Northwest Power and Conservation Council

August 2, 2007

DECISION MEMORANDUM

TO: Council Members

FROM: Mark Fritsch, project implementation manager

SUBJECT: Follow-up action for the *Hungry Horse Mitigation/Flathead Lake*, Project 1991-019-01.

PROPOSED ACTION:

Council staff recommends that the three work elements that did not meet scientific criteria not be funded.

At the August Council meeting, staff will provide an overview of this project and seek a recommendation from the fish and wildlife committee and the Council.

SIGNIFICANCE:

The recommended expense budgets for Fiscal Year 2008, and 2009[1] will be adjusted to reflect the removal of the budgets associated with the work elements that received "*do not fund*" recommendations for those fiscal years. These adjustments equate to corrected budgets for Fiscal Year 2008 of $354,127 and Fiscal Year 2009 of $508,617[2]. The remaining Fiscal Year 2007 budget will be determined in contracting and take into account the outcome of the ISRP review for this point in the fiscal year as well as information received and to be received by Bonneville regarding the project from the Confederated Salish and Kootenai Tribes.

BACKGROUND:

[1] The budgets (FY 2007 @ $234,650, FY 2008 @ $439,460 and 2009 at $518,450) include work elements from the *Montana Focus Watershed Coordination* (Project # 1996-087-01) at $95,650 for Fiscal Year 2007, $101,460 for Fiscal year 2008, and $106,450 for Fiscal year 2009 that had been previously funded separately.
[2] Fiscal Year 2008 recommendations reflects a reduction of $85,333 and Fiscal year 2009 reflects a reduction of $10,333.

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The CSKT *Hungry Horse Mitigation/Flathead Lake* project mitigates the impacts of Hungry Horse Dam on downstream aquatic environments within the Flathead Indian Reservation. It includes components of monitoring, research, and implementation.

The Council transmitted project-specific recommendations to the Bonneville Power Administration in October 2006. In making its recommendations, the Council provided comments on certain projects as a condition to funding. These comments generally addressed concerns raised by the Independent Scientific Review Panel (ISRP) in their final recommendation of proposals submitted for Fiscal Years 2007-2009 (ISRP document 2006-6). The Council comment for the CSKT *Hungry Horse Mitigation/Flathead Lake* project as presented in the final decision document stated the following.

> *"Funding contingent on ISRP and Council review of revised proposal. Revised proposal due end of December, 06."*

On February 9, 2007 the Council received Bonneville's implementation plan for the Fish and Wildlife Program during Fiscal Year 2007 - 2009. As part of this decision, Bonneville requested that the project funding also be contingent on favorable ISRP review and recommendation. Also to fulfill the Council's funding condition, Bonneville provide transitional funds during this review period[3].

On January 2, 2007, the Council received the CSKT response to these concerns, and on February 22, 2007 the ISRP provided a preliminary review of the submittal. The preliminary review requested additional information from the sponsor prior to making a final recommendation. As a follow-up to this request the ISRP and the CSKT held a teleconference on March 30, 2007 to discuss the ISRP's comments. On May 25, 2007 the council received the revised narrative from CSKT intended to address the preliminary review by the ISRP.

On June 20, 2007 the Council received the final review (ISRP document 2007-7) from the ISRP related to the CSKT's project 1991-019-01 (see attachment 1). The ISRP's final recommendation stated "Meets Scientific Review Criteria In Part (qualified).

On July 25, 2007 the Council received a letter from CSKT addressing the final review of the project by the ISRP. The letter reflected on the history of the exchanges with the ISRP during this review period and expressed concern regarding the ISRP's opinions and inconsistencies.

ANALYSIS:

The final review by the ISRP states that the proposal continues to be insufficient due to the lack of a scientifically sound approach to resolve the problems being addressed by the proposal. Specifically, the ISRP determined the following three work elements did not meet scientific review criteria.

[3] $50,000 provided for expense.

- Inventory population status and habitat associations of western pearl mussel @ $31,000 FY ’07-‘09
- Conducting fishing contests for lake trout @ $62,000 FY ‘07
- Remove brook trout from westslope cutthroat trout streams @ $75,000 FY ‘08

In addition, the ISRP provided a qualified recommendation regarding the work element associated with “*reconstruct degraded stream channels.”* The ISRP suggests that this work element be revised to demonstrate trends in ecological conditions.

The letter from CSKT raises concerns regarding ISRP inconsistencies during the review period. It is important to note that this project received more opportunity with the ISRP than the majority of projects reviewed as part of the FY 2007 - 2009 solicitation and that the review is viewed as one and not several. In addition, though the sponsor indicate that the ISRP seemed to raise new concerns during this review, concerns and issues raised by the ISRP all stem from the initial issues raised. The review stemmed from a conditional funding recommendation for a revised proposal. This revised proposal as it evolved began to clarify and provide assurance to the review panel that the project was demonstrating progress towards their objectives based on the long history of the project. In so doing this, items were raised and addressed based on the specific input received by the ISRP so that understanding that the overall objectives and proposed actions of the project can be accomplished.

With this most recent review the ISRP completed their fourth and final response related to the original project proposal associated with the Fiscal Year 2007 - 2009 solicitation. Based on this review the ISRP, and the Council staff believes that the work elements that currently do not meet scientific review criteria should not be funded. In addition, the remaining issue addressing prioritization and ecological trends be addressed in contracting. In removing the three work elements from the proposal and addressing the additional work element in contracting the sponsor has adequately addressed the Council’s funding condition.

Attachment 1. ISRP review of the Confederated Salish and Kootenai Tribes' *Hungry Horse Mitigation/Flathead Lake*, Proposal 1991-019-01.

Independent Scientific Review Panel
for the Northwest Power & Conservation Council
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Memorandum (ISRP 2007-7) **June 20, 2007**

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

From: Eric Loudenslager, ISRP Chair

Subject: ISRP Review of the latest revision of the FY 2007-09 proposal 199101901 (dated 05/25/07), Hungry Horse Mitigation/Flathead Lake

Background

This is the ISRP's fourth review related to the Confederated Salish and Kootenai Tribes' project 199101901 (*Hungry Horse Mitigation/Flathead Lake)* as part of the FY 2007-09 project selection process. Prior to this memo the ISRP has reviewed three versions of the FY 2007-09 proposal: (1) a preliminary review of the original proposal (dated 01/10/06), (2) a subsequent final review of the proposal considering project sponsor responses to our preliminary comments, and (3) at the request of the Northwest Power and Conservation Council (Council), a review of a second revision of the FY 2007-09 proposal (dated 12/11/06) was provided by the ISRP in our memo dated 02/22/07.

