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**Preliminary Review of Six 2010 Estuary Proposals
submitted for the U.S. Army Corps of Engineers'
Anadromous Fish Evaluation Program**



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Review of Six 2010 Estuary Proposals submitted for the U.S. Army Corps of Engineers' Anadromous Fish Evaluation Program

Background

At the U.S. Army Corps of Engineers and Council's January 2010 request the Independent Scientific Review Panel (ISRP) reviewed six proposals for research in the Columbia River Estuary. These projects are proposed for implementation through the Corps' Columbia River Fisheries Mitigation (CRFM) Program, specifically the Anadromous Fish Evaluation Program (AFEP). ISRP review of projects under this program was directed in the 1998 U.S. Congress Senate-House conference report for the fiscal year 1999 Energy and Water Development Appropriations bill. The ISRP's review responsibilities are also incorporated in the [Council's 2009 Fish and Wildlife Program](#).

The Corps, Council staff, and regional fishery managers participating on the System Configuration Team identified these six projects for ISRP review. The ISRP reviewed the proposal using our standard criteria, that the project is based on sound science principles; benefits fish and wildlife; has clearly defined objectives and outcomes; and has provisions for monitoring and evaluation of results. The Corps also requested that we examine whether the study results will usefully inform management decisions.

Our review follows below. To complete the review, we followed our standard review process for Columbia River Fish and Wildlife Program proposals. At least three reviewers independently evaluated each proposal and provided comments. The ISRP held a teleconference and discussed the proposals and individual reviewer comments. Lead reviewers developed recommendations and comments and distributed a draft for comments and consensus.

In addition, our review was aided by our participation in the Council's [Estuary Science and Policy Exchange](#) that was held in Astoria on September 10 and 11, 2009. Results from several of the projects under the review at hand were presented at the Exchange, and the ISRP toured the estuary, seeing several of the project areas and meeting some of the project proponents. These six AFEP proposals are part of a larger set of management actions and research projects undertaken in the estuary including several closely related Fish and Wildlife Program projects. Presentations on the results of several of these projects were also given at the [AFEP Annual Meeting](#) in Walla Walla on December 3, 2009, session 6.

ISRP Overall Comments

In general, the six proposals have relevance to the Biological Opinion and potential to benefit Columbia Basin Fish and Wildlife. However, the proposals lacked sufficient background information on context, coordination, and methods to evaluate their scientific and technical merit. Overall, the proposals did not explicitly incorporate information from recent workshops and symposia on the Columbia River estuary (Council Estuary Science/Policy exchange and

November Portland Estuary conference), relevant ecological literature, relationship of the projects to estuary restoration plans (subbasin and lower Columbia River Recovery Plan), and coordination with tasks executed through other programs (Council Fish and Wildlife Program). Specifically for individual proposals, sampling detail, recent results, simulation of expected results, and presentation of an adequate logic path that addresses key response variables were lacking. The ISRP believes this can be partially explained by the fact that the proposals were developed to meet the standards of the AFEP project selection process, which appears to be oriented toward administrative accountability rather than designed for independent scientific peer review. In Fish and Wildlife Program proposal reviews, the ISRP expects more specific detail in the study design and description of methods than was included in these six proposals.

The ISRP believes that the authors could provide the information needed to meet a standard of independent peer review, as the ISRP examined a subset of annual reports and found more extensive detail and documentation in their methods sections. The high quality presentations from the Council's Science and Policy Exchange and the AFEP Annual Review also contained useful information to further justify the projects.

As evident in the six proposals, many review and process issues identified in the ISRP's comprehensive review of AFEP in 2004 ([ISRP 2004-8](#)) still exist today, five years later. In 2004 the ISRP noted:

“[E]specially for the new AFEP topic areas of ocean and estuary, lamprey, and avian and piscivorous predation, the AFEP and the Council's program have significant overlap. Some proposals have been funded through both programs. For these areas of program needs, proposals should follow a consistent format. The format required of proposals to the Council's program includes sections on: 1) technical and scientific background, 2) rationale and significance to regional programs, 3) relationships to other programs, 4) project results (history), 5) objectives, tasks, and methods, and 6) information on facilities, equipment, and key personnel. This format would provide reviewers consistent presentation of information and explicit reference to identified research needs.”

The six estuary proposals did not follow this recommended format, and in fact the proposals did not follow a consistent format between each proposal. Consistency is not only important to facilitate an efficient review but to ensure parity and coordination across the programs. The Bonneville Power Administration has made advancements in project and program tracking with the Taurus database (www.cbfish.org). The Corps and Bonneville may be able to use Taurus to increase consistency of forms and reporting across the programs. The ISRP recommends that the Council, Corps, and Bonneville explore developing consistent forms for AFEP and Fish and Wildlife Program projects.

For all but one of the proposals the ISRP has assigned a recommendation using the categories developed for the Fish and Wildlife Program project review: Meets Scientific Review Criteria, Meets Scientific Review Criteria - In Part, Meets Scientific Review Criteria (Qualified), Does Not Meet Scientific Review Criteria, Response Requested. Four of these proposals received a response requested recommendation, and one received a meets scientific review criteria (qualified). For proposal EST-P02-04: *Evaluating cumulative ecosystem response to habitat restoration projects in the lower Columbia River and estuary*, the ISRP defers a recommendation

because the project is in the final year of multi-year (2004 - 2010) implementation. For this project, the ISRP suggests a review of the final report once completed.

