Draft Pre-decisional Document
With Format Updates 7/16/09

Recommendations for Implementing Research, Monitoring and Evaluation for the 2008 NOAA Fisheries FCRPS BiOp

Based on AA/NOAA/NPCC RM&E Workgroup Assessments of Actions called for under the BiOp Reasonable and Prudent Alternative

June 2009 Draft Pre-decisional Document

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Introduction

This report provides recommendations for implementing the Research, Monitoring and Evaluation (RM&E) Strategies and associated Actions called for under the Reasonable and Prudent Alternative for the 2008 NOAA Fisheries Federal Columbia River Power System Biological Opinion (BiOp). The report is a compendium of assessments by five BiOp Implementation Workgroups made up of technical and policy representatives from NOAA fisheries, FCRPS Action Agencies (Bonneville Power Administration, U.S. Army Corps of Engineers, and Bureau of Reclamation), and the Northwest Power and Conservation Council. Each workgroup focused on one or more BiOp Strategies: 1) Fish Population and Tributary Habitat; 2) Hydro and Predation; 3) Estuary and Ocean; 4) Hatchery and Harvest; and 5) Regional Coordination and Data Management. The major tasks of these workgroups included a review of the BiOp RM&E strategies/actions/subactions, the associated management questions, and the expectations regarding work and information needed for RPA compliance. This was followed by project specific assessments of the coverage of RPA actions and information needs under existing or planned AA programs, including gaps or areas that could potentially be reduced or scaled back in refocusing efforts and resources.

The set of initial recommendations provided in this report identifies programmatic or project specific changes to AA RM&E Programs needed to successfully implement the BiOp RM&E RPA actions. Additional work that may require the development of targeted requests for proposals is also discussed. The recommendations also include identification of time critical, high priority information needs that may require immediate actions for BiOp compliance.

Details regarding which projects and work elements support specific RPAs and the RPA gap assessment are catalogued in excel work sheets at www.salmonrecovery.gov under the Research, Reports and Pubs tab, and a summary sheet of projects supporting specific RPAs is provided in Appendix A. Viable Salmonid Population (VSP), habitat and hatchery effectiveness monitoring inventory tables organized by Evolutionary Significant Unit (ESU)/Distinct Population Segment (DPS), which are part of this ongoing assessment, are available at www.cbfwf.org/ams .

This version of the RM&E Recommendations Report is currently being updated in July to: 1) address internal agency comments on this report to date; 2) summarize high priority, time critical recommended work that needs to be implemented as soon as possible; 3) identify existing projects that may not be NOAA BiOp implementation critical, but are associated with high-priority F&W Program objectives or USFWS BiOps; and 4) review new information or recently updated information in the Inventories of VSP and habitat/hatchery effectiveness monitoring for any apparent overlaps in monitoring coverage.

The updated July version of the RM&E Recommendations Report will be used along with the Inventory Tables of VSP and Habitat/Hatchery Effectiveness Monitoring as input to the upcoming RM&E Collaboration and Prioritization Workshop Process which will occur this summer and include CBFWA, NOAA, BPA, NPCC, Recovery Planning, and Accord parties. The

products of that collaborative process are intended to be used to update the RM&E Recommendations Report later this fall for input to the 2010 to 2013 FCRPS BiOp Implementation Plan, the Columbia Basin Fish and Wildlife Program RM&E Categorical Review Process, the Corps of Engineer's Anadromous Fish Enhancement Program, and the ongoing implementation of BiOp Accords.

Methods

In January 2009, The AA, NOAA and NPCC assembled five Research, Monitoring and Evaluation (RM&E) Work Groups and an oversight Planning Group. Their assignment was to assess the requirements of the FCRPS BiOp RM&E RPA and insure that actions and projects are being implemented to successfully meet those needs. The work groups met regularly from mid-January through May 2009 and continue to meet as needed. Results from those sessions are reported, by work group, in the results section of this report.

Products from this exercise included a series of spreadsheets where information was compiled. When reviewing AA projects for alignment with specific RPAs, the work groups drilled down to the work element or study objective level, as documented in PISCES or the AFEP catalog of Corps funded projects.

Objectives

Three objectives were identified for these RM&E Workgroups:

1. Confirm the intent and direction of the RM&E-related RPA actions with respect to needs and performance reporting requirements.

2. Insure that the BiOp RM&E-related RPA actions are being implemented successfully, and that information will be available to answer key management questions, inform adaptive management, and demonstrate accountability relative to performance requirements.

3. Oversee BiOp RM&E Annual Progress Reporting, Comprehensive Assessments, and Implementation Plans.

To accomplish the objectives a number of tasks were identified by the Planning Group. To date (1 June, 2009) the work groups have conducted tasks 1-4 for NOAA FCRPS BiOp needs.

Workgroup Tasks

1. Review Management Questions (and associated decisions) and RPAs for monitoring and research requirements.

    a. Each workgroup review key management questions identified in the AA's Proposed Action under RM&E strategy areas that are associated with their specific work group.

    b. Review applicable RPA actions and clarify/document any expectations regarding information needs and compliance requirements.

2. Review and further develop RM&E Work Plan for documentation of expectations, information needs, and identification of subtasks, task leads, and milestones.

a. For each RPA, complete the cells in the RM&E Work Plan (spreadsheet) to document expectations, information needs, associated subtasks (including coordination needs), responsible staff leads, and milestones for completion.

