Department of Energy

Bonneville Power Administration
P.O. Box 3621
Portland, Oregon 97208-3621

PUBLIC AFFAIRS

October 10, 2007

In reply refer to: DK-7

Mr. Neal Clark
Save Our *Wild* Salmon
2031 SE Belmont Street
Portland, OR 97214

RE: BPA FOIA 08-001 (Re: FWS FOIA Request 7-00964)

Dear Mr. Clark:

This is the final response to the enclosed Fish and Wildlife Service (FWS) response to the above referenced Freedom of Information Act (FOIA) request dated June 27, 2007. In that request you asked for records related to FWS participation in the process to develop a Biological Opinion for the Operation of the Federal Columbia River Power System on remand, including the COMPASS model.

FWS identified one responsive document that is the exclusive or of a primary concern of the Bonneville Power Administration (BPA) and on October 4, 2007, forwarded it to our Agency for a release determination. After reviewing the responsive document, the BPA is releasing that record to you in its entirety.

If you are dissatisfied with our determination, you may make an appeal within thirty (30) days of receipt of this letter to Director, Office of Hearings and Appeals, Department of Energy, 1000 Independence Avenue SW, Washington, DC 20585. Both the envelope and the letter must be clearly marked "Freedom of Information Act Appeal."

I appreciate the opportunity to assist you with this matter. If you have any questions about this response, please contact my FOIA Specialist, Laura M. Atterbury, at 503-230-7305.

Sincerely,
/s/ Christina J. Brannon

Christina J. Brannon
Freedom of Information Act Officer

cc: Patti Carroll, FOIA Officer, PNWR Office, Fish and Wildlife Service

Enclosure: Responsive document

"Geiselman,Jim - KEWR-4"
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04/12/2007 01:25 PM

To "Merlin Smith" <Merlin.Smith@noaa.gov>, "Ed Bowles" <ed.bowles@state.or.us>, "Bodi,Lorri - A-SEATTLE" <florrainebodi@bpa.gov>, "Tom Berggren"

cc "Lynne Krasnow" <Lynne.Krasnow@noaa.gov>, "McNary,Sarah R - A-7" <srmcnary@bpa.gov>

bcc

Subject RM&E Collaboration Group Meeting next Monday is Cancelled

The RM&E Collaboration Group meeting we tentatively scheduled for next Monday the 16th of April is being cancelled so the Action Agencies can work on remaining appendices to the PA, review additional comments that we have received, and discuss outstanding RM&E policy issues prior to the PWG Retreat April 23-25. Further collaboration efforts on RM&E issues will be addressed at the retreat. The current schedule for RM&E is to have the updated RM&E PA Draft (along with updated Hydro and Estuary Appendices) and the RM&E Policy Issues Paper circulated early next week. The Habitat and Hatchery Appendices are still being modified to address substantial issues and comments that have been received in these areas, and may not be available until after these issues have been further discussed at the PWG retreat.

Attached is the RM&E paper on Tributary Habitat Action Effectiveness Monitoring that was produced as part of our regional coordination efforts under the Pacific Northwest Aquatic Monitoring Partnership - Action Effectiveness Workgroup, which I indicated in our last meeting that I would share with you. This paper captures some of our current thinking on approaches to monitoring and evaluating the effectiveness of tributary habitat actions.

Tributary Monitoring (04-02-07).doc

Tributary Habitat Monitoring (Draft 4-3-07)

In general, the implementation of tributary habitat actions is intended to increase pre-spawning survival of adults, increase the survival of juveniles (e.g., egg-smolt), and/or expand the geographic distribution of the population. In all cases, the ultimate performance measure is survival (or productivity) and/or distribution of the "population." That is, successful restoration or enhancement of tributary habitat should translate into survival and distribution benefits at the scale of populations, not just at the scale of the implemented actions. Monitoring should therefore be sensitive to responses not only at small spatial scales (e.g., reach or small watershed), but also at the scale of populations. This burden is not easily resolved under existing monitoring programs, because most programs lack critical elements of experimental design (replication, randomization, independence, and controls/references), are collecting data at the wrong spatial or temporal scales, or lack sufficient institutional control to maintain the integrity of the monitoring design over a time period sufficient to generate reliable results. Nevertheless, existing monitoring programs can be tweaked, or new ones can be developed, that should provide information necessary to detect changes at the appropriate spatial and temporal scales.

Monitoring Precepts

Past monitoring activities have taught us much about monitoring tributary habitat actions. Some of the most important lessons learned include:

(1) Status and trend monitoring of population and habitat conditions is needed to establish baseline conditions and to develop a reference for large-scale, long-term patterns that may confound population-scale analyses of habitat restoration effects.