For the four proposals receiving a response requested recommendation, the ISRP suggests that the proponents and Corps can pursue two paths. One is to individually respond to the ISRP review comments; the second is to develop a synthesis report on Corps-funded projects in the Estuary. This synthesis would present the set of six Corps' estuary projects as a coordinated program integrated with the Biological Opinion, restoration plans, and various projects implemented under other authorizations, and reflecting the Science Policy Exchange. The ISRP has conducted synthesis reviews of sets of Umatilla River, Lake Roosevelt, and captive propagation projects. In the ISRP's judgment, this has been a useful peer review approach.

The subject breadth of the proposals appeared almost too focused on the BiOp RPAs. The proposals would be improved through increased focus on advancing our understanding of how the estuary functions as an ecosystem that includes salmonids. These proposals do not fully address the issues raised in the recent workshops and the key attributes and concerns associated with the estuary environment, such as flow changes, hatchery fish, invasive species, contaminants, and their interactions, nor is there clear recognition of limits to production.

While this series of studies covers many concepts, contaminants were not mentioned. Contaminants may be confounding many of the habitat-related analyses – especially the emerging contaminants like flame retardants (polybrominated diphenyl ethers, PBDEs), pharmaceuticals, and personal care products and exposure may vary from population segment to population segment. The Willamette salmonids have especially high PBDEs. This finding is further supported by osprey egg data from the same geographic area. Many contaminants can influence growth rates, lipid content, and ultimately survival. Many fish are being handled by these projects with considerable amounts of data collected. Some of the salmonids with extreme body conditions (high and low) could be analyzed for contaminants. This additional information may greatly improve the analyses already suggested in some of these proposals. There also appears to be opportunity to evaluate food webs at some of these wetland areas, but the evaluations seem limited to water characteristics. Adding investigations of prey availability for salmonids could enhance the studies.

Table of proposals and ISRP Recommendations

Proposal #	Estuary Proposals	Proponents	ISRP Recommendation
EST-P-02-04	Evaluating Cumulative Ecosystem Response to Habitat Restoration Projects in the Lower Columbia River and Estuary, 2010	PNNL, NMFS	Deferred until review of draft final report
EST-P-09-1	Evaluation of Life History Diversity, Habitat Connectivity, and Survival Benefits Associated with Habitat Restoration Actions in the Lower Columbia River and Estuary, 2010	PNNL	Response requested

EST-P-10-1	The contribution of tidal fluvial habitats in the Columbia River Estuary to the recovery of diverse salmon ESUs	NMFS	Response requested
Not available	Julia Butler Hansen National Wildlife Refuge: post-construction assessment of Fishes, Habitats, and Tide gates in Sloughs on the Mainland	USFWS	Does not meet review criteria - response requested
EST-P-02-01	Use of acoustic mobile tracking to evaluate timing, behavior, and fate of juvenile salmonid migrants through the lower Columbia River and estuary	NMFS	Response requested
EST-P-02-01	A Study of Salmonid Survival and Behavior through the Columbia River Estuary Using Acoustic Tags	PNNL	Meets criteria (qualified)

ISRP Specific Comments for Each Proposal

Evaluating Cumulative Ecosystem Response to Habitat Restoration Projects in the Lower Columbia River and Estuary, 2010

Project Number: EST-P-02-04

Project Proponent: PNNL, NMFS

ISRP Recommendation: Deferred. The proposal is not amenable to science review because of a lack of detail, especially on methods. Because the proposal is in its final year of implementation, the ISRP sees value in reviewing a draft final report rather than a revised proposal. The ISRP is particularly interested in the adaptive management implications of this effort.

ISRP Comments:

The ISRP comments below suggest numerous ways that this proposal could be improved. However, the ISRP does not expect to see a revised proposal or a response to our review. Instead, the ISRP suggests that PNNL and NMFS consider our comments as they complete their project and develop a final report.

Proposal Section II. Summary A&B. Goals and Objectives [see Project Summary section II. A&B]

The ISRP found the proposal listed clearly stated and logical objectives that are technically justified. An extensive list of tasks is given for each objective, but they are only briefly stated and no details are given of the process(s) of how these tasks will be carried out. The proposal would be improved by inclusion of these details. The Panel does recognize that the specific objectives for 2010 – the final year of this multi-year project (2004-2010) – involve final summary and synthesis of results and this is the key product of the work.

Another key product from the project is an adaptive management framework (AMF). The proposal would have benefited from further information on this topic, in particular how the AMF will be tailored to meet the needs of restoration projects in the Columbia River estuary.

This proposal would benefit from describing the mechanism where the cumulative effects methodology developed by the proponents will be incorporated into decision-making processes for estuary restoration. There is a lot of emphasis on process and frameworks. The Panel concluded that implementation will require a very ambitious approach given the complexity and diversity of habitats in the Columbia River Basin estuary.

The proposal would also be improved by more information about how “net ecosystem improvement” (page 5) would be quantified. Specifically, what metrics would be used to determine the “increase in the size and natural functions” of the estuary? This is always a difficult question – there is likely no right/wrong answer – but the ISRP would have liked more details about what the project proponents are thinking, particularly if the intent is to distill all of the field data into a single number. The concept of net ecosystem improvement has broad implications for high level indicators elsewhere in the Columbia River Basin.