3. Assess coverage of RPA actions and information needs and areas that may be reduced through critical, project specific reviews (RM&E Gap and Excess Assessment).

    a. Identify all RM&E projects currently being implemented or planned by the AAs, develop key summary information in spreadsheets, and parse projects to applicable workgroups (based on metric information from PISCES and AFEP one page reviews).

    b. Critically review each project to:

        i. Identify what specific NOAA FCRPS BiOp RPA actions, USFWS BiOp RPA actions, and Fish and Wildlife Program RM&E Objectives are supported by the project (document in Work Plan). {NOTE: additional work is still needed to assess project level support for USFWS BiOp and Fish and Wildlife Program objectives that are outside of the NOAA BiOp needs.}

        ii. Identify which components or work elements of the projects support the specific NOAA actions {or USFWS BiOp RPA actions or F&W Program RM&E Objectives}; or are considered low priority or non-essential relative to these information needs (document in Work Plan).

        iii. Identify potential modifications or restructuring of the project to add value or eliminate non-essential work (document in Work Plan).

    c. After all projects have been reviewed, assess overall coverage of each RM&E RPA Action and F&W Program RM&E Objective and document any gaps in expected information needs, coverage or compliance.

4. Develop recommendations for changes to existing projects and/or needs for additional projects that would address any RM&E gaps.

    a. Based on project critical reviews, any identified gaps in RM&E, and cost information on RM&E placeholders and RM&E close-outs, develop recommendations for project modifications and targeted requests for proposals.

    b. Recommendations should balance needs within existing RM&E budgets.

5. Develop targeted requests for proposals as needed.

6. Review proposals and make recommendations to proposed work relative to RM&E gaps.

7. Support annual and 3-yr comprehensive performance reports.
8. Support RM&E implementation plans on a 3-year cycle.

Task 3

Task 3 was the most expansive and complex to perform. To assist in directing the work groups towards a common path and product, the Planning Group provided a series of issues and questions for the work groups to address under task 3.

> Task 3. Assess coverage of RPA actions and information needs and areas that may be reduced through critical, project specific reviews.
>
> a. Identify all RM&E projects currently being implemented or planned by the AAs, develop key summary information in spreadsheets, and parse projects to applicable workgroups (based on metric information from PISCES and AFEP one page reviews).
>
> b. Critically review each project to:
>
> i. Identify what specific NOAA FCRPS BiOp RPAs, USFWS BiOp RPAs, and Fish and Wildlife Program RM&E Objectives are supported by the project (document in Work Plan).
>
> ii. Identify which components or work elements of the projects support the specific NOAA or USFWS BiOp RPAs or F&W Program RM&E Objectives; or are considered low priority or non-essential relative to these information needs (document in Work Plan).
>
> iii. Identify potential modifications or restructuring of the project to add value or eliminate non-essential work (document in Work Plan).
>
> c. After all projects have been reviewed, assess overall coverage of each RM&E RPA and F&W Program RM&E Objective and document any gaps in expected information needs, coverage or compliance.

<u>Standard Questions for 3 b.</u>

- Which specific RPA Action(s) or F&W Program Objective does this project (or parts of) potentially support?
- Which specific RM&E Work Elements, associated project level tasks, and deliverables within the project address the needs or objectives of the RPA(s) or F&W Program Objective?
- How can the project tasks be improved so that meeting the needs is more likely?
- What parts of the project do not appear to match any of the needs?

Standard Questions for 3 c.

- Is the RPA action or F&W Program objective being satisfied by the suite of projects?
- If not, what is the information gap and how should it be filled?
- Are there projects or parts of projects that could be eliminated and still meet the RPA or F&W Program objective?
- Are there projects that possess unique attributes that warrant its funding, even though certain aspects may overlap other projects that apply to the RPA or F&W Program objective?

RPA Coverage Analysis: Hydro and Predation RM&E

In the most recent draft of the FCRPS BiOp, required research, monitoring, and evaluation activities are specified as RPA actions. Some of the Hydro-related RPAs are quite specific and others are more general in the prescriptions. The Hydro and Predation RM&E Work Group reviewed all regional RM&E projects related to the hydro-system and predation, and assessed the alignment with 48 different RM&E-specific RPAs. We addressed the following issues:

1. Is there a gap in coverage with respect to individual RPAs? Specifically, are appropriate RM&E activities being conducted to satisfy the intent and requirement of each RPA?
2. Are there programs or projects that are not funded under the FWP or AFEP, which support the RPA action (e.g., a PUD-funded effort, or an analysis conducted by NOAA using base funding from that agency)?
3. What actions should be taken to fill a gap in coverage?
4. Are too many, or un-needed tasks being funded under the guise of satisfying an RPA?
5. Do any projects that appear to be un-related to the hydro-system indirectly support, or provide critical infrastructure that contributes to a hydro RM&E RPA action?

The Hydro workgroup report is organized by RM&E strategies as specified in the BiOp. There are three RM&E Strategies with 10 associated primary RPAs with several associated subactions assessed by the Hydro and Predation Workgroup: 1) Strategy 1 – Monitor the Status of Fish Populations Related to FCRPS Actions (RPA 50); 2) Strategy 2 – Hydrosystem RM&E (RPAs 52-55); and 3) Strategy 7 - Predation Management RM&E (RPAs 66-70). This report summarizes key findings by the work group for these RPAs and associated subactions.

Monitor the Status of Fish Populations Related FCRPS Actions - Strategy 1

Fish Population Status Monitoring (RPA 50)

- ***RM&E needs and directives:*** Three RPAs call for actions that involve population level monitoring of salmonids migrating through the FCRPS; Maintain the PIT tag system (50.1), Monitor adult returns using both visual counts and PIT information (50.2), and Monitor PIT tagged smolts (50.3). The RPAs are rather generic in the prescriptions, implying that the AA should monitor whatever stocks are at liberty.
- ***RM&E projects-coverage assessment:*** Projects are in place and conducting activities to meet all of these RPAs. There is no gap in coverage. Central to this effort is he PIT tag information system (PTAGIS), which provides the hardware and database system to enable the monitoring of smolts and adults in the FCRPS. Smolts tagged under the FPC smolt monitoring program and related activities (e.g., CSS) contribute stock-specific

information for smolts and returning adults. Additionally, the Corps supports the visual enumeration of adults at fishways in the FCRPS.

