



Independent Scientific Review Panel
for the Northwest Power Planning Council
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May 14, 2002

MEMORANDUM

TO: Mark Fritsch, Fish Production Coordinator

FROM: ISRP

SUBJECT: ISRP review of study design options for the Columbia Plateau proposal, *Yakima/Klickitat Fisheries Project Monitoring And Evaluation, #199506325*

At the Council's request, the ISRP reviewed a set of submittals from the Yakama Nation, dated February 28, 2002, and Bonneville, dated March 21, 2002 addressing the conditions that were placed on the project entitled *Yakima/Klickitat Fisheries Project Monitoring And Evaluation, #19950632*. These conditions were placed on the project as part of the Council's Columbia Plateau decision.

The Council's request to the ISRP emphasized that the ISRP determine whether the Yakama Nation's response addressed concerns expressed in the final ISRP report for the Columbia Plateau Province project review. Specifically, were the inadequacies of the originally reviewed proposal's experimental design to assess the artificial production initiative adequately addressed? Can the stated purpose for the artificial production initiative and its specific objectives be adequately assessed under the proposed study design?

Unfortunately, based on the material provided, the Yakama Nation's response only partially addresses our original concerns for the study design, and cannot fully address specific objectives of the program. The general quality of the response indicates that the respondents took the original ISRP comments seriously and they have provided detailed comment. However, we found ourselves in a position of deciding whether to only comment on the material as provided, or to provide more specific input concerning additional study designs. Given that spring chinook are again returning and we still lack an agreed design, we have provided specific suggestions concerning the experimental design.

This continued dialogue on the Yakama supplementation design should be of significant concern to the Council. After many years of discussion and planning, the experimental design proposed for this major initiative is fundamentally flawed because it lacks a wild control. The lack of a wild control will limit information gained from the study to

inferences, rather than to a better understanding of underlying mechanisms. A wild control provides the baseline from which to differentiate the effects of artificial production and selection from environmental conditions and annual variation. The Yakama response refers to measuring phenotypic traits and trends, but without being able to study the mechanisms causing any change how will we learn from this study and be able to adapt or apply what we have learned to other systems? The potential to correct this situation still exists, but change to the overall design will certainly be disruptive at this time in the program's long history. Why did this planning process not work properly? The ISRP recommends that this situation be examined to reduce the risk of future outcomes such as this.

ISRP Comments on Feb. 28, 2002 Yakama Nation Response

Our response focuses on experimental design considerations presented in Attachment 3; however, there could be continued discussion concerning elements of Attachment 2 and 5 as will be noted below. Attachment 4 was adequate to address our past concerns.

Attachments 1 and 2 of the response provide a detailed history of the Yakima Fisheries Project's (YFP) development and understanding of the program's objectives. The description is consistent with the ISRP's past understandings. To be clear, our understanding of the objectives is:

- 1) to increase the size of the naturally spawning populations of Upper Yakima spring chinook;
- 2) to provide for increased fishing opportunity in the Yakima Basin; and
- 3) to test the assumption that these objectives can be met through a supplementation program while maintaining the genetic resources of these natural populations (page 4, Attachment 1).

Attachment 1 further emphasizes the importance of conserving the genetic population structure of these populations through six strategies (page 6, Attachment 1). These strategies explicitly included the "establishment and continual monitoring of unsupplemented control streams, and the comparison of trends in abundance and genetic indices of supplemented and unsupplemented "sub-populations" within the same stock." The importance of this program as a learning exercise for the Basin is clearly evident in Attachments 1 and 2.

Attachment 2 provides a detailed discussion of objectives and strategies for the four aspects of the YFP specified in the final EIS. The YFP supplementation program was to be assessed against issues or "aspects": Genetic, Natural Production, Experimentation, and Harvest. The ISRP has continued concerns specifically on Genetics strategy 5 and Harvest. Other comments concerning Attachment 2 seem secondary to the continued discussions about the use of controls and agreeing to an appropriate design to meet objective 3 above.