II. C. Methods [see Project Summary section II. C and Project Description section III and Final Statistical Design document]

The ISRP recognizes that methods, project description, final statistical design and data have all been considered in previous reviews and reports of this long-term project. However, further information on methods for the final year’s work was needed for reviewers to evaluate the scientific and technical merit of the proposed work. Tasks are clearly stated, but for many of these tasks no information on specific methods is provided. For example, Task 1.1 “Evaluate the effectiveness of the three, paired sets of restoration and reference sites monitored since the outset of the study” – no information is provided on exactly what methods will be used to evaluate effectiveness or to identify and complete data gaps.

The schedule and deliverables section applies to the overall seven-year project, but a detailed schedule for completion of each proposed task in 2010 would improve the proposal. There are 17 tasks proposed for the final year, and some of them are complex (e.g., Task 1.4 – “Model the estuary-wide potential for synergistic effects of restoration projects”). Without a detailed schedule, it is not clear that all of the proposed work can be completed in one year. The ISRP noted a list of key personnel was provided, but their specific roles in this project were not adequately described (who specifically will be responsible for completing each task?).

II. D. Relevance to the BiOp [see Project Summary section II. D]

As briefly stated in the proposal, the project is relevant to the BiOp (RPA 60 - to develop and implement methods to estimate cumulative effects of habitat conservation and restoration projects). A more specific explanation of relevance would be helpful. Other regional RME plans or projects are mentioned in Section E of the proposal (e.g. Habitat Monitoring in the Lower Columbia River and Estuary by the Lower Columbia River Estuary Partnership (BPA 2003-007-00), and Research, Monitoring, and Evaluation Plan for the Columbia River Estuary and Plume

by the Action Agencies and others (BPA 2002-077-00)), and the proposal indicates that this project will coordinate with these projects.

Proposal Section III. Research Plan (Background and Past Results)

The Panel appreciates that this is an ongoing study and notes the proponents have a well-documented history of progress, which includes six years of annual reports (FY 04 - FY 09). However, a few more specifics in the yearly project paragraphs would have been useful for evaluation of the present proposal. Only a brief year-by-year summary of progress and results is presented. The ISRP found the background information and results presented in materials outside the proposal (links to the Astoria Science and Policy Exchange and AFEP presentations found by the ISRP) to be much more useful. Links to existing products (e.g., to the draft monitoring manual – a year one deliverable from the project) would assist reviewers.

Evaluation of Life History Diversity, Habitat Connectivity, and Survival Benefits Associated with Habitat Restoration Actions in the Lower Columbia River and Estuary, 2010

Project Number: EST-P-09-1

Project Proponent: PNNL

ISRP Recommendation: Response requested

ISRP Comments:

The ISRP understands this project is a component of the cumulative effect studies being conducted by other proponents under the ongoing AFEP programs EST P-02-04 and Julia Butler Hansen National Wildlife Refuge). There seems to be some overlap with the new project EST-P-10-1, and the ISRP would like to find out if the two projects are complementary. The project is a research program with the important goal of establishing and verifying several monitoring metrics – at this stage primarily a proposal to develop a proposal (for the final 2 years of the project), although a pilot field study will also be conducted. Because the project has only been underway for one year (2009) it is too early to tell the project's success. But if the project achieved its goals, it could be very useful to assist the prioritization of habitat restoration actions and salmonid recovery goals in the estuary.

The ISRP found the proposal could be improved by inclusion of important details on key items such as provision of:

1. a link to the 2009 study results and report
2. a more complete methods/tasks section including selected metrics, sample sizes, sample sites with maps and other information which would enable a thorough scientific review of the proposal
3. background information, especially from two related studies in the tidal freshwater part of the estuary.

The ISRP is concerned that this project may be overly focused on fulfilling RPAs of the BiOp and less focused on providing the whole picture of how the off channel estuarine habitats function in meeting the various life history needs/requirements of juvenile salmonids.

1. Proposal Section II. Summary A&B. Goals and Objectives [see Project Summary section II. A&B]

The goals and objectives section of the proposal would be improved by discussion of the relevance of this research to the overarching goals for restoration of habitat in the estuary. It would be very helpful to include a justification of why a pilot-scale, long-term, intensively monitored site in the tidal freshwater part of the estuary would be selected to serve as the cornerstone of this project. This raises several questions: (1) if a single pilot-scale site is selected, what confidence can be attached to extrapolating results to other areas of the estuary with different habitat conditions? (2) if this is to be a long-term study, how long will we have to wait for the answers to the original questions about life history diversity, habitat connectivity, and survival for listed salmonids? and (3) will the intensively monitored aspects of the pilot area duplicate other efforts that are already underway in the estuary and may not need to be repeated here in order to address the project's objectives?

Tasks for Objective 2 are more specific and include evaluating the change in total number/length of passage barriers within the historical floodplain since 2000 and the percent of historical floodplain currently connected to main stem hydrological processes for one reach in which the intensively monitored area is located. However, no justification is provided as why these metrics would be assessed in the tidal freshwater reach of the estuary, to the exclusion of similar areas downstream.

The ISRP noted that Objective 3 does not directly measure survival and suggests the proponents consider the selection of the key response variable(s) for survival more carefully. Is the hypothesis that fish in higher-quality habitats will exhibit different values for the set of indicators that will be collected (e.g., body composition, condition factors, and such)? The proposal would be improved by discussions of how the proponents will assess key metrics such as catch, adult returns, smolt yield, or diversity. Most of these metrics could be influenced by density-dependent effects as well as ocean survival differences. Fitness measures such as lipids and condition factors are also subject to density-dependence effects.