The revised proposal (version 3, dated 05/25/07) is available at: www.nwcouncil.org/library/isrp/isrp2007-7.htm. Other supporting documents, the original proposal, the original ISRP reviews, and the Council recommendation can be found at: www.cbfwa.org/solicitation/components/forms/Proposal.cfm?PropID=549.

In our last review of the proposal, in a memo to the project sponsors dated 02/22/07, we asked for a more complete accounting of accomplishments to date considering the long running history of the project. Additionally, we asked that the response address the following:

(1) In the background section, additional information is needed to more specifically identify the types of habitats to be restored, why particular sites were selected in the context of watershed limiting factors, and the focal species to be recovered.

(2) More detail is needed describing how this project coordinates with several closely related projects and how, in the aggregate, these projects address critical issues in this part of the Flathead Basin.

(3) The supplement providing project results can be incorporated into the proposal narrative (to be consistent with other proposals), but we emphasize that we are interested in ecological outcomes in addition to a description of restoration activities.

(4) The objectives need to be better organized, prioritized, and related to the subbasin plan. The long-term goals of the project also need to be stated, including timelines.

(5) The methods need much more detail (including response metrics) to demonstrate that the projects are using best or most reasonable techniques to determine if restoration objectives are being adequately addressed.

(6) An expanded description of the fisheries and habitat monitoring and evaluation program, with an appropriate level of detail.

For clarification of the above recommendations the project sponsors requested a teleconference call. The ISRP agreed to this request, and on March 30th, 2007, the ISRP and the project sponsors from the Confederated Salish & Kootenai Tribes held a teleconference to discuss how the project sponsors could most effectively revise their proposal in response to the ISRP's comments. Eric Loudenslager, Tom Poe, Pete Bisson, Jack Griffith, and Erik Merrill (coordinator) participated for the ISRP. Kerry Berg participated for the Council, and Barry Hansen led the discussion for the project sponsors. Informal notes from the discussion (see attached notes) were provided to the project sponsors to assist them in revising their proposal.

Summary

ISRP Final Recommendation: Meets Scientific Review Criteria In Part (qualified)

Comment: In their revised proposal, which is the subject of this memo, the project sponsors partially responded to some of the above ISRP recommendations, but overall did not significantly improve other key parts of the proposal. The ISRP emphasizes that the proposal continues to be insufficient in that it lacks a clear statement of a problem and an outline to resolve that problem that is both quantified and scientifically justifiable.

The ISRP concludes that Objective 2 related to using angling to harvest lake trout in an effort to reduce lake trout impacts on westslope cutthroat and bull trout in Flathead Lake is rated *Does Not Meet Scientific Review Criteria*. The latest proposal still fails to acknowledge efforts to achieve similar objectives in other areas of the region. For example, the original proposal did not mention attempts to control lake trout in Yellowstone Lake and Lake Pend Oreille, which show how difficult (perhaps impossible) it is to reverse a lake trout invasion in systems with *Mysis*, and that harvest from recreational angling alone will not be adequate. The sponsors partially responded to the ISRP's request to develop the rationale that the ongoing effort to reduce lake trout numbers via the fishing derbies might overcome the compensatory ability of the surviving lake trout. Sponsors provided a modeling exercise that demonstrated that increased harvest could reduce the lake trout population. Unfortunately, the lake trout population has not been reduced by angling, and the angling efforts have not yet achieved a sufficient harvest. Further, the sponsor did not provide a rationale that this reduction would in turn provide a quantifiable increase in abundance of westslope cutthroat or bull trout.

Objective 2, work element 4 -- Remove brook trout from westslope cutthroat trout streams needs to be more specific before it is scientifically justifiable. Similar to lake trout reduction by angling, there is variable success with brook trout removal. The rationale for specific streams needs to be fully developed as part of a broader westslope cutthroat trout rehabilitation effort.

The ISRP suggested that the lake trout monitoring might be justified if shown to be part of a long-term fisheries plan for Flathead Lake, and funding for the fishing derbies might be justified if linked to a larger lake trout removal effort. The sponsors did not respond to these suggestions. Consequently, Objective 1, the Flathead Lake fishery monitoring work elements is rated *Does Not Meet Scientific Review Criteria*.

Objective 3 -- Replace lost angling opportunity with hatchery-reared fish released in irrigation reservoirs is rated *Meets Scientific Review Criteria*.

Objective 4 -- The plan to investigate populations of western pearlshell mussels is insufficiently detailed to judge its scientific merits. Although a mussel sampling program is apparently underway, no information on the five populations was given, habitat relationships were not described, and criteria for reintroducing this species were not presented. Consequently, the mussel objectives and work elements are not scientifically justified and are rated *Do Not Meet Scientific Review Criteria*. Scientific and technical background related to western pearlshell mussels needs to be developed in section B, rather than first appear as an objective.

Objective 7 -- Tributary stream habitat improvement in class 2 and 2.5 streams is rated *Meets Scientific Review Criteria (qualified)*. The qualification is that from the proposal the ISRP cannot establish a quantifiable benefit to target fish populations and their habitats. This issue should be addressed by Council and BPA in contracting, or to the ISRP in a document addressing this single element. In this revised proposal the sites and watersheds where tributary habitats would be restored are not identified on a map. The ISRP suggested that support for the stream habitat work could be justified if shown to be part of a well developed and prioritized restoration program, or that the sites could be specifically linked to habitat restoration objectives in the subbasin plan. Currently, the habitat restoration is being monitored almost exclusively with photo-point documentation. Additional metrics that represent trends in ecological conditions are also needed. These can be very simple, based on the Flathead watershed assessment and subbasin plan. The sponsors did not respond to this suggestion. What the ISRP is asking for is a more specific set of habitat objectives, a clear rationale that the sites selected for restoration are justifiable in terms of correcting factors that limit fish populations, and a strengthened effectiveness monitoring plan (the implementation monitoring presented in the proposal was satisfactory). The effectiveness monitoring component should be sufficient to detect quantifiable habitat improvements and increases in fish populations or expanded distributions.

Specific Review Comments

A. Abstract

A general point is that the proposal continues to be an insufficient summary of the scientific basis for the proposal in that it lacks a clear statement of a problem and an outline to resolve that problem that is both quantified and scientifically justifiable. As an example of this deficiency, the abstract does not describe a focal species, an explicit biological objective for the focal species, limiting factors for the focal species, and methods to reduce those limiting factors with some sort of timeline for achieving the goals of focal species abundance. Instead, the abstract provides a narrative summary of the project's past work and the tasks planned for the FY 2008 and FY 2009 periods.

