risk or extirpated Chinook salmon) and integrated harvest (for tribal ceremonial and subsistence purposes).

ISRP Step-Two Comments: The benefits remain as identified, although we note that the integrated harvest program includes potential recreation harvest as well as earlier identified tribal ceremonial and subsistence purposes.

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 One)?

ISRP Step-One Comments: Section 5.1.4 and Table 2 estimate habitat carrying capacity for salmon and steelhead smolts as well as recent production averages for natural production (and thereby a rough estimate of the carrying capacity). If accurate, the system can handle additional production without density dependent effects counteracting production.

The primary habitat threats to the Okanogan Subbasin are listed as impaired hydrological condition due to water withdrawal, elevated summer water temperatures, sedimentation, loss of riparian vegetation. Ultimately, the Master Plan indicates that the most important limitation to natural productivity results from out-of-basin impacts associated with poor passage through the downstream dams.

Given the level of impairment described throughout the basin from instream and out of basin dams, from water and upland land use, from modification of riparian habitat and channelization there is clearly a legion of opportunities for habitat improvement throughout the Subbasin. Ongoing projects are considered and described in Chapter 6.

ISRP Step-Two Comments: While the Step-One comments regarding carrying capacity were focused primarily within the basin and especially subbasin, current understanding of oceanic conditions warrants additional consideration of downstream, out of basin effects to carrying capacity (see ISRP response #8 "Other issues – out of basin effects and oceanic influences").

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

ISRP Step-One Comments: The Master Plan indicates (in section 6.7.1) that the habitat work in current projects, such as those in Omak and Salmon Creeks, and proposed for the Antoine or Loop Loop Creeks are vital to the objectives of this project. While reasonable, more thoroughly describing this dependence will help define whether and where other analogous activities may be needed.

ISRP Step-Two Comments: Step-One comments remain and should be a required element in the revision of this draft.

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 One)?

ISRP Step-One Comments: The Master Plan's Chapter 8 includes a discussion of alternatives. This section was short and briefly focused on alternatives solely for artificial production. No alternatives were discussed concerning habitat improvements, changes to the hydrologic regime in basin or out-of-subbasin, or harvest effects, and so on. The ISRP recognizes that until the entire down river hydrosystem is operated in a more ecosystem-friendly manner, natural production will be limited.

ISRP Step-Two Comments: No additional information was provided in this submittal and should be a required element in the revision of this draft.

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

ISRP Step-One Comments: The summary provided is adequate.

ISRP Step-Two Comments: The summary provided is adequate and should remain as a content element in the plan.

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

ISRP Step-One Comments: The Master Plan benefits from the previous HCP process – thus information is not needed to be recreated for salmon. Information about anadromous sockeye and steelhead, and resident fish and wildlife in the basin were not included as the project is specifically focused on Chinook propagation. Again, this may be enhanced by considering this Master Plan within the context of the Subbasin plan.

ISRP Step-Two Comments: The Step-Two submittal is consistent with the Okanogan Subbasin Plan, which describes current and planned management (reflecting Subbasin Planning support tools such as EDT).

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

ISRP Step-One Comments: The Master Plan addresses the condition and recovery needs for the two Chinook ESUs in question. For the Summer/Fall Chinook ESU the recovery goal of the proposed artificial production includes focusing on local stock (Okanogan), increased temporal/seasonal coverage of the run by increasing brood collection over a longer period of time, expanded set of rearing and release localities to take advantage of unused spawning habitat, limiting the escapement of hatchery-origin fish into the breeding pool. If successful at achieving demographic goals for increasing natural production of Spring/Fall Chinook, the program will simultaneously achieve broader ESU recovery goals. Ultimately, the recovery plans for both Chinook ESUs are broader than the Okanogan (as well as for steelhead and bull trout which are not directly addressed in the Master Plan).

ISRP Step-Two Comments: No additional comment.

11) describe the status of the comprehensive environmental assessment (Step One and Two)?

ISRP Step-One Comments: Environmental assessments for the Subbasin have been completed at a relatively coarse scale in the U.S. The Master Plan refers to and briefly describes several of these. In this regard, dovetailing this Master Plan with the Subbasin Plan would be appropriate and extremely valuable.

ISRP Step-Two Comments: A draft environmental impact statement has been submitted, reviewed, and comments received. A final EIS was anticipated "in 2007 pending completion of ESA Section 7 formal consultation with NMFS and completion of a National Historic Preservation Act (NHPA) cultural resources consultation…" No additional information has been received by ISRP to date and revision should indicate status of approval at that time.

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

ISRP Step-One Comments: Inclusion of effectiveness monitoring and programmatic evaluation toward program goals is relatively lean. Effective adaptive management is firmly grounded in evaluating an action as an experimental treatment. To evaluate success (predicted response), a robust analytical design is required upfront. A conceptual design for Monitoring and evaluation is described in Chapter 10, but lacks detail in terms of specific hypotheses to be tested and design characteristics. Appendix H contains considerably more detail. Here again, the M & E design will benefit from integration and further development of M & E in the Subbasin Plan and in the

other subbasins of the Columbia Basin. In particular, the M&E plans should be made consistent with and cooperate with ongoing pilot M&E projects, e.g. in the Wenatchee, the "Monitoring strategy for the Upper Columbia Basin (Hillman 2004), and "Monitoring strategy For The Duck Valley Indian Reservation (Hillman and Dykstra 2004" and monitoring strategies for evaluation of other hatchery operations, e.g. the Northeast Oregon Hatchery (NEOH) Spring Chinook Master Plan: Monitoring and Evaluation Plan (ISRP 2004).