2. II. C. Methods [see Project Summary section II. C and Project Description section III and Final Statistical Design document]

The ISRP found the methods section incomplete and in some cases would be improved by clarification. The information on methods in the proposal is insufficient to evaluate the scientific and technical merit of the proposed work. Tasks are clearly stated, but for many of these tasks no information on specific methods is provided. The proponents propose to collect unspecified information on fish captured at study sites to be designated at some future time and use this information to generate indices of life history diversity, habitat connectivity and the effect of habitat restoration on survival, fish condition, and such. How these goals will be accomplished using this information is never addressed.

No definition of “life history diversity” is provided and the ISRP strongly encourages the proponents plan to seek broad peer review and discussion of this concept before a life history diversity index (LDHI) is settled upon. In addition to the references cited, the review by Wissmar and Simenstad (1998) and the evaluation of restoration in the Salmon River, Oregon estuary (Bottom et al 2005) might be informative. LDHI can be used to refer to broad life-history strategies, like ocean-type versus river-type Chinook salmon. However, it also can be used to refer to much more subtle differences in life history, such as the selection of seasonal habitats or the use of food resources. Some clear definition of what “life history diversity” means in the context of this study is required before clear objectives can be articulated. A study design and discussion of suitable data and methods is not possible until these preliminary steps are completed.

The ISRP noted this project collects many fish with various physiological stress measurements, e.g., cortisol and lipid content. It would seem logical to add some contaminant evaluation here. For example, PBDEs are increasing in fish-eating Osprey eggs from the Willamette and lower Columbia Rivers (Henny et al. 2009). PBDEs are also the highest in juvenile salmonids from the Willamette River (Sloan et al. *in press*). Are some contaminants (PBDEs, PAHs, etc.) confounding survival evaluations based upon habitat factors alone?

3.II. D. Relevance to the BiOp [see Project Summary section II. D]

The proposal specifically notes the relevance of the project to the 2008 BiOp through RPA Actions 2 and 3, which are Adaptive Management Actions; 36 and 37, from Habitat Strategy 2; and 58, 59, and 60, which are contained within RM&E Strategy 4. The proposal further notes that evaluation of the ability to quantify BiOp-required metrics is critical to meet the Action Agencies’ reporting requirements.

4. Proposal Section III. Research Plan (Background and Past Results)

The project was started in FY 09 (Oct. 2008) so some project history or results from 2009 would improve the project history section. This proposal appears to be based very closely on the recommendations of the 2009 study and references to this 2009 study are found throughout the proposal. However, no specific reference or report is cited for the study.

The schedule and deliverables section states: “Year 3 and 4 may be finalization of approaches and full-scale sampling, analysis, and reporting.” The ISRP notes the qualification “may be” does not inspire confidence that the proposed project can be completed in 4 years.

Key personnel at PNNL are listed. The proposal would be improved by information on specific roles and responsibilities in the project.

Given the considerable body of research already done in the Columbia River estuary, the proponents should be able to select a pilot-scale area for developing field protocols in the lower

estuary. The proposal would be improved by an explanation why these tasks cannot be completed with existing data or why the focus should be shifted to the tidal freshwater reaches.

References

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The contribution of tidal fluvial habitats in the Columbia River Estuary to the recovery of diverse salmon ESUs

Project Number: EST-P-10-1

Project Proponent: NMFS

ISRP Recommendation: Response requested

ISRP Comments:

This is an important proposal which could add key methods and data to procedures for stock specific estuarine habitat restoration, as well as extending our knowledge base on fish use of the upper estuary, upstream of river kilometer 100. It is well written and involves a team of very qualified and experienced researchers. However, the ISRP found the proposal wanting in a number of areas and could be improved by numerous additional details to objectives, methods, and statistical approaches. The ISRP notes the project has an eight-year time horizon but actually will require additional years to answer some of the questions framed in the proposal. It is therefore important to make sure the project has a solid base before starting complex and data-intensive research. In addition, the Panel would like to learn if past results from the team's work from the lower estuary have been implemented by restoration agencies and managers as similar products are mentioned in this new proposal.

Proposal Section II. Summary A&B. Goals and Objectives [see Project Summary section II. A&B]

The objectives are clearly stated and justified, but in places the methods are too general and assume that the reviewers have knowledge of previous work. More specific details would be helpful. The project is well justified by noting that the population response to estuary restoration remains poorly understood because previous work has not focused on the contribution of estuarine-rearing juveniles to adult returns. Furthermore, other studies that use acoustic tagging methodology to estimate estuary survivals do not track the response of smaller salmon size classes. This proposed study collects and tags fish that enter the estuary below Bonneville Dam so the results will account for the habitat-use patterns or survivals of six listed lower Columbia River ESUs that enter the estuary below the dam

The ISRP suggests that a better understanding of predator presence, abundance, and impact is necessary. For example the upper reaches of the estuary have significant numbers of pike minnow (e.g., Camas and Washougal area). Is there a risk of enhancing the habitat for predators? This is likely less of a problem in the saline areas, where freshwater predators are less numerous

Objective 1. The proposal would be improved by information on how the proponents will obtain genetic data in real time, as it appears from the proposal that sampling and habitat studies will be based on stock identification in the field. In addition, given that juvenile salmon are likely on a rearing migration and as well can move from one habitat to another (e.g., from wetland to channel as a marsh drains) on a tidal cycle, how do the proponents propose to account for this multiple habitat use?