B. Technical and/or scientific background

The latest revision adds one paragraph that identifies the focal species to be recovered and generally gives reference to locations/habitats given priority for restoration in the Flathead River Subbasin Plan (the proposal refers to page numbers in the plan). However, this section does not go far enough in providing the details of the proposed tasks in the context of achieving the objectives for the focal species, the subbasin plan, or the Hungry Horse mitigation plan. This section states that the focal species are westslope cutthroat trout and bull trout, and that the project is attempting to address the loss of habitat (quantity and quality) in the interconnected Flathead watershed owing to Hungry Horse Dam impounding the river. However, it does not provide the quantitative assessment (either in stream length, fish numbers, or fish communities) that forms the basis of the Hungry Horse Mitigation agreement. It does not provide any indication of how much of that loss is covered by this proposal or related proposals. This section does not describe the solution this proposal will provide to improving environmental conditions for focal species.

The revised proposal provides some information on class 1, 2, 2.5, and 3 streams and their relationship to restoration potential and proposed actions. But the appropriate scale and context for the tasks are missing. How many kilometers of class 1 tributary streams are there? How many kilometers of class 2 and 2.5? How many kilometers of class 2 and 2.5 streams need to be improved to class 1 to achieve the subbasin objectives and Hungry Horse Mitigation agreement objectives? What specific tasks are being proposed under this proposal and timeframe (FY 2008/09)?

C. Rationale and significance to subbasin plans and regional programs

This section of the revised proposal is exactly the same as the last version, so previous ISRP comments remain unchanged; "The proposal identifies several limiting factors from the Flathead River Subbasin Plan and indicates that the project is addressing these factors in a general way. In the previous section of the proposal the sponsors also indicate how this project addresses the 1994 Fish and Wildlife Program (Section 10.1). The Flathead subbasin plan actually contains very little about Flathead Lake and the lake trout/kokanee reintroduction issue, which are key elements in this proposal."

D. Relationships to other projects

This section of the proposal has been revised to indicate ***how*** this project interacts with other projects, which is an improvement over the last version. However, indication of data sharing and how M&E is coordinated is still lacking.

E. Project history

This section of the revised narrative has been significantly improved and is now adequate. In response to our earlier recommendation, the sponsor revised the Project History section and incorporated the project results supplement that was provided in the last review iteration. As we indicated in our last review, the material provided in the supplement was helpful and enabled a better understanding of work to date. However, it reinforces our perception that (a) critical improvement is needed in prioritizing elements of a program that will have the most benefit for native species, and (b) better M&E is needed for some program elements – not a complete range of M&E for every activity, but at least systematic photopoints, quantification of the length of stream improved or miles of new habitat made available, with some before/after fish monitoring on a subset of the sites. One ongoing task is the evaluation of offsite fish planting, but no methods are described nor results given. Another ongoing task is to "mimic natural beach formation." The ecological justification for this type of habitat improvement project, and how it fits with Fish and Wildlife Program goals, should be provided. Graphs would be more useful if they included more indication of the data variability (range, etc.) where appropriate.

F. Proposal biological objectives, work elements, and methods

Objectives - This section still remains the major weakness of this proposal, although some improvements have been made since the last version. The major revision is the addition of a background section following each Objective. This is useful material but most appropriately, belongs in Section 1 – Technical and Scientific Background.

As requested by the ISRP there is a detailed demographic explanation to justify using angling as a method of lake trout reduction. There are two components of this effort (using angling and fishing contests) that the ISRP finds inconsistent with ISRP review criteria. The first is the acknowledgement by the project sponsor that to date angling has not worked to the extent that the lake trout population has not decreased. Further, by angling, the harvest target has not been achieved. So, even if the demographic modeling exercise is correct, executing the population abundance reduction through angling has not been successful. This is disappointing, but not surprising. More troubling to the ISRP however, is the statement on page 36: "Step 5: We determine the harvest necessary to increase the mortality rate that will reduce the theoretical population from 0.32 to 0.50. Although we do not know the specific mortality rate that will reduce the Flathead population, there are many examples of populations with mortality rates of less than 0.50 that are sustainable (Payne et al. 1990)." It is not entirely clear what sustainable refers to in this statement – to the lake trout population or to the lake trout fisheries. In either case, it seems odd to the ISRP that on the one hand the sponsors are trying to reduce the abundance of lake trout to improve the status of westslope cutthroat and bull trout but at the same time trying to maintain a sustainable lake trout population (or fishery). Finally, this section does not indicate what level of depression of the lake trout population is needed to facilitate recovery of the westslope cutthroat and bull trout populations.

Most ISRP comments from the last review still apply. The first two paragraphs of this section are the same as the last version and attempt to give an overview and organization to the objectives but remain confusing. Many of the objectives are also stated as broad goals (i.e., Objectives 3, and 5 – 11) and need to be re-stated as biological objectives that are more specific and measurable. The project actions can then be better related to benefits for fish and wildlife. A majority of the objectives are wide ranging, center mostly on general habitat restoration goals, and are a bit too general to be of real use. They could be re-stated using the habitat restoration material in the supplement.

Methods - The methods for many objectives have been added but are so generally described (i.e., what will be done instead of how) that the reader is uncertain if the techniques to be employed will meet any standards. Metrics are lacking, with the exception of photopoint comparisons.

Monitoring and Evaluation – This section is unchanged. The brief paragraph describing M&E is very inadequate and non-specific to the objectives. The sponsors state that, "We employ a broad and lengthy list of monitoring and evaluation procedures to determine the biological results of our activities." Details regarding these M&E procedures are what the ISRP needed to see.

More than $500,000 was budgeted for subcontracts in 2007-09. The nature of that work was inadequately identified and not sufficiently justified.

G. Key personnel, facilities, and equipment

Project personnel appeared to be qualified, but their resumes lack detail. Facilities and equipment were only briefly mentioned with little description of their capacity to enable efficient task completion.

H. Information Transfer

In-house progress reports and reports to BPA are the primary sources of information transfer.

I. Benefits to Fish and Wildlife

There may be both short-term and long-term benefits to fish and wildlife, but better documentation with measurable data is needed to determine this.

Notes on ISRP teleconference with Confederated Salish & Kootenai Tribes on proposal 199101901, Hungry Horse Mitigation/Flathead Lake

On March 30th, the ISRP and the project sponsors from the Confederated Salish and Kootenai Tribes for project 199101901 held a teleconference to discuss how the project sponsors could most effectively revise their proposal in response to the ISRP's comments. Eric Loudenslager, Tom Poe, Pete Bisson, Jack Griffith, and Erik Merrill (coordinator) participated for the ISRP. Kerry Berg participated for the Council, and Barry Hansen led the discussion for the project

sponsors. These informal notes are provided to assist the project sponsor as they revise their proposal.