- ***Recommendation:*** These RPA actions do not specifically identify which ESUs or populations therein require monitoring, although this issue is addressed on a limited basis by other RPAs (52.4, 52.5) for Upper Columbia stocks and Snake River sockeye. We recommend that the upcoming regional PIT-tagging plan address this matter to ensure appropriate stock coverage and that an ample number of fish are tagged annually.

Hydrosystem RM&E - Strategy 2

Monitor and Evaluate Fish Performance in the FCRPS (RPA 52)

RM&E needs and directives: Seven RPA s (52.1-52.7) call for actions related to monitoring salmon and steelhead survival. Three of the RPAs (52.1-52.3) require estimating smolt or adult survival through the FCRPS using appropriate methods, and comparing those to standards or targets. Two RPAs call for expanding the PIT tagged populations to increase stock coverage for survival monitoring; Snake River sockeye (52.5), and Upper Columbia populations (52.4). RPA 52.6 requires that a regional PIT-tagging plan be developed to coordinate tag numbers and population coverage among the assorted projects (across the H's). RPA 52.7 calls for analyses to resolve inconsistencies in adult conversion rate estimates.

All but one RPA (52.6) are being met by projects that are either currently, or are soon to be in place. Even so, the level of tagging effort (N) and stock coverage are not clearly specified with supporting rationale. Thus, we point to the upcoming Regional PIT tag Plan, as a pivotal instrument to solidify future tagging needs. Since each RPA is unique in its provisions we address them individually.

RPA 52.1 -- Evaluate dam survival in terms of the stated standards; 96% for spring migrants and 93% for subyearling Chinook.

- ***RM&E projects -- coverage assessment:*** No gap exists. The AA have successfully demonstrated that acquiring these estimates is feasible using strategically located releases of smolts tagged with active tags (JSAT acoustic transmitters in these applications). However, the preferred experimental design has not yet been selected. There are two options being considered, a single and a multi-dam format. The Region is in the process of determining which experimental design is most appropriate. In 2009, under the AFEP program a new multi-dam experimental design is being developed (SPE-06-2) that could substantially reduce costs and provide statistically sound dam survival estimates. In the Snake River the single dam method is moving forward under projects SPE-W-08 and SPE-W-05 and may soon be applied in dam survival standard tests. This issue should be resolved by 2010 since we already have ample experience with the

single dam approach, and the multi-dam method will be tested next year (2010) in the lower Columbia.

- ***Recommendations:*** None.

RPA 52.2 -- Monitor survival of smolts through the FCRPS (system survival).

- ***RM&E projects - coverage assessment:*** No gap exists. PIT tag based survival estimates using tagged smolts entering and migrating through the FCRPS (Lower Granite through Bonneville Dam) are calculated annually and have been produced since 1994. The NOAA project (1993-029-00) conducts the analyses using fish PIT tagged under the SMP (1987-127-00) and CSS. The new recent expansion of tagging to include Snake River sockeye and Upper Columbia populations (2008-724-00) in 2009 will augment the effort.

However, managers need to clarify some points. It is not clear if annual estimates of D are required as specified in the RPA. But it is not certain if estimates are required every year. Also, precision levels associated with the survival and N has never been formally established. Thus, the scale of the PIT-tagging effort, including acceptable population coverage is uncertain.

- ***Recommendations:*** There needs to be closer coordination among various tagging operations and analytical groups e.g., SMP, CSS, and NOAA, to ensure efficient allocation of tags, and adequacy of effort. This could be accomplished under the auspices of the regional PIT tag planning group. Furthermore, NOAA and AA need to confer and establish analytical guidelines with respect to expected precision and population coverage. This may require a more structured Hydro RM&E Plan, including descriptions of methods and protocols.

RPA 52.3 -- Monitor the upstream passage survival of returning adults.

- ***RM&E projects - coverage assessment:*** No gap exists. The PTAGIS system provides data on returning adults of known origin. NOAA biologists conduct analyses and report upstream passage survival. To make the calculations additional data regarding harvest and tributary-turnoff rates are required. TAC currently reports harvest information. The Colville and CRITFC harvest projects may improve these estimates. Stray rates based on information from previous radio-telemetry studies, and/or new stream-based PIT detectors.

- ***Recommendations:*** Include a description of analytical methods and precision requirements in a Hydro RM&E Plan.

RPA 52.4 -- Increase the Upper Columbia PIT-tagging effort for spring Chinook and steelhead.

- ***RM&E projects - coverage assessment:*** No gap exists. Funds have been allocated to initiate this effort as early as 2009 (2008-724-00). But the extent of tagging and stock

coverage required has not yet been specified. These populations would be incorporated into the annual system smolt and adult survival monitoring. Non-contracted efforts by PUDs may supplement the federal effort.

- ***Recommendations:*** Tagging needs, sample sizes and population coverage, should be addressed in the upcoming regional PIT-tagging plan (RPA 52.6).

RPA 52.5 -- PIT tag Snake River sockeye salmon for FCRPS survival monitoring and transport evaluations.

- ***RM&E projects - coverage assessment:*** No gap exists. The Action Agencies have funded this effort in 2009 (2008-724-00). However, this is a pilot study in 2009, and long-term needs with respect to precision levels and sample sizes need to be formally established.