Details on the PIT tag part of the study design would assist the Panel's review, giving previous study information (monitoring locations, previous results, tag numbers, detection rates, etc.).

Details on specific survey and sampling design would also be helpful. In the first year, this is primary a proposal to develop a proposal. "Reconnaissance" surveys will be conducted to select representative sites and initiate test sampling. It is not clear whether 60 samples per reach (8 reaches) and time period (up to 2,400 samples per year for two years) is a sufficient number to accurately estimate and characterize stock composition of juvenile Chinook salmon in the Columbia River estuary. Two years of data will not be adequate to characterize interannual variation in stock composition. Proposed use of beach seines will not be adequate for sampling all types of nearshore and shallow habitat. How will otolith chemistry indicators of entry into the tidal freshwater zone be linked to genetic stock information?

Objective 2. The proposal states "We will use methods similar to those developed for the lower-estuary habitat surveys (i.e., Roegner et al. 2008b), although some techniques (e.g., fish sampling gear, otolith analyses) must be adapted to upper-estuary conditions." Reviewers would be assisted by information from Roegner (2008b) summarized in the proposal.

The methods for Objective 2 (as well as Objective 1) indicate that the genetic stock can be determined for individual fish; however, the proponents need to clearly establish that this is possible.

The proposal would be improved by inclusion of more details about the proposed study on food habits and examination of the food web in the upper reaches. How will this work be coordinated with the feeding studies proposed in EST P-09-01?

Objective 3. For objective 3, year 1, the explanation of the SELFE model and simulations is not sufficient to evaluate scientific and technical merit. How will model results be validated and linked to salmon? What about the effects of other factors not included in the model? The ISRP review would also benefit from information on how successful the model has been in the lower reaches? Has it been effective at identifying restoration sites?

Objective 4. The ISRP notes the M&E component in this objective is critical to follow up on adult returns. However, this objective also lacks sufficient details on sampling protocols.

Details are lacking for Objective 4 because planning depends on results obtained in prior objectives. As mentioned above, details are needed about numbers of fish to be PIT tagged if they are being used to track survival to adults, expected return rates, and sensitivity to detecting meaningful differences. A check in with the ISRP is suggested prior to implementing PIT tagging.

Objective 5. More details are needed on Objective 5 concerning life cycle models (Zabel et al. 2006; Crozier et al. 2008). Specifically, how will VSP parameters be incorporated into life cycle models, and how will the models be validated? Confirmation from modelers is needed to verify that the models will work with estuarine salmon data as estuaries are more open ecosystems than rivers.

II. C. Methods [see Project Summary section II. C and Project Description section III and Final Statistical Design document]

The methods are appropriate for the objectives, and how the various components of the project complement on another is clearly described. However, there are shortcomings in descriptions of the several objectives, as described above.

The proponents should consider evaluating Ba availability in food sources at various locations in the estuary to augment the assessment of this element in the otoliths of juvenile Chinook. Relying solely on the Chinook otolith Ba content to indicate whether Ba is a good indicator of residency in the region of the estuary between the head of tidal influence and the upper extent of salt water intrusion could be complicated by movement of the juvenile fish.

II. D. Relevance to the BiOp [see Project Summary section II. D]

This project is very relevant to the objectives of the BiOp and will closely respond to the 2008 BiOp RPAs 7, 37, 58, 59, and 61. However, how will this project coordinate with proposed project #EST- P- 09-1? That project also responds to RPAs 58 and 59.

The stated relevance to the BiOp is primarily linked to established estuary restoration goals for 10-year survival improvements of 9% for ocean-type and 6% for stream-type Chinook ESUs. However, the proposed 5-year study will not estimate survival improvements by ESU. The project schedule suggests that work on contribution of estuarine habitat restoration to adult returns would start in 2014 and continue to 2018 and perhaps beyond.

Proposal Section III. Research Plan (Background and Past Results)

The ISRP strongly suggests the proponents incorporate contaminant studies in the proposal. Studies have shown stock-specific contamination of PBDEs, with Willamette River juvenile Chinook showing high concentrations of PBDE flame retardants (Sloan et al. in press). Are survival indices (growth rate, lipid content, stress factors, etc) affected? Addition of a contaminant component might reduce a confounding factor in habitat-related performance analyses. *(Note full reference citation is listed on previous project)*

Julia Butler Hansen National Wildlife Refuge: post-construction assessment of Fishes, Habitats, and Tide gates in Sloughs on the Mainland

Project Number: Not available

Project Proponent: USFWS

ISRP Recommendation: Does not meet scientific criteria - response requested. The proposal is not amenable to scientific review as not enough details are provided.

ISRP Comments:

The ISRP appreciated that this project is a component of the cumulative effects studies being conducted by others under the AFEP program (i.e., EST P-09-1 and P-02-04). The objective of improving knowledge about habitat usage by adult and juvenile salmonids in the lower Columbia is justified, and the focus on informing additional restoration actions from tide gate installation is timely. However, because of its brevity and scanty background information it was very difficult for the Panel to review. We found the proposal lacked details throughout, especially a clearly described study design and sampling protocols. The proposal states that “The goal of this proposal is to provide information to assist in assessing effectiveness of new tide gates installed in summer 2009. Information collected in 2010 (post-construction) will be compared to that collected in 2007 and 2008 (pre-construction).” The proposal indicates that it is a BACI design. However, the pre-construction assessment database is not referenced (some reports should exist even if not issued yet) nor any 2007 - 2008 data summarized. The ISRP also found plans for reporting results should be improved. Results should be reported to a wider audience to share successes and lessons learned with others in the region and beyond.