The ISRP continues to have concern about the experimental design issue and the designs described in Attachment 3. We appreciated the work involved in collating the 13 design

options (Attachment 3) and the inclusion of a Hatchery control in the program design, but *we do not agree* with the conclusion that “a wild control line is not feasible”. Our comments focus on the “spatial sequestering” of a portion of the basin (we concur with the comments concerning use of juveniles as controls) and summary comments on each design are included in the attached table (ISRP Attachment 1).

ISRP Enhancement to Design 2

Design 2 of the Yakama response acknowledges the potential benefits of wild and hatchery control lines, and has incorporated a hatchery control line into the response. The wild control is limited by the availability of habitat that is comparable to the spring chinook habitats being supplemented. The response concludes that a spatially discrete wild control line is not feasible, and that there are design problems with the proposed temporal designs. In these temporal designs, the entire basin would be devoted to a wild control line in one out of four years and the supplementation program would proceed in the other three years. The response notes a few issues with these temporal designs but the significant one is that *environmental effects between years would be confounded* with the temporal design proposed. Further, and as noted in the response, the accumulation of information comparing treatment versus controls would be slow.

The ISRP does not have the local expert knowledge concerning habitats that the proponents do; however, if we accept that other spatially discrete populations cannot be identified as a wild control, then we still see three additional possibilities that have not been addressed in the response:

- a) since three populations were identified for supplementation, then an option would be to randomly choose one of the three for a control population; or
- b) within these three treatments streams, is it possible to isolate and use tributary habitats as control streams; or
- c) if not (a) or (b) then, building on the temporal design, control treatments could be rotated through the three supplementation populations so that the environmental variation between years becomes part of the experimental error. This design would not include a true control but rather treated and untreated periods within common environments.

The ISRP recommends (a), but we acknowledge that there will be obvious concerns for each of these suggestions. The first would disrupt the study design already agreed to and used to design the Cle Elum facility. It would also likely be suggested that overall production would be reduced, which may or may not occur. However, as the Yakama response acknowledged, the establishment of a wild control would be the most informative design option. We do note though that the limitation to this option is that treatment has already begun. The second suggestion would likely cause concerns for whether production from the “control” tributary could be truly independent of the treated section of the stream and would necessitate additional structures to isolate the spawners. The third suggestion, while in our opinion is definitely less desirable relative to the first two, also has some merit. It would accumulate information on comparisons more

quickly, would remove the confounding of annual environmental effects, and could be conducted with little concern for reduced production. However, this design will require more time for data collection and will have less statistical rigor and power than including a strictly wild control. Using the table presentation format in the Yakama response to portray this option, option (c) would be:

YEAR	NATURAL ENVIRONMENT (treatments)			HATCHERY ENVIRONMENT	
	POPN 1	POPN 2	POPN 3	REMAINDER	CONTROLS
1	S	S	S	S	H
2	S	S	S	S	H
3	S	S	S	S	H
4	S	S	S	S	H
5	W	S	S	S	H
6	W	S	S	S	H
7	W	S	S	S	H
8	W	S	S	S	H
9	S	S	W	S	H
10	S	S	W	S	H
11	S	S	W	S	H
12	S	S	W	S	H
13	S	W	S	S	H
14	S	W	S	S	H
15	S	W	S	S	H
16	S	W	S	S	H
17	Randomize streams, repeat design			S	H

In this table, S represents the supplementation production as originally designed, W indicates the year in which no supplementation would be allowed in that system, and H in the hatchery represents the ongoing Hatchery control line. Four years of treatment is suggested as about the generation time for these spring Chinook populations (but 5 years could be more appropriate?).

If a true wild control line is not feasible, then this type of temporal design would still enable an assessment of the comparative productivity of supplemented and non-supplemented streams, the benefits and/or cost of supplementation, how these results interact or vary with habitat, and phenotypic responses of the populations. The design would not include a true control stream and would not allow a direct assessment of genetic issues but genotypic frequencies could be monitored and assessed over time.

One overall concern may be for the capacity of the hatchery facilities that were designed for the full supplementation treatment. If the numbers of fish needed for supplementation were reduced, then facilities in the hatchery could still be used by reducing the density of rearing or could allow for introduction of the hatchery control line without need for additional raceways. The acclimation sites may be dormant for a few years or could be used for other purposes. Our initial thought, however, is that the funds originally planned for acclimation could be directed to assessment studies of the natural production or habitat activities in the watershed. Total production for fisheries may not be reduced since the hatchery control line would contribute additional fish below Roza dam, and reduced density is likely to increase survival of the supplemental production.