- ***Recommendations:*** This should be a topic treated in the regional PIT-tagging plan (RPA 52.6).

RPA 52.6 -- Develop a regional PIT-tagging plan that coordinates efforts across the 4-H's.

- ***RM&E projects - coverage assessment:*** A gap exists. No regional PIT-tagging plan is in place. Population coverage and sample sizes need to be resolved in that document. This will require input from the AA, NOAA, other federal agencies, as well as state and tribal agencies. The vision is to establish a PIT tag planning work group to draft the plan. There is no specific project dedicated to this effort.

- ***Recommendations:*** Fill gap by convening the PIT tag planning Work Group, specify needs with NOAA, AA, other federal agencies, and State/tribal input, and draft the plan. Coordination among 4-H's is necessary to realize efficiency and adequacy of tagging.

RPA 52.7 -- Examine and resolve observed incongruities between conversion rates of UCR & SR steelhead and spring Chinook. Develop and implement a monitoring plan to address this.

- ***RM&E projects - coverage assessment:*** No gap exists. An analysis is currently being conducted by Paulsen. PIT tagged adults are at liberty for use in the analysis. Harvest monitoring projects (Colville Tribes and CRITFC Accord projects) could provide improved harvest rate estimates, but TAC estimates are needed now. Improved coverage of tributary turn-off of PIT tagged adults will improve accuracy of estimates. This is occurring with expanded emplacement of stream-based detection systems.

- ***Recommendations:*** None.

Monitor migration characteristics and river conditions (RPA 53)

RM&E needs and directives: Five RPAs call for actions that monitor and describe migration characteristics and condition of either juvenile or adult salmonids within the FCRPS.

All these RPAs are being met by projects conducted by an assortment of agencies.

RPA 53.1 -- Monitor and estimate the abundance of smolts passing index dams.

- ***RM&E projects - coverage assessment:*** No gap exists, but NOAA seeks improved smolt abundance estimates, and expanded coverage at more dam monitoring sites. Currently, The FPC calculates passage indices at all collector dams, as well population estimates at LGR Dam. SMP methods may provide a method for satisfying NOAA's needs. However, NOAA is considering an additional method using subroutines in COMPASS to produce dam-based population estimates. These could be compared with those from the FPC approach. Non-contracted NOAA analysts need to participate, or could be supported under the "new project" associated with COMPASS modeling (project # 2008-737-00).
- ***Recommendations:*** Have NOAA and the FPC coordinate analytical efforts, conduct and report estimates to the region.

RPA 53.2 -- Monitor and describe the migration timing of smolts at index dams, identify potential problems, and evaluate implemented solutions.

- ***RM&E projects - coverage assessment:*** No gap exists. This is a cornerstone activity within the SMP.
- ***Recommendations:*** Review the SMP to determine the extent to which population-specific (PIT tagged) data are needed to describe timing.

RPA 53.3 -- Monitor and describe smolt condition (e.g., descaling and injury) at dams with JBS, identify potential problems, and evaluate implemented solutions.

- ***RM&E projects - coverage assessment:*** No gap exists. SMP monitoring appears to be adequate, but some agencies have expressed concern that the handling effort may be more than needed. A reduction in fish handling may be desirable.
- ***Recommendations:*** Review sampling/handling needs.

RPA 53.4 -- Monitor and enumerate adult salmonids passing through fishways in the FCRPS, identify potential problems, and evaluate implemented solutions.

- ***RM&E projects - coverage assessment:*** No gap exists, but the quality of estimates may be in question given fallback, counting expansions, etc. Corps ladder counts are adequate, in conjunction with PIT detectors as supplemental information for various analyses, like conversion rate estimation.

RPA 53.5 -- Evaluate operation of the Bonneville PH2 corner collector from March 1 through start of spill as a potential means to provide a safer downstream passage route for steelhead kelts, and implement if warranted.

- ***RM&E projects - coverage assessment:*** No gap exists. The Corps has funded two years of research on this issue. Management is now digesting that information and will prescribe operating guidelines. Even so, NOAA & BPA are suggesting there may be a need to obtain more population-specific information.
- ***Recommendations:*** A formal plan for B2CC operation needs to be developed. This matter can be addressed within the upcoming Kelt Management Plan.

Evaluate operations and configurations at dams (RPA 54)

- ***RM&E needs and directives:*** Fourteen RPAs call for actions that evaluate the effects of dam passage improvements and operations. Most of the projects addressing these needs are reviewed and funded under the Corps' AFEP program. The RPAs are quite specific in the directives.
- All of these RPAs are being addressed.

RPA 54.1 -- Monitor and evaluate the effects of existing spillways, modifications, and operations on smolt survival.

- ***RM&E projects - coverage assessment:*** No gap exists. Both dam-specific and system-wide evaluations of spill effects on survival are regularly executed by several agencies including NOAA, USGS, and the FPC. This occurs under a variety of AFEP and FWP projects.
- ***Recommendations:*** None.

RPA 54.2 -- Monitor and evaluate the effectiveness of traditional juvenile bypass systems and modifications on smolt survival and condition.

- ***RM&E projects - coverage assessment:*** No gap exists. AFEP regularly evaluates bypass performance as new systems are built, or upgrades occur to existing systems.
- ***Recommendations:*** None.

RPA 54.3 -- Monitor and evaluate the effectiveness of surface bypass structures and modifications on smolt survival and condition.

- ***RM&E projects - coverage assessment:*** No gap exists. AFEP regularly evaluates SFO performance as new systems are emplaced or upgrades to existing facilities occur.
- ***Recommendations:*** None.