1. Proposal Section II. Summary A&B. Goals and Objectives [see Project Summary section II. A&B]

The ISRP found the goals of the project are appropriate for the set of sloughs the proponents where the evaluation is being conducted. However, the goals and objectives of the proposal were presented very generally and would be improved by more detail on methods, as described below.

2. II. C. Methods [see Project Summary section II. C and Project Description section III and Final Statistical Design document]

The ISRP found the “methods and task” section would be improved by provision of details so that reviewers could evaluate the scientific and technical merit of this proposal. The proposal would be improved by details on sampling gear, sampling size, maps of the study site, and such. Statements such as “conduct surveys for...” should be expanded.

The basic design is a before and after comparison of slough conditions and fish use following modification of tide gates. Pre-treatment data already have been collected but these data are not summarized in the proposal. Therefore, their adequacy for making a post-treatment comparison is unclear.

Some of the project elements are based on a comparison with conditions at reference sloughs. The only description of these sloughs provided is associated with Objective 4 where a reference to sloughs on Hunting Island is made. Some discussion about innate differences between mainland and island sloughs needs to be included in the proposal to ensure the reader/reviewer that it is appropriate to use these island sloughs as references for sloughs on the mainland with tide gates. Island sloughs would be expected to be only minimally influenced by water from upslope areas of the mainland; the vast majority of water present in these sloughs during all tidal cycles would be river water. In contrast, the mainland sloughs could have a considerable proportion of their water delivered from mainland tributaries or groundwater. Therefore, attributing any differences in water quality between the reference and gated sloughs to the tide gates would be questionable. Some of the biological attributes also could vary simply due to the innate differences between island and mainland tidal sloughs. The reference sloughs should be ungated sloughs on the mainland.

The reason for PIT tagging fish is unclear. Simply trapping fish moving past the altered tide gates is clear evidence of passage, whether or not the fish are tagged. If the point of the PIT tags and detectors is to compare the rate or likelihood of passage into a slough between gated and ungated sloughs, then the tags could be useful. If this is the purpose of the tagging, then some consideration of the number of tags required should be included in the proposal. If the objective is to determine residency then statistical considerations are also required. The PIT tagging may also bias the data toward larger fish.

If the tasks associated with objective 3 are conducted with spatially balanced allocation of sampling effort that implies that the sites samples in 2007-08 were selected in this same spatially balanced manner. The proposal would be improved by confirmation of this design aspect.

Task 1.1 states “conduct surveys for adult anadromous salmonids and evidence of spawning in the upper reaches of the tributaries.” No information is provided on when, where, and how these surveys will be conducted. An online slide show presented some of this information, but the proponents did not include any of this information in the proposal, and the slide show was not referenced by the proponents. There are no specifics on sample sizes or statistical or other data analysis methods.

3. II. D. Relevance to the BiOp [see Project Summary section II. D]

The proposal generally refers to the BiOps and the Subbasin Plan for the Columbia Mainstem and Estuary in the Background section. The ISRP agrees the project is relevant to be reducing uncertainty about appropriate restoration actions in tidally-influenced wetlands. The development of tide gates that enhance passage by juvenile salmonids upstream is important to some aspects of estuary restoration. However, the proposal would be improved by details of how the project would specifically address the required elements in those plans (e.g. no RPAs referred to or specific recommendations from the Subbasin plan). Before/after habitat restoration projects are listed as a high priority in those plans.

The study rationale and design in this proposal does not provide for evaluating the long term benefits of this restoration/construction project. No follow-up monitoring is proposed except for 2010 sampling, although some work in 2011 is also mentioned.

4. Proposal Section III. Research Plan (Background and Past Results)

A presentation from the recent AFEP conference (URL provided by the NPCC coordinator) provided some useful background information on the first two years of the study (preconstruction assessment in 2007 and 2008). However as mentioned above ISRP concluded the proposal would be improved by inclusion of past data – they are critical to a scientific assessment of the proposal.

The proposal would also be improved by expanding information on the proponents reporting plans. Results should be reported to a wider audience to share successes and lessons learned with others in the region and beyond.

The ISRP also thought the response of the aquatic food web to the changes from culvert construction would be especially enlightening and would broaden the scope of the study. In addition the study area would be a good place to look at contaminants to see if migrating fish are picking up contaminants. The U.S. Fish and Wildlife Service collected sediment, invertebrate and fish samples at this refuge which indicated some contaminant exposure (Buck 2004).

Buck, J. 2004. Environmental contaminants in aquatic resources from the Columbia River. Final Report, U.S. Fish and Wildlife Service, Portland, OR. 112 pp.

1) Mobile Tracking: Use of acoustic mobile tracking to evaluate timing, behavior, and fate of juvenile salmonid migrants through the lower Columbia River and estuary

2) Fixed Array: A Study of Salmonid Survival and Behavior through the Columbia River Estuary Using Acoustic Tags

Project Number: EST-P-02-01

Project Proponent: 1) NMFS and 2) PNNL

ISRP Recommendation:

- NMFS mobile tracking - Response requested;
- PNNL fixed array - Meets scientific review criteria (qualified)

ISRP Comments:

NMFS Proposal - The ISRP requests that the proponents provide more detailed descriptions of methods with justification of sample sizes, more detailed maps of sample/survey grids, and assumptions for determination of fish status regarding type of mortality. The proponent should also provide additional information to improve the context for their study goals and objectives by providing additional background utilizing the recent literature that suggests that estuarine residency could confer survival benefits (e.g., Maier and Simenstad 2009).