Secondary comments

Many of our comments concerning Genetics strategy 5 may best be addressed through discussion between the ISRP and Yakama Nation, but we do note that the Yakama response does not address how success would be determined or when supplementation would be terminated. Concerning the Harvest topic, there remain two issues: how would the sport and Native American fisheries be integrated and managed, and whether the existing monitoring programs are capable of the commitment in the last paragraph of page 13, Attachment 2. The combined sport plus Yakama Nation fisheries could potentially exert a 55-60% terminal harvest rate that would be excessive to naturally spawning spring chinook.

In Attachment 5, further discussion between the ISRP and the Yakama Nation may be beneficial on aspects of their responses for Spawning Ground Surveys and In-basin Monitoring for Harvest.

Next Steps

As already noted, the fish are again returning and the need for a decision is becoming critical. We would now recommend that any further discussion occur in a meeting format to avoid further delays. We must emphasize though that any decision to proceed without an appropriate wild control will be contrary to past ISRP advice and will compromise aspects of the originally agreed-upon design and objectives of this program (Attachment 1). Trade-offs inherent in such a decision would be outside the strictly technical advice of the ISRP and will involve substantial uncertainty concerning how much will be learned from this program.

**ISRP Attachment 1. Summary table and comments on designs presented
Attachment 3 of the Yakama (Feb. 28, 2002) response letter.**

DESIGN	NEW CONTROL LINES	YAKAMA COMMENTS AND RECOMMENDATIONS	ISRP COMMENTS
1A	Hatchery and Wild	Acknowledged as scientifically most interesting, but no representative wild control; noted issue of surplus hatchery production. <i>Design not recommended</i>	We must defer to their local knowledge concerning other “wild” habitats outside of their supplementation streams. Surplus return of hatchery control is likely but production is extra to the supplementation program, returns are for experimental use, not associated with future loss of production. See ISRP comment on an enhancement to this design (in response text).
1B	Wild only	Concern for how representative the Easton Reach habitat would be, and about “leakage” of Wild controls into supplemented populations. <i>Design not recommended</i>	No Hatchery control line, but the Wild comparison would be the critical comparison. As above, defer to judgment of local staff about habitats. Why wouldn’t “leakage” issue be of concern in both directions? See comment in text but this design would be less informative than 1A if modified as in text.
1C	Hatchery only	Scientifically interesting and feasible, but comparison may be “of little interest to the region.” There could be many surplus fish in some years. <i>Design not recommended</i>	There would be regional interest but the comparison with a wild control is critical to the supplementation evaluation. Regarding surplus production, see comment for 1A.
2A	Hatchery control, no wild control. Temporal design	Wild control replaced by temporal comparison over all supplemented populations (1 of every 4 years). Several “Cons” identified but design confounded with environmental variation. <i>Design not recommended</i>	If we accept that other representative wild habitats do not exist, then temporal designs are an interesting alternative. Confounding with environmental variation is a serious concern. See ISRP comment on an enhancement to this design (in response text).
2B	No true hatchery or wild control lines. Temporal design	Natural production in one brood year can be compared against “heavy hatchery influence” in 1 out of every 4 years. Overall, fewer hatchery-line fish would be produced. “Cons” same as in 2A <i>Design not recommended</i>	We see very little value in this design. The “wild” will simply be production from an un-supplemented year, and no hatchery control line would be maintained. Seems disruptive for little value.