RPA 54.4 -- Monitor and evaluate the effectiveness of turbine operations and modifications on smolt survival and condition.

- ***RM&E projects - coverage assessment:*** No gap exists. AFEP projects regularly evaluate performance as new turbine designs or alternative operations are proposed.
- ***Recommendations:*** None.

RPA 54.5 -- Monitor and evaluate overall dam passage with respect to modifications at projects (including forebay delay and survival).

- ***RM&E projects - coverage assessment:*** No gap exists. AFEP regularly evaluates performance as identified in the needs and priority process. Relative survival estimates and/or passage route distribution are appropriate performance measures to determine best treatment operation or configuration.
- ***Recommendations:*** None.

RPA 54.6 -- Monitor and evaluate the effectiveness of the juvenile fish transportation program and modifications to operations.

- ***RM&E projects - coverage assessment:*** No gap exists. AFEP evaluates performance of transport facilities and operations as the need arises.
- ***Recommendations:*** None.

RPA 54.7 -- Monitor and evaluate the effects of environmental conditions affecting juvenile fish survival.

- ***RM&E projects - coverage assessment:*** No gap exists. Total Dissolved Gas, temperature, turbidity, and flow are considered key factors, and they are regularly monitored throughout the FCRPS. If other factors are a concern, the suite of variables to be monitored could be expanded. Many PIT tagged fish migrating through the system from assorted projects provide response units for analyzing effects on smolt survival or migration characteristics. The FPC, NOAA and CSS have conducted these types of probative analyses. The Corps funds the collection and recording of temperature and TDG data, and index flow at dams. DART compiles and displays these and other environmental and fish data, as does the FPC.
- ***Recommendations:*** None.

RPA 54.8 -- Monitor and evaluate the effectiveness of reducing predation towards improving juvenile fish survival.

- ***RM&E projects - coverage assessment:*** No gap exists. The collective predation studies adequately address the needs of this RPA. Ongoing under CRFM, continued monitoring

of avian predators and their colonies (O&M), dam angling and estimates of annual exploitation of Pikeminnow (modeling), in conjunction with juvenile dam survival studies will all demonstrate effectiveness. No one project addresses this RPA, which requires more of a synthesis of collective information.

- The collective predation studies (fish, birds and mammals) should be reviewed as a complex regarding management needs for 2010 and beyond and effort required. Pikeminnow efforts should be stabilizing, but other fish species are being considered for additional study. Terns may require less basic research, but perhaps some level of general monitoring. Cormorants will likely continue to receive emphasis.

- ***Recommendations:*** AA may need to issue an RFP to have this holistic analysis performed.

RPA 54.9 -- Investigate, evaluate and deploy alternative technologies and methodologies for fish passage, e.g., SFO's, TSW's, etc.

- ***RM&E projects - coverage assessment:*** No gap exists. New passage technologies have been and will continue to be prototyped, tested, and ultimately deployed as part of AFEP and CRFM.

- ***Recommendations:*** None.

RPA 54.10 -- Determine if actions directed at benefiting juveniles have an unintended effect on migrating adults (e.g., certain spill operations).

- ***RM&E projects - coverage assessment:*** No gap exists. This issue is addressed at each project as need arises. The AFEP forum treats this matter.

- ***Recommendations:*** None.

RPA 54.11 -- Install and maintain PIT tag detectors in fish ladders at key dams in the FCRPS and evaluate adult survival (conversion rates).

- ***RM&E projects - coverage assessment:*** No gap exists. PIT tag detectors are now installed in all key FCRPS ladders. However, currently there are no detectors at The Dalles and John Day dams. Tributary turn-off and straying between Bonneville and McNary dams is of concern when calculating conversion rates or upstream passage survival. If stream-based PIT detectors successfully function in the major tributaries in this reach, then the need for additional ladder coverage could be circumvented. Those systems are being developed and tested in 2009. If the stream systems fail, then detectors may be required at TD and JD dams. NOAA uses ladder-based detections to monitor upstream passage survival.

- ***Recommendations:*** None.

RPA 54.12 -- Monitor and evaluate the effects of fish ladder operations and configurations on adult passage rates.

- ***RM&E projects - coverage assessment:*** No gap exists. This issue is addressed at each project as need arises through the AFEP process.
- ***Recommendations:*** None.

RPA 54.13 -- Evaluate operation of The Dalles Dam sluiceway from March 1 – March 31 and from December 1 – December 15 as a potential means to provide a safer fallback passage route for overwintering steelhead and kelts, and implement if warranted.

- ***RM&E projects - coverage assessment:*** No gap exists. In AFEP, project ADS-P-00-6 addresses this issue.
- ***Recommendations:*** None.

RPA 54.14 -- Investigate surface-flow outlets during wintertime as a means to provide safer fallback opportunity for over-wintering steelhead (the need will be determined by results of further research).

- ***RM&E projects - coverage assessment:*** No gap exists. The need for research has been identified and executed at The Dalles and B2CC. Data are in hand (ADS-p-00-6).
- ***Recommendations:*** A management plan for the B2CC needs to be devised using this information.

Investigate critical uncertainties (RPA 55)

- ***RM&E needs and directives:*** Nine RPAs call for research directed at resolving key uncertainties regarding broad-scale biological responses to the FCRPS. Some focus on evaluating the feasibility of using new tagging technologies to improve our information base. The prescriptions are somewhat generic and open-ended. In addition to the nine specified in the BiOp, we include one estuary RPA (58.1) that complements others in this category.
- Only one RPA remains to be addressed, the biannual delayed mortality workshop called for in 53.3. By and large the other RPAs are being addressed to the extent that is practical. However, we do make recommendations, to help focus the direction of future research.