Revised proposal timeline. As a point of process clarification, the ISRP's review memo characterized the Council's recommendation as "the Council recommended partial funding for FY 2007 but made FY 2008-09 funding contingent on ISRP and Council review." However, the Council's recommendation was "Funding contingent on ISRP, Council review of revised proposal. Revised proposal due end of December, 06." Barry should talk with Mark Fritsch and his BPA COTR on the timing for the review. The assumption is that the revised proposal and ISRP review should be complete by the end of May 2007.

Level of detail. Barry Hansen opened the discussion and described the difficulty in finding the right balance between providing too little or too much information in a broad proposal that addressed many problems. Barry's strategy was to keep it simple so the proposal doesn't get too lengthy. Barry described that the Tribes' general approach to the proposal was to describe all potential impacts addressed (and a hydrosystem mitigation responsibility) but then submit a modest proposal to BPA. They use BPA funding to augment other funding. The ISRP said the proposal should clearly describe what elements are fully or partially supported by Bonneville.

In general, the ISRP advised to not be overly concerned about making the proposal too long. (The proposal form instructions states that projects/programs pursuing multiple strategies should be able to provide sufficient detail in 25 pages.) The proposal should contain a consistent level of detail on stating the objectives clearly, describing the methods concisely, and describing how the results will be monitored and evaluated in relation to the objectives. The proposal needs sufficient detail, but every measurement made to arrive at a conclusion is not needed. For example, the description on why they aren't pursuing kokanee restoration was sufficient.

Results reporting. Barry asked whether the last submittal adequately covered this issue. The ISRP acknowledged the progress made on results reporting in the Supplement, but for the next revision request that the results need to be interpreted on how they met their objectives. This can be done fairly easily. An example might be: harvest was increased by "x" amount, but it doesn't appear that the Lake Trout population has decreased; in fact, the Lake Trout population estimates have increased/remained within "x" range. The results reporting needs to be incorporated into the project history section of the narrative.

Road decommissioning and action effectiveness monitoring – as an example. Barry raised the issue of what constitutes adequate monitoring. They are pretty intent on road decommissioning, but they don't do baseline sediment monitoring. They don't feel that this would be a good use of the funds. The ISRP said the proposal needs to describe some sort of assessment of why the site was selected for decommissioning and some post action monitoring to show that it was effective. There needs to be evidence that the areas where roads are decommissioned are thought to have restoration potential to improve the productivity for the focal species. This can be established in the background section and the relationship to the subbasin (or other) plan. For example the subbasin plan should identify the stream as a high priority location for restoration, and perhaps a westslope cutthroat or bull trout management plan will identify the location as one with high potential. The ISRP agreed sediment monitoring can be tough, but suggested the sponsors shouldn't give up on the notion of effectiveness monitoring.

For example, some simple things like pool frequency and embeddedness may be informative. Moreover, it is helpful to reviewers if the proposal explains the logical link from the limiting factor (sediment) to the action (road decommissioning).

Barry said his reading of the literature says that road decommissioning is a good thing. The actions are inherently constructive. When you sample, the variability overwhelms the data. For example, one restoration action they propose is to replace/modify a hanging culvert to reconnect two isolated cutthroat trout populations. The objective is to increase the long-term viability of the population which is hard to measure. The ISRP thought describing this should be quite easy and the objective of increasing long term population viability was a good one.

The ISRP 2006 Retrospective Report contains a section on habitat monitoring and evaluation that should be useful in the revision (ISRP 2007-1: www.nwcouncil.org/library/isrp/isrp2007-1.htm).

Specific points for clarification from the last ISRP memo. The ISRP and project sponsor went through the ISRP's memo point by point.

(7) In the background section, additional information is needed to more specifically identify the types of habitats to be restored, why particular sites were selected in the context of watershed limiting factors, and the focal species to be recovered.

Discussion: Barry asked, is this for each work element? The ISRP said the background should describe the problem and the proposed solution to the problem. Identification of the focal species should be up front, for example, recovery of bull trout and westslope cutthroat. Reference to findings in the Supplement, as applicable, would be useful. The ISRP suggested taking two or three key actions and providing good justification for those. The background should lay the foundation for all that follows. It needs to describe the geographic scope of the proposal, Flathead Lake, portions of the Flathead River, and tributaries that are on tribal lands. It needs to identify the focal species, their historic, and current status, and desired restored status. It needs to identify the limiting factors that impede achieving the restored status under the current environmental conditions. It needs to identify the strategies that will be employed to address the limiting factors. It needs to provide scientific justification that the strategy has a reasonable chance for success. For example, if bull and westslope cutthroat trout are focal species in decline in Flathead Lake and predation by lake trout is the limiting factor, and lake trout removal is the strategy, and angling is the proposed method, then evidence needs to be provided on the size of the lake trout population, the numbers that need to be removed, and evidence that angling has the potential to achieve the reduction.

(8) More detail is needed describing how this project coordinates with several closely related projects and how, in the aggregate, these projects address critical issues in this part of the Flathead Basin.

Discussion: Barry said he had the information to address this request.

(9) The supplement providing project results can be incorporated into the proposal narrative (to be consistent with other proposals), but we emphasize that we are interested in ecological outcomes in addition to a description of restoration activities.

Discussion: The Council's recommendation called for a revised proposal, and the ISRP agreed this was needed. The ISRP suggested losses from Hungry Horse dam (1991) be put in the perspective of improvement to bull trout and westslope cutthroat populations. An example could be the culvert removal described above -- the biological objective is persistence of westslope cutthroat trout in that stream.

(10) The objectives need to be better organized, prioritized, and related to the subbasin plan. The long-term goals of the project also need to be stated, including timelines.

Discussion: Barry said he could address this request.

(11) The methods need much more detail (including response metrics) to demonstrate that the projects are using best or most reasonable techniques to determine if restoration objectives are being adequately addressed.

Discussion: The ISRP said some details are needed on the monitoring actions, for example, the macroinvertebrate work. The ISRP suggested if there are preliminary results, they should be presented. This will give the ISRP some confidence the monitoring and evaluation is working.

(12) An expanded description of the fisheries and habitat monitoring and evaluation program, with an appropriate level of detail.

Lake management. The ISRP said they had a general request for the proposal to clarify and justify the program/actions on the lake. Is this a long-term program?

Barry explained that lake trout were introduced in 1905. By the late 1980s Mysis shrimp stimulated an explosion of lake trout that completely changed the lake ecosystem including the demise of the kokanee populations. The kokanee supported a strong local fishery as well as bald eagle populations. The public called for kokanee enhancement, but the mechanisms weren't understood. The kokanee could not be restored. By 1998 native trout such as bull trout were in serious decline. Research indicated that lake trout were controlling the populations of the other fish, so they focused on lake trout reduction. They created a program in cooperation with Montana Fish Wildlife and Parks. They're committed to testing lake trout reduction through angling. They don't have evidence that this will or won't work.