DESIGN	NEW CONTROL LINES	YAKAMA COMMENTS AND RECOMMENDATIONS	ISRP COMMENTS
3A	Hatchery but comparative wild control in Naches River	Comparisons are feasible but Naches population is not considered a good representation of Upper Yakima habitat or populations. Involves development of additional sampling for traits in Naches population. <i>Design not recommended</i>	Again defer to local knowledge but these comparisons could still be very useful if targeted at a higher level of performance. For example, compare trends in overall production and annual productivity. Appropriate stock assessment programs for the Naches and American rivers should enable comparisons of adult-adult production, and possibly adult-smolt-adult production. We acknowledge that new programs may be needed. This design would be less desirable than the modified 1A or 2A.
3B	Comparative wild control with Naches only	Re-states concern for Naches comparison and acknowledges loss of hatchery information. <i>Design not recommended</i>	We see little value in this option. Significant loss of information as noted in the proposal.
4	No control lines added	Supplementation proceeds without control lines, but crosses are made to study “within-generation reaction norms.” Will only allow testing of single generation domestication effects without logistical difficulty of control lines. Precludes study of domestication over multiple generations. Need to conduct comparisons in hatchery and wild environments, and cannot likely study adult performance traits <i>Design not recommended</i>	Our interpretation of this design is that H = marked production from supplementation release, and W = unmarked return from natural production (at least one generation in the natural habitat). The design is again vulnerable to environmental impacts (single year treatment over all wild treatments), and we agree with concern about using large numbers of H origin parents. Where would wild sequestered habitats be located, and would they be replicated?
5	No controls, use of cryo-preservation of sperm	Supplementation proceeds without control lines, but crosses allow for testing multi-generation effects of domestication. Infusion of cryopreserved genes may influence domestication process understudy. <i>Design not recommended</i>	This could be an interesting study but seems high risk as the only comparison. The proposal contains several appropriate comments about the “cons”. We do not view this as an adequate study design.

DESIGN	NEW CONTROL LINES	YAKAMA COMMENTS AND RECOMMENDATIONS	ISRP COMMENTS
6	No controls	Supplementation proceeds without controls and genetic change is inferred from differences between current and historical performance. This approach is the minimally intrusive “see what happens” approach. <i>Design not recommended</i>	A “totally uncontrolled experiment” is an oxymoron. This is not a serious study design and will likely occur under any situation, anyhow!
7	Hatchery and comparative wild control in Naches River	Similar to design 4, but includes controls introduced in design 3A. <i>Design not recommended</i>	More complicated design but still only allows testing of single generation domestication effects in crossing studies. Would allow for comparative trends in supplementation and hatchery lines, and comparison with Naches production. Could be quite informative but not a critical test of supplementation.
8	Comparative wild control Naches River, NO hatchery control	Design includes aspects of 4, 5 and wild comparison of juvenile traits with Naches River population. No surplus production from Hatchery control line. <i>Design not recommended</i>	While this design allows for limited multi-generational effects, the loss of the hatchery control line is significant as noted in the proposal. We agree with the pros and cons listed in the proposal. First time that modifying the EIS for use of hatchery fish was mentioned. This likely applies to other designs as well?
9	Hatchery and comparative wild control in Naches River	<i>Recommended design.</i> Design includes aspects of 4, 5 and wild comparison of juvenile traits with Naches River population.	While this is the recommended design, we are uncertain about aspects of the description. For example, the H in the crosses is presumably the Hatchery-control line fish and the S is the supplemented production from the hatchery. There would not be any crosses with the naturalized supplemented production (i.e., the unmarked W fish in design 4). If there is a potential for release of H control fish into wild habitats, is there an EIS concern, or how would this be prevented? Would HxS crosses only be released into the hatchery slough? Further, why is there a need to conduct the SxH comparison each . . .

DESIGN	NEW CONTROL LINES	YAKAMA COMMENTS AND RECOMMENDATIONS	ISRP COMMENTS
			<p>year under this design? There would only be one comparison of multi-generational effects after about 5 generations (i.e. 15 to 20 years).</p> <p>Is this design recommended due to the ongoing SxH crosses as the core assessment study?</p>

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July 19, 2002

MEMORANDUM

TO: Mark Fritsch, Fish Production Coordinator

FROM: Rick Williams, ISRP Chair

SUBJECT: ISRP review of study design options for the Columbia Plateau proposal, Yakima/Klickitat Fisheries Project Monitoring And Evaluation, #199506325

This memo documents the ISRP's meeting on July 15, 2002 with the Yakama Nation and WDFW project sponsors to discuss unresolved issues relative to the experimental design of the proposed supplementation experiment. These issues were first identified in the ISRP's review of the project in the Columbia Plateau Provincial Review. The Council's decision on that process resulted in a second round of discussions, in which the Yakama Nation and BPA provided submittals addressing the conditions that were placed on the project by the Council. The ISRP reviewed those submittals and in a May 14, 2002 memo to Mark Fritsch identified several issues that persisted, primarily the need for the project to establish a wild control.