ISRP Step-Two Comments: Comments remain in place and while conceptual foundations and some details are provided in Appendix H, further refinement and revision per recommendations above should be required in the Step-Two revision. Focus on response variables that are directly linked to project goals was absent and require an analytical framework upfront, as previously stated. We specifically refer the sponsor to ISAB/ISRP 2005-15 for additional guidance.

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 One, Two and Three)?

ISRP Step-One Comments: The Master Plan provides cost estimates for future planning and design (i.e. conceptual, preliminary and final), construction, operation and maintenance and monitoring and evaluation.

ISRP Step-Two Comments: No additional comment.

B. Artificial Production Initiatives

Does the Chief Joseph Dam Hatchery Program 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 One)?

ISRP Step-One Comments: The Master Plan does address the linkage and association to the Fish and Wildlife Program basinwide provisions and policies, but it does so primarily through listings or cross-referencing (pp. 18-20), rather than discussion of those points, and see comments above on Basin-wide impacts. The Master Plan also supplies direct comparisons to an appropriate ISAB framework (2003) and recommendations therein, as well as to the recent Landscape Hatchery Concept by Williams et al. (2003) that explores ways to integrate natural and artificial production. The Williams et al. (2003) paper has not been reviewed by Council or the independent science groups, but not surprisingly given the author list, provides many recommendations in common with the Council's program and the general recommendations from both independent science groups on artificial production and supplementation. For the purposes of this review, most useful to the Council and the ISRP are the direct and explicit linkages to the Fish and Wildlife Program and the ISAB's supplementation framework (2003).

ISRP Step-Two Comments: While the Williams et al. references were struck, the basis for the Step-One comments remain in place and need to be addressed.

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

ISRP Step-One Comments: HGMPs are included for both the Summer/Fall Chinook and Spring Chinook populations as Appendices C & D.

ISRP Step-Two Comments: These were provided but will be revised as well as an upcoming HSRG review. These will be critical elements in the revision or next step of planning as they become available.

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

ISRP Step-One Comments: The Master Plan refers to the Management Plan purportedly being developed in the US v Oregon and Washington court proceeding. Judge Richard Belloni, shortly after his ruling in 1969, ordered the parties to that proceeding to develop a fishery co-management plan. At the present time there is no co-management plan in place (December 2004). There remains, apparently, an impasse among the parties because the activities undertaken have generally failed to deliver the fish promised. Ultimately to be effective the parties need to agree upon a set of statements about how the fisheries will proceed given the requirement within subbasin plans that call for returns of specified numbers of adults to the tributaries, fisheries, and streams. For example, what are the guiding principles for co-managing the mainstem fisheries and those in the tributaries? What rights of access of allocation and access will be distributed for allowable harvest?

Without a Management Plan that considers treaty fishing rights and the inherent requirement for returning anadromous fish to the usual and accustomed grounds and stations of the individual tribes, this Hatchery Master Plan could be rendered meaningless and the hatchery left with no source of brood stock. The history of hatcheries in the upper Columbia Basin is full of examples -- Leavenworth NFH, Entiat, Methow, Turtle Rock, and so on. Subbasin plans adopted by the Council should provide ultimately the basis for management decisions on harvest outside and inside of the individual subbasins.

On page 45 the Master Plan says that escapement goals have not been set for the individual tributaries, Wenatchee, Entiat, Methow, Okanogan, Similkameen, and Chelan rivers, and that WDFW regulates recreational fisheries based upon combined counts of Summer/Fall Chinook at Priest Rapids Dam. Management of this fishery and tribal fisheries must become much more sophisticated if numerical goals for fish returning to individual subbasins, and hatcheries are to be achieved. It is to be hoped that the newest Management Plan developed in the US v Oregon and Washington proceeding will specify a process to be used that will take into account this problem.

The Master Plan also notes that the Colville Confederated Tribes are not a party to US v Oregon and Washington. As a result, there is a danger that stocks from the Okanogan and Similkameen rivers might be left out of the Management Plan under development. It is essential that disagreements from this potential problem be recognized and all appropriate steps taken to ensure that all stocks in the Columbia Basin be included in the resulting Management Plan adopted by the Court.

ISRP Step-Two Comments: No additional comment.

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

ISRP Step-One Comments: A conceptual design is provided with linkage to and utility of existing facilities.

ISRP Step-Two Comments: No additional specific comment.

5) provide a preliminary design of the proposed facilities (Step Two)?

ISRP Step-One Comments: While this is not required for Step One (it is a Step-Two issue). Many of the preliminary design specifications are included.

ISRP Step-Two Comments: The ISRP did not review the technical design and engineering specifications as these are generally beyond the collective expertise of the group.

6) provide a final design of the proposed facilities, including appropriate value engineering review, consistent with previous submittal documents and preliminary design (Step Three)?

ISRP Step-One Comments: Not applicable for this Step of the review (this is a Step-Three issue).

ISRP Step-Two Comments: Not applicable for this Step of the review (this is a Step-Three issue). As a recommendation to Council, we seek to identify an expert(s) to the PRG to provide technical guidance on the integrity of the design and engineering specifications.