The ISRP noted that the evidence from Idaho is that angling is not adequate to control lake trout. Barry said he was aware of this and that in Idaho they have jumped into netting, and other take methods. Idaho has had expanded lake trout populations for several decades, but the lake trout domination of the Flathead Lake fish community is more recent.

Barry added that the Tribes have made substantial progress expanding harvest and participation from 300 anglers in 2006 to 900 in 2007. They are sensitive to the fact that they haven't shown results on lake trout reduction, but the program is experimental and they have modeled a harvest target. They acknowledge that compensation is a concern. They are four years into the program. They first want to see if angling works before pursuing alternative strategies. This will be a test case for other areas in the Columbia River Basin.

The ISRP suggested that the proposal needs to describe the modeling that has been done: what the population is (lake trout biomass), what it needs to be reduced to, what angling is needed to achieve this reduction, and what the native trout response is. These basic problems and goals need to be concisely laid out. The models and methods used to assess the problem need to be described. The information described in this discussion was not in the proposal but is just the sort of information needed in the proposal.

Land acquisition. For land acquisition, the proposal needs a description of the criteria for purchase. If properties have been selected for purchase they should be identified and a description provided. The Tribes had described this in other projects and can summarize in the revised proposal.

Notes by Erik Merrill and Eric Loudenslager, April 5, 2007.

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Northwest Power and Conservation Council

August 2, 2007

MEMORANDUM

TO: Council Members

FROM: Mark Fritsch, project implementation manager

SUBJECT: Update on the Lake Roosevelt Kokanee Program Review

PROPOSED ACTION:

At the August Council meeting, staff will provide an update regarding the programmatic review of the kokanee production projects in Lake Roosevelt, Washington. This programmatic review was part of the Fish and Wildlife Project Funding Recommendations for Fiscal Years 2007 through 2009.

BACKGROUND:

The Council made its final Fiscal Year 2007 - 2009 project funding recommendations to Bonneville at its October 2006 meeting. In making its recommendations, the Council provided comments on certain projects as a condition to funding. These comments generally addressed concerns raised by the ISRP. A suite of Lake Roosevelt projects related to kokanee production received ISRP recommendations of "fundable in part." As part of the Council's October decision document the Council stated:

> *Kokanee production -- Spokane Tribal Hatchery (199104600); Sherman Creek Hatchery (199104700); Chief Joseph Kokanee Enhancement (199501100); Ford Hatchery (200102900) (all in the Intermountain Province); and Banks Lake Fishery Evaluation Project (200102800; Columbia Plateau Province). The ISRP rated a number of these production projects as "fundable in part," raising concerns about the level and methods for ongoing and proposed kokanee production. Responsive to the ISRP's concerns, yet seeking to continue consideration of kokanee production as a priority in the Intermountain plan, the*

> *Council's funding recommendation requires the project sponsors to hold a review workshop on kokanee production with the ISRP as soon as practical. The Council recommends that the funding for the kokanee production elements continue in FY 2007. The Council will revisit the funding recommendation for FY 2008 and 2009 following the workshop. In addition, the artificial production elements of the Chief Joseph Kokanee Enhancement project proposal trigger the Council's step review process.*

In addition to this programmatic language, the Council provided project-specific language in the comment field associated with the recommended budgets for the projects.

- *Spokane Tribal Hatchery* (1991-046-00) ISRP fund in part: funding continues but part of funding contingent on outcome of a workshop with the ISRP to address ISRP concerns. Intermountain Province Oversight Committee reduced by $100,000 FY07, result of housing cost reduction.
- *Sherman Creek Hatchery* (1991-047-00) ISRP fund in part: funding continues but part of funding contingent on outcome of a workshop with the ISRP to address ISRP concerns
- *Chief Joseph Kokanee Enhancement* (1995-011-00) ISRP fund in part: funding continues but part of funding contingent on outcome of a workshop with the ISRP to address ISRP concerns. If project sponsor decides to pursue artificial production (Obj. 1, work element 3) then implementation is dependent upon favorable step review.
- *Ford Hatchery* (2001-029-00) ISRP fund in part: funding continues but part of funding contingent on outcome of a workshop with the ISRP to address ISRP concerns.
- *Banks Lake Fishery Evaluation Project* (2001-028-00) Include project in review of kokanee projects through kokanee workshop. Funding to be identified and contingent on outcome of workshop. Consider moving the project to the Intermountain province[1]

On February 9, 2007 the Council received Bonneville's implementation plan for the Fish and Wildlife Program during Fiscal Year 2007 - 2009. As part of this decision, Bonneville requested that the project funding also be contingent on favorable ISRP reviews and recommendations.

In order to meet a requirement of the Council's FY 07-09 funding recommendations, the Lake Roosevelt Kokanee Workshop was held on May 2 and 3. Participants in the workshop included representatives from the ISRP, Spokane Tribe, Colville Confederated Tribes, WDFW, BPA, EWU, and the Council. The workshop included both site visits and sponsor presentations. In addition to the work shop, the Council asked the ISRP to clarify some unresolved issues:

- Will the Lake Roosevelt and the Banks Lake kokanee programs benefit fish and wildlife?
- Are the different kokanee projects based on sound science principles? What alternatives could be considered?
- Are the objectives associated with the kokanee program in Lake Roosevelt and Banks Lake clearly defined with adequate provisions for monitoring and evaluation of results? What is the timeline for expecting results?

[1] The Council did not recommend this project for funding, and Bonneville provided funds in FY 2007 ($134,064) for project closeout and final report writing.

On July 18, 2007 the Council received the final review (ISRP document 2007-10) from the ISRP of the Lake Roosevelt Kokanee Program (see attachment 1).

The ISRP's final review concluded that there continues to be no scientific justification to continue the production of kokanee for stocking Lake Roosevelt or programs associated with naturally produced kokanee. The ISRP does qualify this recommendation with the understanding that if the current environment of Lake Roosevelt is altered to address the entrainment problem, walleye population, and reservoir drawdown levels, then artificial production and/or support of natural production of kokanee could be re-initiated.

Attachment 1. ISRP review of the Lake Roosevelt Kokanee Program.