PNNL Proposal – Based on the recent ISRP review of the JSATS proposal and Skalski model, the PNNL project appears sound and technically justified. The qualifications are that: (1) the ISRP would expect to review the study design and methods of the pilot study in the plume (Objective 5) prior to the study being implemented and (2) in a future proposal the ISRP would expect to see a more detailed description of methods with justification of sample sizes needed for Objective 6, the survival of transported fish post-release (below Bonneville).

Proposal Section II. Summary A&B. Goals and Objectives [see Project Summary section II. A&B]

NMFS Proposal: The overall goal of the NMFS study is to evaluate migration routes, residence behavior, timing, and fate of juvenile salmonids migrating below Bonneville Dam using a mobile tracking unit. The proponents should improve the context for their study goals and objectives by providing additional background utilizing the recent literature that suggests that estuarine residency could confer survival benefits (e.g. Maier and Simenstad, 2009).

The objectives are to determine the fate of acoustic-tagged juvenile salmonids that do not complete migration through the lower Columbia River and estuary and to determine migration routes and possible residence behavior of acoustic-tagged juvenile salmonids migrating through the Columbia River downstream from Bonneville Dam. Several questions regarding these objectives are noted below in discussing the methods to be deployed.

The proponents state (page 7): “results...from 2008 indicate that substantial mortality occurs in the reach between Rice Island (Rkm 36.0) and the lower estuary primary array (Rkm 8.3).” The proponents should consider the possibility that these fish may have gone into the marshes and

then left after the tags stopped transmitting and/or the primary array was taken down (McMichael proposal for 2010 says the array taken down after early September).

PNNL Proposal: The goal of this study is to estimate juvenile salmonid survival through multiple reaches of the Columbia River downstream of the Federal Columbia River Power System (FCRPS). To achieve this goal the PNNL study proposal identifies 6 objectives but only objectives 1, 2, 5, and 6 are addressed within the proposal for work to begin in 2010 and the conduct of objective 6 is only vaguely described.

The ISRP has several questions regarding these objectives listed below:

Objective 1 - Fig 6 shows the proponents are planning to deploy only one detector in the shallow mid channel area at rkm 22 (Astoria). Is there solid evidence that the fish will in fact stay in deep water in the channels on either side of this shoal?

Objective 2 - Will the numbers of fish detected be sufficient for valid statistical comparison of survival between spill, RSW, JBS, and turbine passage routes?

Objective 5 - The proponents state that a pilot-scale effort will be conducted in the Columbia River plume to collect information necessary to design a rigorous survival estimation deployment strategy. This raises questions such as: when will this design be completed, by whom, and will the design be available for review by ISRP?

Objective 5 - On page 4, line 11 the proponents propose to monitor movement into and egress from the plume. The ISRP recommends a working definition of the plume since typically it is thought to extend much farther offshore than shown in Figure 9 (see Fiedler, P.C., and R.M. Laurs, 1990a. Variability of the Columbia River plume observed in visible and infrared satellite imagery. *International Journal of Remote Sensing* 11:999-1010)

Objective 6 - Will the numbers of fish detected be sufficient for valid statistical comparison of survival between early and late transported fish?

II. C. Methods [see Project Summary section II. C and Project Description section III and Final Statistical Design document]

NMFS Proposal: The methods related to determining the fate of acoustic-tagged juvenile salmon involves finding stationary tags resting on the substrate. It is not clear how to distinguish among tags that are products of evacuation following predation events, tags rejected as expulsions by the host, or individuals succumbing from natural mortality. Stationary tags represent losses but do not unambiguously determine fate of fish. In 2010 the stationary tag detection protocol will be modified to adapt operational characteristics of the mobile tracker and to water current and wind conditions in the lower estuary.

The proponents plan to deposit at least three uniquely coded reference tags within each sampling station. These reference transmitters will be used to ensure that the mobile tracker can detect and identify transmitters lying on the estuary substrate. It would be prudent to deposit these reference

tags blindly, that is without the knowledge of personnel actively searching for tags, in order to provide a valid test of tag detectability.

To address the objective of determining migration routes and resident behavior the 2010 protocols call for sampling each station at least weekly. Mobile targets observed during the sampling process will be considered potentially resident. Repeated acquisition of the same mobile target code over successive sampling dates will be considered evidence of extended residence. These data will also furnish timing and migration corridor information. The proponents note that there is a probability that some portion of the observed tags is actually due to predators that have ingested the transmitter along with their salmonid prey. The proponents claim that subsequent detection would provide evidence of that predation as deposited tags. The ISRP notes that the location of presumed mortality may be incorrect if predators move prior to depositing tags.

Additional questions and comments:

The proponents state: “Unless fish reside for extended periods outside the sampling sites, weekly sampling should find stationary tags before they cease to function.” (page 10, 5th line from bottom). However, Chinook yearlings and subyearling have been found to reside for up to 50 d in wetland habitats too shallow for the sampling vessel to operate in (e.g., tidal channels at Russian Island – McNatt et al. 2009). Could researchers working in the tidal channels be provided with a tag detector?