The meeting and the project sponsors' presentation were informative and allowed ISRP members and project participants to reach a common understanding of the design strengths and of the constraints imposed on experimental design by existing stock status, stock diversity, and local subbasin geography.

The ISRP supports the project sponsors' decision to establish a hatchery by hatchery (HxH) control line as one of the two data baselines needed to evaluate the project's results relative to the efficacy of supplementation. During the discussion, the ISRP recommended that the project sponsors consider replicating the HxH control in each of the two Cle Elum raceways that will be devoted to the HxH controls, rather than creating a single HxH control that uses both raceways (although the small number of females proposed for the HxH control likely did not justify use of a two-line approach).

With respect to the need for a wild control data baseline, the ISRP supports the project sponsors' decision to use the Naches/American chinook populations as reference wild controls. The ISRP agrees with the sponsors' judgment that the creation of a more rigorous upper Yakima basin wild control was desirable, but logistically probably untenable. The use of the Naches and American river chinook populations can serve as

wild reference controls for the supplemented upper Yakima basin chinook population in order to monitor trend data and population responses to supplementation. However, use of the Naches and American river chinook populations as wild reference controls precludes some of the fine-scale rigorous genetic comparisons as originally planned.

The ISRP recommends and understands that the project sponsors will prepare a revised proposal that describes these changes to the project's experimental design. The new proposal should fully describe the HxH control including how it will be created, maintained, and monitored to achieve the project's objectives. Similarly, the proposal needs to fully describe the Naches and American river chinook wild reference control populations, how they will be monitored, and how the collected data will be used to assess supplementation effects of the program in the Upper Yakima. Specifics about the wild reference controls that may limit the analysis or inferences should also be described.

The ISRP appreciates the Council's persistence and the project sponsors' effort in moving toward a study design that will provide a scientifically sound test of supplementation. The ISRP is available for any additional review as needed by the Council.

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August 7, 2002

MEMORANDUM

TO: Mark Fritsch, Fish Production Coordinator

FROM: Rick Williams, ISRP Chair

SUBJECT: ISRP comments on July 23, 2002 letter from WDFW regarding Amendment to the Yakima/Klickitat Fisheries Project Monitoring and Evaluation Project 199506325

This memo contains the ISRP's review of proposed changes to the study design of the *Yakima/Klickitat Fisheries Project Monitoring And Evaluation, #19950632* and describes the current status of an iterative process between the Council, the Yakima Fisheries Project (YFP) sponsors (the Yakama Nation and WDFW), and the ISRP. Scientific issues with the project's study design were first identified in the ISRP's review of the project in the Columbia Plateau Provincial Review. The Council's decision on that process resulted in a second round of discussions, in which the Yakama Nation and BPA provided submittals addressing the conditions that were placed on the project by the Council. The ISRP reviewed those submittals and in a May 14, 2002 memo to Mark Fritsch identified several issues that persisted, primarily the need for the project to establish a wild control. In response to that memo, the YFP sponsors reconsidered potential wild control streams in the Yakima Subbasin and met with the ISRP on July 15, 2002 to discuss potential wild control streams and the design for the hatchery by hatchery (HXH) control line.

The July 15 meeting allowed ISRP members and project participants to reach a common understanding of the design strengths and of the constraints imposed on the experimental design by existing stock status, stock diversity, and local subbasin geography. In a July 19 memo to Mark Fritsch, the ISRP documented its support for the project sponsors' decision to use the Naches/American chinook populations as reference wild controls and to establish a hatchery by hatchery (HxH) control line as discussed at the meeting. These two controls, if properly monitored, could establish the data baseline needed to evaluate the project's results relative to the efficacy of supplementation.