RPA 55.1 -- Investigate and quantify delayed differential effects (D-value) associated with the transportation of smolts in the FCRPS as needed.

- ***RM&E projects - coverage assessment:*** No gap exists, and species coverage is expected to expand in 2009 and beyond since sockeye and fall Chinook are proposed for research.

Other species will continue at some level, but frequency of and sample size for acquiring estimates needs clarification for future years. This complements with RPA 52.2, which calls for D estimates to be incorporated into system survival evaluations. Both NOAA and CSS analyze this information. Many PIT tagged fish used in the calculations have come from the CSS study and SMP.

- ***Recommendations:*** Tagging needs (e.g., population coverage and N) should be established in the regional PIT tagging Plan.

RPA 55.2 -- Investigate the post-Bonneville mortality effect of changes in fish arrival timing and transportation to below Bonneville.

- ***RM&E projects - coverage assessment:*** No gap exists. Recent NOAA transport studies treat this issue at some level. Projects are reviewed in AFEP, with focus on SARs from BON-BON.

- ***Recommendations:*** Since tagged fish used in most evaluations emanate from other programs above LGR, tagging needs (N, populations) required for generating useful delayed mortality indices should be addressed in the regional PIT tagging Plan.

RPA 55.3 -- Conduct a workshop every other year with members of the Independent Scientific Advisory Board (ISAB) to review current research and monitoring approaches on post Bonneville mortality for transported and non-transported fish. (Initiate in FY 2009).

- ***RM&E projects - coverage assessment:*** *A* Gap currently exists. The workshop is to be held in 2009, and is in the early planning stages. BPA and the Corps have the lead on this. The workshop will synthesize research results and analyses, identify further needs, and plan the direction of future research.

- ***Recommendations:*** Execute the workshop in 2009.

RPA 55.4 -- Investigate, describe, and quantify key characteristics of the early life history of Snake River Fall Chinook Salmon in the mainstem Snake, Columbia, and Clearwater rivers.

- ***RM&E projects - coverage assessment:*** No gap exists. Studies have been ongoing under the FWP for more than a decade, and complementary projects have been funded under AFEP (e.g., radio tag investigations in Snake reservoirs). Additionally, proposed transport studies have important life history implications. This has been a multi-faceted complex of investigations over the years. The focus and level of effort for future studies should be examined during upcoming FWP project review.

- ***Recommendations:*** Conduct fall Chinook workshop to synthesize information to date and identify future research needs. Also, coordinate future research with any fall

Chinook transport study. Collectively, fall Chinook investigations should be treated as one well-coordinated program.

RPA 55.5 -- Complete analysis and reporting of a multi-year (2000-2007) investigation on the effects of adult passage experience in the FCRPS on pre-spawning mortality (2008). Following reporting, SRWG will review the results and provide a recommendation on the need and nature of future research.

- ***RM&E projects - coverage assessment:*** No gap exists. A multi-year research study has been conducted by the University of Idaho. However results from the research are still pending.
- ***Recommendations:*** The Corps needs to insist that U of I completes and publishes the analysis by a firm target date.

RPA 55.6 -- Continue development of state-of-the-art turbine units to obtain improved fish passage survival through turbines with the goal of using these new units in all future turbine rehabilitation or replacement programs.

- ***RM&E projects - coverage assessment:*** No gap exists. The Turbine Survival Program (TSP) is developing hypotheses to test in near-term. The BiOp schedule may slip until hypotheses are resolved.
- ***Recommendations:*** None.

RPA 55.7 -- Investigate feasibility of developing PIT tag detectors for spillways and turbines.

- ***RM&E projects - coverage assessment:*** No gap exists. Efforts have been underway and continue under the FWP project conducted by NOAA.
- ***Recommendations:*** None.

RPA 55.8 -- Evaluate new tagging technologies for use in improving the accuracy and assessing delayed or indirect hydro effects on juvenile or adult fish.

- ***RM&E projects - coverage assessment:*** No gap exists. JSAT, POST and Genetic markers are examples of new technologies being investigated for application in accordance with the BiOp. Perceived overlap in project scope for acoustic tag studies needs resolution. There may be opportunities to refocus the studies and realize cost savings.
- ***Recommendations:*** Convene a workshop that focuses on clarifying the needs and methods for estimating survival using various telemetry tools both in FCRPS, and into the marine environment.

RPA 55.9 -- Assess the feasibility of developing PIT tag detectors for use in natal streams and tributaries, or other locations, as appropriate to support more comprehensive and integrated All-H monitoring designs and assessments of stray rates.

- ***RM&E projects - coverage assessment:*** No gap exists. Devices have been and continue to be developed and tested for application at several sites (NOAA).
- ***Recommendations:*** None

RPA 58.1 -- Estimate smolt survival through the estuary.

- ***RM&E projects - coverage assessment:*** No gap exists. Both JSAT and POST offer capabilities to track juvenile fish and generate certain survival estimates. However, management needs, and the roles of the tag systems in satisfying those needs require clarification.
- ***Recommendations:*** Convene a workshop that focuses on clarifying the needs and methods for estimating survival using various telemetry tools both in FCRPS, and into the marine environment. **See RPA 55.8**.

Predation Management RM&E – Strategy 7

- ***RM&E needs and directives:*** Five RPAs address predation issues in the Columbia Basin. These are generic in nature.
- A broad array of predator related RM&E projects are being conducted in the Basin. No gaps in coverage were identified.