The proponents state: “We propose to substitute extended parallel transects (routes) up to several nautical miles in length for the square grids used in 2009.” The proposal would be improved by information on the range of detection – wouldn’t this influence transect width and positioning of the sample lanes? Apparently acoustic overlap can be measured, but presumably this refers to within the yellow lanes areas in Figure 1. Are the proponents confident that the majority of the fish are in fact moving in those lanes? No references or data are given to support that idea.

The proponents also mention the issue of reference tags shifting position on the bottom (page 9). They only plan on using three reference tags. It would be useful to consult with geologists or hydrographers familiar with the mobility of the bottom sediments in the estuary to plan a strategy for placing these references to better estimate movement along the bottom. Three reference tags may not be enough to get a good idea of where the most mobility is.

PNNL Proposal: The coordinated use of acoustic-tagged fish and receiver arrays among related projects is a positive development. However, as a result some information in the PNNL proposal it is not always clear such as what is meant by “Large numbers of fish ...” in the statement, “Large numbers of fish that survive through the lower three FCRPS dams will be available below Bonneville Dam to estimate survival through the lower Columbia River estuary.” The full scope of the project appears uncertain. For example, the proposal states that if plume receivers are deployed for Objective 5, then migratory behavior will also be assessed for early and late transported yearling Chinook salmon.

Furthermore, Objective 5 is a pilot-scale effort that will be conducted in the Columbia River plume to collect information necessary to design a rigorous survival estimation deployment strategy. This raises questions such as: when will this design be completed, by whom, and will the study design and detailed methods be available for review by the ISRP?

The sample size for Objective 6 in the PNNL study is presented without justification so the scientific adequacy of the methodology cannot be evaluated.

II. D. Relevance to the BiOp [see Project Summary section II. D]

NMFS Proposal: The proposal notes relevance of the project to the 2008 BiOp through RPAs 52.1 and 58.1, measurements of juvenile salmonid survival and RPAs 61.1 and 61.3, habitat usage in the lower Columbia River and estuary. The relevance to the 2008 BiOp calls for RPAs 55.1 and 55.2 to address determining the effects of transport timing on survival and behavior in the Columbia River downstream of the FCRPS is not clear because JSATS tagged fish will be released at unspecified sites upstream from Bonneville Dam. Where and when will fish, which are destined to be transported, be JSATS tagged and released? Will there be sufficient tagged fish to unambiguously determine the effects of transport timing on survival?

The proposal states that the number and size of sampling stations will be restricted to the number that can be sampled weekly. It seems that this information should already be available and some evaluation of the adequacy of areal coverage made in the proposal. The start of sampling is planned to begin as soon as tagged fish are expected to appear in the lower river. Is it possible that a non-negligible proportion of fish may be missed with this strategy? Are there safeguards in place to ensure this does not happen?

PNNL Proposal: In addition to responding to the RPAs as stated above in the NMFS proposal, this proposal also responds to RPA 55.8, which calls for efforts to “Evaluate new tagging technologies for use in improving the accuracy and assessing delayed or indirect hydro effects on juvenile or adult fish.” This project is well targeted on this BiOp requirement. However, as stated above for RPAs 55.1 and 55.2, “for determining the effects of transportation on survival and behavior downstream of the FCRPS”, it is not clear how data from this project will meet this Objective 6 (as stated above).

It would also be helpful if the proponents explained that results are only relevant to hatchery fish. It is not clear if this is a limitation to the BiOp relevance (does it refer to wild fish only?).

Proposal Section III. Research Plan (Background and Past Results)

NMFS Proposal: A mobile unit for tracking fish implanted with JSATS-encoded transmitters has been in use since 2007. The proponents propose to continue to refine mobile-tracking protocols to track individual target migration routes, identify and document high-risk predation areas, and attempt to determine areas and identify habitats where fish may be slowing migration to the extent that survival is impacted.

The proponents could improve the proposal by inclusion of more background information on the ecology of Chinook in the estuary. They could add to this body of literature by reporting their data and analysis in journal articles.

Example References:

McNatt, R, Hinton, S., Teel, D., and D. Bottom, 2009. Salmonid use of intertidal wetland habitat in the Columbia River estuary. Abstract of presentation at Coastal and Estuarine Research Federation 20th Biennial Conference, Portland OR Nov 1-5 2009.

Greer O. Maier and Charles A. Simenstad, 2009. The Role of Marsh-Derived Macrodetritus to the Food Webs of Juvenile Chinook Salmon in a Large Altered Estuary. *Estuaries and Coasts* (2009) 32:984–998; <http://www.springerlink.com/content/uv277q5840778302/>

The NMFS proponents state that results will be published in appropriate scientific journals and presented at scientific forums. This is an important goal. An additional benefit of this project will be the planned dissemination of results from all tagged fish encountered among researchers from all collaborative research efforts.

PNNL Proposal: The proponents clearly state how technology transfer will take place but could have been better linked to the mobile tracking companion study. For example, the proposal mentions the mobile tracking system/study but states only that results “are forthcoming.”

McMichael et al. (*Fisheries* Vol 35, January 2010) was not published when the proposal was submitted. However, the ISRP noted this peer-reviewed paper was an important product of previous JSATS project and gave good background. This publication is also evidence that the proponents do a good job of monitoring, analysis, and reporting of results.

The project history section could be improved by adding some more details regarding project accomplishments (i.e., a short list organized in chronological order).