Independent Scientific Review Panel
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Lake Roosevelt Kokanee Program Review

ISRP 2007-10
July 18, 2007

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ISRP Lake Roosevelt Kokanee Program Review

Contents

ISRP Lake Roosevelt Kokanee Program Review

Background

This ISRP review considers the following FY 2007-09 proposals:

- Spokane Tribal Hatchery (199104600)
- Sherman Creek Hatchery (199104700)
- Chief Joseph Kokanee Enhancement (199501100)
- Ford Hatchery (200102900) (all in the Intermountain Province, Lake Roosevelt) and
- Banks Lake Fishery Evaluation Project (20010280, Columbia Plateau Province)

In its review of the FY 2007-09 Lake Roosevelt proposals, the ISRP rated the kokanee propagation portions of the proposals "not fundable" (does not meet scientific criteria). The ISRP was concerned with the lack of success of kokanee actions given the significant limiting factors for kokanee in Lake Roosevelt, namely entrainment and predation. However, the ISRP recommended that the projects' continued redband and triploid rainbow production was "fundable" (meets scientific review criteria).[2] For the Banks Lake proposal, the ISRP had serious concerns about trying to manage for kokanee in a lake with high abundances of walleye and bass but found that the project justified continued testing of the kokanee effort.

Taking into account the ISRP's recommendation, yet considering the Intermountain Subbasin Plan's prioritization of kokanee production, the Council's funding recommendation required that the project sponsors hold a kokanee production workshop with the ISRP. The Council recommended that the funding for the kokanee production elements continue in FY 2007 but the funding recommendation for FY 2008 and 2009 would be revisited following the workshop. The project sponsors organized and held the Lake Roosevelt Kokanee Workshop on May 2 and 3, 2007 (see Appendix). Participants in the workshop included representatives from the Independent Scientific Review Panel (ISRP), Spokane Tribe, Colville Confederated Tribes, Washington Department of Fish and Wildlife, Bonneville Power Administration, Eastern Washington University, and the Council. The workshop was well organized and informative including both site visits and sponsor presentations.

Based in part on the results of the workshop, the Council intends to resolve a broader policy and programmatic issue associated with funding recommendations for the suite of Lake Roosevelt kokanee production projects. To facilitate this effort, the Council asked the ISRP to clarify some unresolved issues:

1. Will the Lake Roosevelt and the Banks Lake kokanee programs benefit fish and wildlife?
2. Are the different kokanee projects based on sound science principles? What alternatives could be considered?
3. Are the objectives associated with the kokanee program in Lake Roosevelt and Banks Lake clearly defined with adequate provisions for monitoring and evaluation of results? What is the timeline for expecting results?

[2] www.nwcouncil.org/library/isrp/isrp2006-6.pdf; Lake Roosevelt see pages 603-610; Banks Lake see page

ISRP Findings

Summary

The ISRP concludes that there is no scientific justification to continue artificial production of kokanee for stocking Lake Roosevelt or programs to develop and support naturally produced kokanee. However, the ISRP believes that if it could be conclusively demonstrated that the entrainment problem was controlled or significantly reduced, if the walleye population was significantly reduced and managed, and if drawdown levels were reduced or managed, then artificial production and/or support of natural production of kokanee could be re-initiated. As stated in our final FY 2007-09 recommendations, the kokanee production for experimental stocking in Banks Lake (where the aforementioned limiting factors are less severe) is justified.

Answers to Council's Questions

1. Will the Lake Roosevelt and the Banks Lake kokanee programs benefit fish and wildlife?

Unfortunately, there has been a significant lack of success in producing both a tribal and recreational fishery for kokanee salmon. The results reported by the kokanee program's experimental monitoring and evaluation efforts have documented that lack of success. Two major factors appear to be limiting this success: entrainment of large numbers kokanee through Grand Coulee Dam (particularly following the initiation of operations of the third powerhouse) and predation by walleye (whose population has increased significantly over the past eight years and now supports the major fishery in Lake Roosevelt). In addition, spring drawdowns have been significant in the past several years and have severely impacted kokanee spawning potential and natural production in the lower reaches of the tributaries.

Consequently, the ISRP concludes that there is no scientific justification to continue artificial production of kokanee for Lake Roosevelt or programs to develop and support naturally produced kokanee. However, kokanee production for experimental stocking in Banks Lake (where the aforementioned limiting factors are less severe) is justified. Based on the empirical evidence from Lake Roosevelt - a reduction in kokanee abundance from that observed in the 1960s and poor survival from at least fifteen years of hatchery stocking - the ISRP believes it would be erroneous to conclude that achieving success with this effort is just around the corner. What is being achieved now is what is likely to continue until major changes occur in reservoir operations and predator population management.

2. Are the different kokanee projects based on sound science principles? What alternatives could be considered?

The original assumptions for selecting kokanee for mitigation were sound. These assumptions included the belief that the reservoir had sufficient biomass of forage (large zooplankton and fish) to support several million kokanee; that survival from hatchery release to maturation would be sufficient to provide harvest and returning adults to maintain the hatchery production; and that

the capacity and productivity of the reservoir and tributary streams would be sufficient to either establish, or reestablish, natural kokanee production.

In recent years there has been a significant lack of success in managing for both a tribal and recreational fishery for kokanee salmon, because of the major limiting factors associated with entrainment, walleye predation, and drawdown.

The ISRP believes that if it could be conclusively demonstrated that the entrainment problem was controlled or significantly reduced, if the walleye population was significantly reduced and managed, and if drawdown levels were reduced or managed, then artificial production and/or support of natural production of kokanee could be re-initiated.

3. Are the objectives associated with the kokanee program in Lake Roosevelt and Banks Lake clearly defined with adequate provisions for monitoring and evaluation of results? What is the timeline for expecting results?

The kokanee component of the Lake Roosevelt projects has yet to establish explicit post-release biological objectives. Further, the projects have yet to establish a timeline and decision path to determine when to continue or discontinue the efforts to produce a kokanee fishery using artificial production.

The states of Idaho, Oregon, Washington, California, Wyoming, and Colorado have kokanee production programs where kokanee adults in lakes or reservoirs provide eggs for hatchery production that supports angling in reservoirs. Many of these states have established monitoring programs to evaluate the suitability of individual reservoirs for fishery production using stocked hatchery kokanee. If future environmental and ecological conditions become suitable for re-introduction of kokanee, the Lake Roosevelt co-managers should consider the methods used in these other regions to establish an effective monitoring program for evaluating kokanee in Lake Roosevelt, and to establish reasonable yield to harvest from the production and stocking of hatchery kokanee. This routine monitoring should produce metrics similar to the Fall Walleye Index Netting, which can serve as a baseline to evaluate kokanee production and yield.

In addition, the proposal and project, do not appear consistent with and fully address the Policy guidelines for artificial production developed in the Artificial Production Review (NWPCC 99-15). Specifically:

- Policy 1. The manner of use and the value of artificial production must be considered in the context of the environment in which it will be used;
- Policy 3. Hatcheries must be operated in a manner that recognizes that they exist within ecological systems whose behavior is constrained by larger-scale basin, regional and global factors; and
- Policy 5. Naturally selected populations should provide the model for successful artificially reared populations, in regard to population structure, mating protocol, behavior, growth, nutrient cycling, and other biological characteristics.