Monitor and evaluate the Caspian tern population in the Columbia River estuary (RPA 66)

- ***RM&E projects - coverage assessment:*** No gap exists. It is possible that this basic research effort can decrease in a few years and move toward conducting general periodic monitoring.
- ***Recommendations:*** None.

Monitor and evaluate the Double Crested cormorant population in the Columbia River estuary (RPA 67)

- **RM&E projects - coverage assessment:** No Gap exists. Basic research is still being conducted, and is funded under AFEP.
- **Recommendations:** None.

Monitor and evaluate inland avian predation (RPA 68)

- ***RM&E projects - coverage assessment:*** No gap exists. Several research objectives (WEs) under contract AVS-W-03-01 investigate inland bird predation.

- ***Recommendations:*** None.

Conduct monitoring related to marine mammal predation (RPA 69)

- ***RM&E projects - coverage assessment:*** No gap exists. The Corps program in conjunction with the Accord project, CRITFC hazing project (2008-0004-00,) adequately address this RPA.

- ***Recommendations:*** None.

Conduct monitoring and evaluations related to piscivorous predation; Pikeminnow and other freshwater species (RPA 70)

- ***RM&E projects - coverage assessment:*** No gap exists. Pikeminnow have received emphasis thus far. A workshop was convened in 2008 to focus on other predatory species and identify research needs. Field work is expected to be initiated in the fall of 2009, and funds have been allocated. Plans are in place to address species beyond Pikeminnow.

- ***Recommendations:*** None.

Additional Observations and Recommendations by the Work Group

The Work group subcommittee recommends the following suite of projects should each be reviewed as a coordinated complex of studies. This may reduce overlap, help establish preferred methodology, clarify PIT tag sample sizes for certain monitoring activities, and determine if studies need to refocus RM&E to adequately address certain RPAs.

- **Fall Chinook studies in the Snake River (RPA 55.4, 55.2, 55.1)**. Complementary projects include; early life history studies by USGS and NOAA investigators, migration behavior using telemetric tags and PIT tags, and the proposed transport evaluation study. Collectively, this suite of studies is complementary. The transport evaluation remains to be conducted, but in some manner needs to be integrated with the other studies and hatchery production issues. This complex network of information and concerns has necessarily involved input from a number of agencies. Since information has been collected for more than a decade, it may be time to synthesize the collective information and perhaps refresh research objectives for 2010 and beyond.

- **System survival monitoring (RPA 52.2).** The community appears to have settled on PIT tags and the single release model as the preferred method for monitoring smolt survival through the FCRPS, at least for spring-migrating races. Still, population coverage,

sample sizes and the required hatchery/wild mixture have not been settled. Coordination with hatchery and habitat tagging needs is paramount, since source fish for mainstem monitoring will emanate from these tagged populations. Individual RM&E Work Groups cannot prescribe sample sizes without considering needs of the other groups. The yet to be established Regional PIT tag Planning Work Group needs to resolve these matters. In so doing, efficiencies in allocating resources to PIT tagging should be realized.

- **Delayed mortality (RPA 55.1, 55.2**). A number of studies have used, or explored the use of a variety tags to estimate delayed effects associated with passage through the FCRPS and/or transportation. PIT tags reflect effects incurred throughout the life cycle to returning adults. Whereas acoustic tags, JSAT and VEMCO systems, focus on survival through to the mouth of the Columbia or out into the nearshore marine zone (VEMCO). There is the perception by some that the studies employing these devices are competitive. But in some respects they can be considered complementary, since they provide information spanning different geographic zones and life history stages. We suggest that the responsible research review forum, treat these as a set of studies, not isolated investigations. In doing so they may be able to identify opportunities for coordination among projects, so that results are truly complementary, providing a more complete picture of estuarine and early ocean survival. We expect that the upcoming delayed mortality workshop (**RPA 55.3**) will delve into this issue and provide a solid foundation for focusing future research on delayed mortality.

- **Collective predation studies (birds and fish) (RPA 66, 67, 68, 70).** A broad complex of projects and work elements treat fish and bird predation issues. Research and monitoring emphasis will likely be shifting among species in 2010 and beyond. Some species may only require general monitoring (e.g. Terns and Pikeminnow) while other species may require more basic research (e.g., cormorants and certain resident fish species).

- **Smolt Monitoring Program (RPA 53.1 – 53.3)**. The assortment of PIT tagging, smolt trapping and sampling activities supported under this program are used to describe migration characteristics of smolts in the Basin. In conjunction with the CSS study and some hatchery monitoring efforts, these collective efforts infuse many PIT tagged fish into the system. The population coverage and sample sizes among these efforts should be suitable to meet general monitoring needs as well as produce useful system survival estimates **(RPA 52.2)**. The regional PIT tagging WG will need to consider SMP and related tagging efforts from a more holistic perspective.

RPA Coverage Report – Estuary/Ocean

June 2, 2009, Estuary/Ocean RME Workgroup, GEJ (503 417 7567)

Introduction

Since November 2008 at the behest of the Action Agencies, the estuary/ocean research, monitoring and evaluation workgroup (ERMEW) has been working on a comprehensive review of estuary/ocean RME RPAs (58-61) in the 2008 FCRPS BiOp and associated projects funded by BPA, USACE and others. The ERMEW is comprised of representatives from BPA, NMFS, NPCC, and USACE and is facilitated by PNNL. The tasks for this review included: 1) review Management Questions (and associated decisions) and RPAs for monitoring and research requirements; 2) review and further develop RM&E Work Plan for documentation of expectations, information needs, and identification of subtasks, task leads, and milestones; 3) assess coverage of RPA actions and information needs and areas that may be reduced through critical, project specific reviews; 4) develop recommendations for changes to existing projects and/or needs for additional projects that would address any RM&E gaps. This RPA coverage report addresses Tasks 3 and 4.