(2) Population-level responses to tributary habitat actions can only be detected at the appropriate spatial and temporal scales. Measurements of the effects of restoration actions may occur at multiple spatial and temporal scales, but the monitoring program must be designed to evaluate responses at the population scale, or at least the scale of major life-history components, and over multiple years or generations.

(3) Individual habitat actions generally do not directly impact population processes. Their direct effect is to modify physical or biological habitat condition. Therefore, responses of individual habitat actions are most easily detected at the scale of the action (i.e., reach or habitat unit scale).

(4) The mechanism(s) by which a given action generates a response at the population scale is usually unknown and may differ across populations.

Given these precepts, one should be able to develop valid approaches to monitoring the effects of tributary habitat actions.

Ideal Monitoring Approaches

In general, the basic before-after, control-impact (BACI) design provides a foundation for monitoring the effects of tributary habitat actions on population productivity and distribution. The validity of the basic BACI design can be extended by including sampling at multiple Control and Impact locations on multiple occasions during the Before and After period (MBACI). Better yet, the certainty of inferences may be further improved by establishing several pairs of Control and Impact locations that are sampled on multiple occasions during the Before and After period (MBACI(P)). The intent of these designs is to reduce the likelihood of alternative explanations for differences seen in treatment and control locations. These designs, if implemented correctly, include the four essential ingredients of an ideal design: randomization, replication, controls, and independence.

Problems with the Ideal Approaches

The "ideal" design is rarely, if ever, feasible at the population scale because of losses of control and/or treatment areas, spatial arrangements of populations, lack of randomization, lack of independence, the nature of variables measured, and institutional and economic arrangements. BACI-type designs require institutional control over the time and place of implementation of treatments and the selection and preservation of control areas. This is rarely feasible at the scale of populations. In reality, controlling social, economic, and political arrangements at the scale of populations is very difficult and the lack of experimental control often results in treatments being implemented at different times and intensities, and control areas being treated (loss of independence). Maintaining control populations for comparison with treated populations for long periods of time is very difficult institutionally.

In addition, some performance measures, such as fish abundance, biomass, and productivity are quite variable in space and time. Variability in fish metrics may result from different seeding levels (recruitment) and density-dependent factors that can be independent of habitat conditions. Large variability in fish metrics makes it difficult to assess effects of tributary habitat actions on population productivity.

Given the problems associated with implementing BACI-type designs at the scale of populations, alternative approaches are needed. Although these alternatives do not provide the level of certainty of inference that attends MBACI or MBACI(P) designs, the alternatives may demonstrate causation at the population scale if implemented correctly.

Alternative Monitoring Approaches

There are basically two general types of approaches that can be implemented to assess habitat treatment effects on population productivity and distribution; intensively monitored watershed approaches and levels-of-evidence approaches.

Intensively Monitored Watershed (IMW) Approaches

The IMW approach consists of at least two approaches that differ depending on the number of types of habitat actions implemented.

(1) ***Intensively Monitored Watershed (Single Habitat Type)***—This IMW involves the implementation of a single habitat action type in a population-scale area. The treated area is matched with a control population-scale area. Effects of a specific action type are assessed through monitoring population productivity in a treatment-control or intervention-analysis context.

(2) ***Intensively Monitored Watersheds (Multiple Habitat Types)***—This IMW involves the implementation of multiple habitat action types in a population-scale area. The treated area is matched with a control population-scale area. Cumulative effects of the actions are assessed through monitoring population productivity in a treatment-control or intervention-analysis context. This approach cannot by itself separate the effects of individual habitat action types on population productivity.

Both IMW approaches provide inferences at the population scale; however, only the IMW (single habitat type) can assess the effects of specific habitat types on population productivity. The lack of spatial replication and randomization limits the certainty of inferences of IMWs. In addition, they require long-term institutional control, which means that relatively few of these can be implemented successfully.

Levels-of-Evidence Approaches

The levels-of-evidence approach consists of at least three interdependent approaches to monitoring habitat actions to determine biological benefit:

(3) ***Status/Trend Monitoring***—Status/trend monitoring of population productivity and habitat condition is a long-term effort (decades) that assesses effects of habitat actions through correlation of productivity change to habitat condition and action reporting. Status/trend monitoring provides higher certainty of inference if before-after data are collected at the population scale and physical and biological effects are measured at the reach or habitat scale.

(4) ***Project-based Monitoring***—Project-based monitoring includes measuring physical and biological effects of individual habitat actions at a reach or habitat scale. Because this type of monitoring does not directly measure the effects of habitat actions on the population, status/trend monitoring should be used to assess possible changes at the scale of the population. Effects of individual actions are assessed through extrapolation of action influence and modeled connection of habitat condition to population processes.