The ISAB has provided additional information on the implications and application of these policies when implementing artificial production strategies. In particular, the ISAB has recommended that artificial production goals and objectives must include standards for survival, harvest, and escapement, not just numbers or pounds of fish produced and released from a hatchery.

Appendix

Lake Roosevelt Kokanee Workshop

Eastern Washington University - May 3, 2007

Participants: Participants in the workshop included representatives from the Independent Scientific Review Panel (ISRP), Spokane Tribe, Colville Confederated Tribes, Washington Department of Fish and Wildlife, Bonneville Power Administration, Eastern Washington University, and NPCC staff.

Objectives: The workshop was held to discuss ISRP concerns raised in the FY 2007-09 project review regarding justification for continuing artificial production of kokanee in Lake Roosevelt considering the lack of success to date.

Projects/Proposals Discussed:

- Kokanee production -- Spokane Tribal Hatchery (199104600)
- Sherman Creek Hatchery (199104700)
- Chief Joseph Kokanee Enhancement (199501100)
- Ford Hatchery (200102900) (all in the Intermountain Province) and
- Banks Lake Fishery Evaluation Project (20010280, Columbia Plateau Province)

Workshop Summary Results and ISRP Comments

The initial presentation by Dr. Allan Sholz provided the background justification for developing a management plan for Lake Roosevelt. Surveys by the U.S. Fish and Wildlife Service and its predecessor agencies conducted purse seine sampling in Lake Roosevelt in the 1960's. Estimates of kokanee in Lake Roosevelt from that sampling were nearly 15 million fish. The ISRP has not reviewed these original sampling reports but accepts their conclusion. At some time during its recent history, Lake Roosevelt has supported a significant population of kokanee. In these same reports, and other subsequent reports, there was speculation that kokanee in Lake Roosevelt originated within the reservoir from beach (shoreline) spawning. These reports were apparently anecdotal, and the ISRP has not seen evidence to assume that shoreline spawning was ever a major source of kokanee within Lake Roosevelt, nor that there is evidence that reservoir management actions could induce kokanee to exhibit this reproductive behavior.

The management plans developed for Lake Roosevelt in the mid 1980s and incorporated into the Northwest Power and Conservation Council's Fish and Wildlife Program were predicated on assumptions concerning the life-stage survival of kokanee in Lake Roosevelt. These assumptions included the belief that the reservoir had sufficient biomass of food resources (large zooplankton and forage fish) to support several million kokanee, that survival from hatchery release to maturation would be sufficient to provide harvest and adults to maintain the hatchery production; and that the capacity and productivity of the reservoir and tributary streams were sufficient to

either establish, or reestablish, natural kokanee production which would provide ecological linkages for natural food webs.

The assumptions were reasonable, but they have not been supported by the results of this project. Re-examining these assumptions and reconsidering the likely success of the naturally-spawning kokanee is warranted, based on the lack of evidence of success to this point.

The sponsors' various strategies and actions to improve the kokanee project elements have, for the most part, had a logical basis. Some actions, however, appear to not be well thought out. For example, the plan to catch adults at Hawk Creek without sufficient adult holding infrastructure and security is puzzling.

There seem to be two strategies that the kokanee portions of the projects are pursuing. One is providing hatchery kokanee for both a recreational and tribal fishery. The second is the production of natural kokanee to mitigate the ecological and cultural values provided by anadromous salmon prior to constructing Grand Coulee Dam.

The first question that needs to be considered is whether it is likely that kokanee will actually populate and thrive in a moderately high velocity reservoir like Lake Roosevelt. Lake Roosevelt is somewhat similar physically to the run-of-the-river reservoirs on the lower Columbia and Snake Rivers, rather than the large terminal storage reservoirs and natural lakes where kokanee have thrived.

The second question is what is the origin of the naturally-spawned kokanee in Lake Roosevelt? Is it from production in Lake Roosevelt tributaries, or are they immigrants from the Arrow Lakes region in Canada? The ISRP was told that the Canadians have found kokanee to spawn in significant numbers below Kennlyside Dam. Sponsors have observed some spawning kokanee in several tributaries of Lake Roosevelt. On the basis of these spawning adults there is interest in establishing self-sustaining kokanee runs in tributaries to provide eggs for hatchery production. The ISRP was also told that at a fish trap on the San Poil River only natural fish were passed upstream for spawning. When hatchery kokanee are trapped they are not passed upstream. The discovery that hatchery kokanee are straying into the San Poil River raises the question of whether all the adult kokanee that are observed in Lake Roosevelt tributaries are hatchery strays or immigrants from upstream lakes or reservoirs.

During the presentations by sponsors, the ISRP asked whether the lack of evidence of kokanee recruitment to the fishery was a consequence of insufficient design in the creel census used to evaluate the project, rather than an actual failure of fish to survive long enough to eventually be harvested. In the recent past the ISRP has recommended revising the creel census protocol. This census revision has been completed and implemented, but the data have not yet been summarized in a report. There was a verbal report at the workshop of a harvest of 4,000 kokanee based on expansion of the creel census counts from one recent year. The ISRP believes this yield to the fishery is not particularly high in comparison to yields observed in other kokanee enhancement programs. The fishery harvest relative to the level of hatchery release needs to be verified by the sponsors.

Perhaps the strongest evidence that the program is not meeting its biological objectives in a timely manner is the failure to achieve sufficient returns of adult kokanee to eliminate the need for importing eggs from outside the subbasin. The major source of eggs is currently from Lake Whatcom (Puget Sound) and this source is soon to be lost due to the restoration of a naturally-spawning sockeye run there. With this action disease risks will be elevated and eggs will not be able to be shipped outside this drainage. As Meadow Creek is not a reliable source for kokanee eggs, Banks Lake may be the only potential alternative. In summary, the ISRP remains concerned that the existing artificial production program for kokanee in Lake Roosevelt is not likely to be self-sufficient in the foreseeable future.