On July 23, as agreed to at the meeting, the YFP sponsors submitted a revised proposal that describes the changes to the project's experimental design. The ISRP finds that the revised design is consistent with the general discussions at the July 15th meeting, but the ISRP continues to have some concerns about the specific procedures as described in the July 23rd letter. The ISRP continues to fully support the wild and hatchery control lines as agreed for the study design but has some comments on the how they will be implemented. In particular, the ISRP has concerns about implementation of both controls, sampling guidelines, certain studies outlined to assess traits, and the apparent lack of smolt information from the wild control populations. These concerns are described below.

Significant points for consideration

- 1) The Naches basin discussion is consistent with the presentation, and we agree with its use as a “wild control”, except that we have concern about the comment on the combined sampling of American and Naches River stocks at the Cowiche Dam. The proposal is to “use the two populations collectively as a single wild control line”, except for sampling on the spawning grounds. However, the information presented suggests that the Naches tributary stocks (i.e., excluding American River) will likely be a better control at least on a demographic basis, while the comparability of the Naches and American basin environments to the Upper Yakima is unclear. What is clear is that the Naches and American stocks are mutually distinct and are also distinct from the Upper Yakima. Merging data from the Naches and American would sacrifice their potential value as independent controls, and would compromise the ability to analyze for the effects of life history differences and environmental differences as covariates. While we accept that the value of sampling for individual stocks may prove to be limited, they cannot test this assertion unless they start from the opposite premise. Sampling in the initial years should be adequate to test for differences and to then separate samples if necessary. Such a test could be conducted for 3-5 years and then a decision made on the necessity for continued sampling. If differences are significant, then protocols could be developed to separate the Cowiche samples into stocks by time period and age classes, or by marking, or by genetic analysis. The time period for sampling is not mentioned in any of their sampling outlines. To conduct this test, there should be associated efforts made to ensure random samples are collected from the American and Naches river spawning populations.
- 2) The ISRP also noted and accepts the concern expressed about generating the hatchery control lines with small initial populations sizes and, therefore, the proponents recommend one hatchery control line. But, for the same reason, we believe that initiating the stock with 30 pairs (with a resulting effective population size of about 100) is too limited for a long-term breeding study. If this control is to be “analogous” to other major hatchery stocks in the Basin, then the proper numbers of parents is likely 10+ times this. In the initial years of this control line, we believe it would much wiser to create the line by breeding many more parents and using a sub-sample of each family’s eggs or fry. For example, if 100 pairs were used and then 1,000 fry collected from each, then the effective population size would be much larger but the numbers of progeny about equal. The genetic background of the 30 pairs will be unknown and would be a very small sample of the “natural” population. The number of parents used in the hatchery control line should be comparable to the supplementation populations so that any observed differences in performance between the lines is ascribable to the treatments of interest as opposed to a rapid accumulation of inbreeding owing to flaws in design.

The ISRP had a number of comments on the tables of traits but will only comment here on the significant concerns. More general concerns are noted at the end of this response and are for the proponent’s consideration.

- 3) Pages 9-11, Traits A2-4. These “traits” are assessed based on the same samples ... and all suffer from the same problem. A target sample size of 140 fish per group will not be adequate to estimate the age by sex except with very poor precision and risk of error. The sampling issue here is that with 3 principal ages and 2 sexes, the sampling is multinomial for 6 classes or categories. A sample of 140 may be adequate to estimate the proportion of the largest class but will certainly not provide adequate precision for any of

the other classes. The investigators must re-examine these sample sizes. Further, if they do need to assess the Naches sub-populations then additional classes would be necessary at Cowiche and/or the sampling may have to be stratified by time period.

- 4) Page 14-17, Traits A7-10. These each rely on sampling 10 Naches (wild control) pairs and then 30 pairs from the other 3 lines (although we are assuming this for HC and SN since it is not stated). We seriously question the value of this work based on 10 wild control pairs. If there is significant concern for removing more than 10 pairs of Naches parents, then we suggest reassessing the need to do this work. The 30 pairs in the other lines are reasonable but what is really learned from sampling the wild control for these traits? Alternatively, it may be preferable to remove more parents for comparison but only periodically.

Any change in use of the wild control parents would influence several other trait comparisons.