(5) ***Watershed-scale Monitoring***—This approach is similar to IMWs, but is implemented at a sub-population scale (a watershed scale smaller than the geographic area of the population). As with IMWs, this approach may include multiple habitat action types or single action types. Because watershed-scale monitoring does not directly measure the effects of habitat actions on the population, status/trend monitoring should be used to assess possible changes at the scale of the population.

These alternative approaches lie along a gradient of inferential certainty from relatively strong to relatively weak (Table 1). IMWs provide more inferential certainty than do levels-of-evidence approaches, because IMWs are design-based at the population scale. That is, inferences from IMWs are based on the design rather than model assumptions. However, the lack of randomization and replication of IMWs may not allow their results to be easily generalized to other populations.

Table 1. Intrinsic and extrinsic constraints on methods to determine population scale biological effect of tributary habitat restoration actions.

Monitoring Approach	Scale		Type of Inference		Certainty of Cause-and-Effect at Population Scale	Identify Mechanism (Action specific)	Sensitivity to Institutional Control	Notes
	Spatial	Temporal	Design Based (Test/Control)	Model Based (Correlational)				
Status/Trend	Large (population, MPG, ESU)	Long (decades)	No	Yes	Low-Moderate	No	Low	Confounded by lack of controls, replicates, and multiple treatments
Bottom-Up (Project-based)	Small (but scaled to population indirectly)	Long (decades)	Yes at small scale. No at population scale.	No at small scale. Yes at population scale.	Low-Moderate	Yes at small scale. No at population scale.	Medium at small scale. Low at population scale.	Low priority, cheap, and does not provide population level answers
Top-Down (Watershed scale)	Watershed-Population	Short-Moderate	Yes at all scales.	No	High	Yes at small scale. No at population scale.	High	Confounded with multiple treatments, rare opportunities
IMW (with one action type)	Watershed-Population	Short	Yes at all scales.	No	High	Yes at all scales.	High	Difficult to implement, rare opportunities

The levels-of-evidence approaches rely more on correlative data to try and make a case for causal inference. Correlation is used to rule out alternative hypotheses (note that we make our case as much if not more by disproving plausible alternatives as we do by showing that the data are consistent with a hypothesis). Although the levels-of-evidence approaches may allow robust inferences at small spatial scales (scales smaller than the population), inferences at the population scale are usually inferred from correlation. The following criteria are often used to demonstrate causation from levels-of-evidence approaches:

- *Strength of Association*—Measures the size of the change in performance measures associated with the incidence of treatments. In some respects, this is similar to gradient analysis. One can compare the percentage difference in average value of performance measures at locations that received treatments to those that did not.
- *Consistency of Association*—An association between performance measures and the treatment that is observed many times provides higher confidence than if no such consistency is observed.
- *Specificity of Association*—The association is only seen in the presence of the treatment (i.e., an observed change in the performance measures occurs after the onset of the treatment).
- *Temporality*—If the treatment causes some change, then the change must follow the onset of the treatment. Temporality is a particularly useful criterion, because it has the potential to discard explanations – either the treatment explanation or alternative ones.
- *Biological or Ecological Gradient*—If one can observe a distinct increase in the magnitude of effect with increasing intensity of the treatment, then there is further evidence of causality.

Given the uncertainty of maintaining the integrity of robust monitoring designs (e.g., BACI designs, IMWs, etc.), a combination of approaches seems appropriate. IMWs should be implemented wherever feasible (i.e., where the integrity of the design can be maintained for at least 12 years, or about three generations), while project-based and/or watershed-based monitoring in concert with status/trend monitoring should be implemented where institutional control is less feasible.

Importance of Habitat Models

It should be clear that not all tributary habitat actions can be monitored, nor can the effects of actions be measured for all populations. Therefore, analytical tools are needed to assess the potential effects of habitat actions on population productivity across the many populations that will be treated with habitat actions. Analytical tools range from the simple (professional-judgment-guided model of the Habitat Remand Workgroup) to the very complex (Ecosystem Diagnosis and Treatment model). The goal should be to develop a transparent model that can be applied across different landscapes and populations, and provides reasonably accurate results.

One model that is transparent and has provided reasonably accurate results, at least in the Puget Sound area, is the Shiraz model (Scheuerell et al. 2006). Shiraz relies on a multistage Beverton-Holt model to describe the production of salmon from one life stage to the next. It includes density-dependent population growth, habitat attributes, hatchery operations, and harvest management in a time-varying, spatially explicit manner. The fact that it deals with hatchery operations is important because many of the populations that will be treated with habitat actions have hatchery programs, some of which will be going through modifications. This model should allow researchers to examine the separate and combined effects of habitat and hatchery actions on population parameters.

It is important that habitat monitoring support the development of analytical tools. This means that monitoring should be conducted at spatial and temporal scales sufficient to develop and populate models and to provide data to validate the models. This can probably be accomplished by monitoring extensively a select few populations across the Columbia Basin.