Triploid Rainbow Trout Net Pen Operations

In the 2007-09 proposal review the ISRP provided a general recommendation to all projects that planned on using triploid rainbow trout:

The ISRP recommends that only female triploids be stocked, because male triploids (in mixed sex production lots) will engage in courtship behavior with native trout, possibly leading to gamete waste (from the native trout). The ISRP notes that standardized Quality Assurance/Quality Control protocols are not yet established for using sterile female triploids to provide recreational angling in waters inhabited by native trout. Large-scale production of triploid female rainbow trout is not 100% effective. Sponsors should have the production lots they stock evaluated for the percentage of triploids, and report this as part of the project monitoring. The efficacy of avoiding hybridization between stocked and native trout is unknown when less than 100% of the stocked fish are triploids. Ongoing evaluation of hybridization in contemporaneous native trout populations will be needed in the future. Stocking triploid females to provide recreational angling in regions with highly sensitive native populations is not yet justified. See Kozfkay, J. R., J. C. Dillon, and D. J. Schill. 2006. Routine use of sterile fish in salmonid sport fisheries: are we there yet? Fisheries 31(8):392 - 401.

The essence of this recommendation was to use only female triploid rainbow trout instead of mixed-sex triploids, have triploid production lots evaluated for the proportion of triploid individuals, and do not use triploid hatchery fish to provide a recreational fishery in watersheds believed to be inhabited with native, genetically pure populations of redband trout. The rationale for these recommendations was summarized in the 2007-09 review, and is repeated here because the conditions still exist.

Female triploid rainbow trout were suggested because male triploid trout undergo a modest level of testis development and engage in courtship behavior. This could lead to attempted spawning between triploid males stocked for angling and natural self-reproducing diploid rainbow trout. The objective of having the production lots of triploid individuals screened to determine the proportion of triploids is to document the level of triploidy achieved in the heat or pressure treatments used to induce triploidy. This will further the evaluation of the post-stocking consequences of using triploid fish. Stocking triploid fish has not been an ongoing management tool long enough to know the full extent of the environmental results of using these fish. The recommendation to not use triploid fish to support recreational fishing in waters inhabited by

native species of concern is because there is no certainty that interbreeding between stocked trout and native trout will not occur, and the level of competition between stocked triploid and native trout is unknown. These risks suggest using caution in planting triploid rainbow trout in waters with potentially sensitive native trout until the above concerns are more completely addressed. Opportunities for fishing may be found in other waters. Washington Department of Fish and Wildlife biologists indicated they had a risk assessment tool to evaluate the likelihood of escape to natural spawning grounds by diploid individuals present in triploid lots. The ISRP encourages the evaluation of triploid production using these risk assessment tools, and peer review of the risk assessment tools.

The ISRP did not anticipate that these recommendations would be controversial. Co-managers from Lake Roosevelt indicated that they wanted to use mixed-sex populations of triploid rainbow trout in net pen production. They were concerned that the ISRP recommendation would become a requirement. During the presentation the ISRP indicated that mixed-sex triploids were acceptable, but that it would be useful to provide a justification for not using all female triploids. The co-managers provided information on the proportion of triploid individuals in the production lots. The ISRP continues its recommendation that this should be reported for stocking programs employing triploid trout and that using triploid trout to provide a recreational fishery in waters inhabited by sensitive native trout populations is premature at this time and does not meet Artificial Production Review policies established in the Council Artificial Production Review (NWPPC 99-15) and incorporated into the 2000 Fish and Wildlife Program.

The Lake Roosevelt co-managers raised three concerns about using all female triploid rainbow trout in the net-pen program. First, they objected to eating fish that had been fed hormones; second they objected to consuming fish that were genetically modified (GMO concerns); and third, they were concerned about hazards posed to hatchery technicians feeding fry with food to which methyl-testosterone has been added.

With regard to the first concern – eating fish that have been fed hormones – all female production fish, whether diploid or triploid, have not been fed hormones. To the ISRP's knowledge, there are no hormone additives that are FDA-approved for fish food. All-female production fish are produced by mating normal females (that produce eggs that all carry an X chromosome) with females that are sex inverted so they produce sperm rather than eggs, and all the sperm carry an X chromosome. Mating between an XX female and XX male produces all XX progeny and they are all females. The XX individuals that are sex inverted (they would be female under normal circumstances, but they are transformed into males) are done so by feeding trout fry mash that has alpha-methyl testosterone as an additive. This mash is usually fed for a month or two when the fry are very small. During this period the fry are susceptible to inducing the undifferentiated gonad to developing into testis in both XX (normal females) XY (normal males) individuals. XX males develop sperm cells, but do not have normal sperm ducts and cannot be manually spawned. This facilitates differentiating XX and XY males. To produce an all-XX line of trout, the XX males are used to fertilize eggs from XX females. A portion of the individuals produced by this process are set aside, and then fed mash with alpha-methyl-testosterone to invert them to males. These males are used in subsequent production matings, and the pedigree is advanced each generation. No fish that are fed hormones are released for angling or processed for human consumption.

Regarding the second concern, that all-female triploids are Genetically Modified Organisms (GMOs), the term GMO – genetically modified organism – usually is restricted to a plant or animal that has a gene inserted and whose regulation is under special regulation. These organisms are also referred to as transgenic individuals. The inserted gene can be from the same species, or it can be from a different species. For example, many cereal crops have genes from other species inserted. Some of these add production value to the final product; others add value by making the crop easier to grow. An example of this latter situation would be inserting genes that would make a plant resistant to herbicides. Then farmers could apply herbicides to the fields without injury to the primary species under cultivation and kill competing weeds. There are coho and Atlantic salmon that have had a growth hormone gene inserted that results in four to six fold increase in growth rate and 20% improvement in feed conversion. The ISRP is under the belief that no transgenic coho or Atlantic salmon are being produced on a commercial scale in the United States. Using this narrow definition, triploid individuals are not Genetically Modified Organisms.

Using a broader definition, all hatchery trout are genetically modified organisms. Typical production hatchery fish will undergo domestication selection that will lead to changes in allele frequencies in the population compared to allele frequencies in the natural population. Triploid individuals, whether from an all-female pedigree, or from a mixed-sex pedigree, are genetically modified compared to the diploids from which they are derived. The triploids have three sets of genomes, the normal diploid has only two. Ploidy manipulation is a routine tool in plant agriculture. It is uncommon in animal agriculture. Obviously, it has gained acceptance in trout production. The extent of genetic modification is no greater in all-female trout, in comparison to mixed sex production.

Finally, regarding health hazards to hatchery employees feeding mash with alpha-methyl testosterone as an additive, the ISRP has not been able to verify the status of safety concerns at this time. An internet search of paradoxical feminization failed to turn up any reports in humans from feeding this testosterone-supplemented mash. Contacts with state biologists involved in triploid production revealed that they were unaware of the health hazard status, and that they were currently producing mix sex lots of triploid rainbow trout. All-female eggs (both diploid and triploid) are available commercially (from Trout Lodge, Inc, Sumner, Washington). The biologist in charge of this aspect of production was unavailable for comment until early July. This would be a likely source to establish the current status of environmental hazards for hatchery technicians. Without question, the ISRP endorses employing safe production methods.