- 5) Page 26, Fry-to-migrant performance in the natural environment. Now that we understand the use of a “fish tight” trap at the hatchery, we question the utility of this comparison at all. Equal numbers of unfed fry from each line would be released into an unnatural “natural” rearing environment. The oxbow slough is cut-off from the river channel and would require a “fish tight” trap at the downstream end of the channel to contain the wild and hatchery control fish. While the oxbow provides an opportunity for the study, what inferences would draw from any results and do the risks actually merit these costs? The survival of unfed fry will be very limited and value of this investment questionable. If the objective is to assess the relative survival of these lines, why not retain parr for marking by family/line (PIT presumably) and allow the fish to rear, migrate, and return naturally. Upon return, the wild and hatchery control fish could be screened out at Roza Dam to ensure that they do not compromise the lines spawning upstream.

Our final but major concern is the conspicuous lack of investigations of juveniles in the wild control populations, particularly the lack of any reference to measuring smolt production from the Naches populations. Was any consideration given to developing a downstream trapping program for Naches smolts? If PIT tags could be put on, then their recovery at Prosser could provide a population estimate of the smolt run and it could be compared later to the recovery of PIT tags in adults. One of the essential measures in these supplementation studies concerns the relative fitness of the control versus the wild spawning fitness of the treatment populations. Adult-to-adult measures of returns are of limited value since any change in adult production could have numerous causes: changes in freshwater production, variation in marine survival rates, changes in exploitation rates, etc. Given the investment in the Yakima supplementation study, the ISRP must strongly recommend that a smolt production monitoring component of the wild control line be developed and included in this evaluation.

There is a lot of money proposed for a wide variety of studies of low priority items at Cle Elum, and the estimation of wild control smolt production would be a much better use of the funds compared to several of the proposed studies.

The ISRP did not discuss the “very coarse budget” since any final consideration of budget would be contingent upon the outcome of the above points.

Additional ISRP comments for consideration by the Yakima project managers

Comments presented concerning the juvenile and adult traits are listed below, but are considered less important than the issues raised above.

- We agree with comments on cryopreservation, it could be an interesting future study.
- Page 8. Adult-Adult Survival. The data collected for this will be essentially the core information for the assessments, but we do not understand why it is a “trait”. A trait must be monitored within lines and brood years, not by return years. Further, the return rate may be a function of downstream and marine survivals that can be estimated from the PIT tag data. Ensuring that the survival data is available will be critical to their assessments.
- Page 13, A6, Spawning timing. This “trait” will be extensively influenced by environmental conditions and is more consistent with analyses of distributions than point estimates (a median). The ability to estimate either is dependent on the survey frequency of the spawners. The investigators do invest significant time in their spawning ground surveys but why aren’t the multiple survey data used as opposed to a single median date?
- Page 17, A10, Male and female fertility. Why is a 2x2 factorial design used in this study? The results will be influenced by maternal effects and does not replicate for tank effects (or rearing container). Why are only 400 eggs used, is this by isolette (4 x 400 per female or per female)? These crosses are used to assess many of the traits (and therefore overall project assessment), so some care should be given in this design.
- Page 25, Fry-smolt survival. Hatchery control fish are to be reared in two raceways. Are these split between conventional raceways and “NATURES” treatment? Why are the hatchery control fish only released from one acclimation site? Why couldn’t the hatchery control fish be released from the hatchery if only one acclimation site was selected?
- Page 30. Food conversion efficiency and condition factor. This seems more like a routine fish culture task, and we see little value in measuring it as performance trait. They cannot measure the true efficiency of individuals only the net efficiency of the entire raceway ... what does this indicate? Are differences due to line effects, raceway locations, NATURES vs. conventional, etc.?
- Page 31. Agonistic-competitive behavior. This again has the limitation noted in point 4 (above), and does not comment on what size the fish would be tested at (their performance may also vary with size). To have test animals, now also indicates the need for prolonged rearing of these fish by family. Are tanks available or new costs?
- Page 34. Incidence of precocialism in experimental tanks. How do these fish relate to the other crosses? This seems to be the same crossing design but a different use of the fish. What is the objective of this study? If you want to study precocialism, why not design the appropriate crosses, using precocial parents, and examine the genetic and environmental basis of this life history strategy? This is another large-scale study with limited background provided.