Methods

The ERMEW identified pertinent projects and assessed coverage of the RPAs. Individual scores and comments are documented in Attachment 7 of the ERMEW's Running Meeting Notes. The ERMEW used the following scoring system:

Score	Criterion
1	Complete, the RPA is fully covered and met by past and existing projects; discontinue work related to this RPA
2	Ongoing, the RPA is fully covered by existing work; continue work related to this RPA
3	Ongoing, the RPA is partially covered by existing work; continue work related to this RPA and add new work elements
4	Ongoing, the RPA is partially covered by existing work; continue work related to this RPA and initiate an RFP
5	Nothing, the RPA is not being covered by any project; initiate an RFP

General Findings

General findings include:

- None of the RPAs were complete and fully covered such that project work could be discontinued (Score 1). On the other hand, no RPAs had zero project coverage (Score 5).
- Most RPAs were either fully covered by ongoing projects (Score 2) or would be fully covered with additional work elements (Score 3).

- There is an overarching need for synthesis of the collective information on many RPAs. These "roll-ups" will be very relevant to BiOp reporting requirements.

Specific Findings and Recommendations

Specific findings on gaps and any recommendations for new work elements or RFPs are organized by RPA Subaction. This material is drawn from Attachment 5 in the ERMEW's Running Meeting Notes. These findings and recommendations are subject to change.

Monitor and Evaluate Fish Performance in the Estuary and Plume (RPA 58)

Subaction 58.1 -- Monitor and evaluate smolt survival and/or fitness in select reaches from Bonneville Dam through the estuary.

- Coverage: No gap for the survival component; but, there is one for the fitness component. AFEP project EST-02-P-01 is using acoustic telemetry to make survival estimates for various reaches in the lower river and estuary (Bonneville to the mouth).
- Recommendations: The "and/or" element causes ambiguity. Assuming both survival and fitness are required, consider assessing applicability and feasibility to measure fitness of juvenile salmon at select locations in the lower Col. R. and estuary under AFEP project EST-09-P-01 or a new project.

Subaction 58.2 -- Develop an index and monitor and evaluate life history diversity of salmonid populations at representative locations in the estuary.

- Coverage: No gap for development of the life history diversity index assuming AFEP project EST-09-P-01 will be successful during 2009/2010. Monitoring coverage will be determined after the index is developed.
- Recommendations: Develop the index, then design the monitoring effort to support it. AER2 to review the applicability of a life-cycle modeling approach.

Subaction 58.3 -- Monitor and evaluate juvenile salmonid growth rates and prey resources at representative locations in the estuary and plume.

- Coverage: There is a coverage gap in that more (TBD) representative sample sites in the estuarine and tidal freshwater reaches are needed to fulfill this subaction, as is an estuary-wide roll-up. The Corps, however, respectfully disagrees as this subaction is being addressed with intensive data from action effectiveness research on the realized benefits from habitat restoration.
- Recommendations: Continue ongoing work, but add more sampling sites and do periodic roll-ups to provide up-to-date, comprehensive summaries of the research for managers to use to make decisions.

Subaction 58.4 -- Monitor and evaluate temporal and spatial species composition, abundance, and foraging rates of juvenile salmonid predators at representative locations in the estuary and plume.

- Coverage: Need to consult with the Hydro/Predation Workgroup.
- Recommendations: Need to consult with the Hydro/Predation Workgroup.

Monitor and Evaluate Migration Characteristics and Estuary/Ocean Conditions (RPA 59)

Subaction 59.1 -- Map bathymetry and topography of the estuary as needed for RM&E.

- Coverage: There is a gap until the bathymetry and topographic mapping are completed. Work to fill some gaps is underway under F&WP project 2003-007-00 but floodplain bathymetry is not covered by a project. LiDAR post-processing has been done for selected sites under AFEP project EST-02-P-04 but is insufficiently developed in most parts of the estuary for habitat planning purposes.
- Recommendations: Continue to work within F&WP project 2003-007-00, AFEP project EST-02-P-04, and/or other projects to finish the bathymetric and topographic mapping.

Subaction 59.2 -- Establish a hierarchical habitat classification system based on hydrogeomorphology, ground-truth it with vegetation cover monitoring data, and map existing habitats.

- Coverage: Gap in that F&WP project 2003-007-00 currently plans to develop the estuarine ecosystem classification and associated maps for only 1 and part of 2 of the 8 reaches between the mouth and Bonneville Dam. Input data for the classification is missing (e.g., vegetative land cover) (see Subaction 59.5). The Action Agencies and NOAA agreed that the ecosystem classification system should be completed for the entire lower river and estuary (Bonneville to the mouth).
- Recommendations: Expand work in F&WP project 2003-007-00 to complete the remaining six+ reaches. Develop input data for the classification (e.g., vegetative land cover) through a new project.

Subaction 59.3 -- Develop an index of habitat connectivity and apply it to each of the eight reaches of the study area.

- Coverage: No gap assuming AFEP project EST-09-P-01 is successful in developing a habitat connectivity index during 2009/2010.
- Recommendations: None, assuming the habitat connectivity index will be applicable to all eight reaches.

Subaction 59.4 -- Evaluate migration through and use of a subset of various shallow-water habitats from Bonneville Dam to the mouth toward understanding specific habitat use and relative importance to juvenile salmonids.

- Coverage: There is a gap in that this subaction has not been fully addressed by the ongoing projects because we do not definitively know the relative importance of various habitat types to juvenile salmon. The Corps respectfully disagrees because, in their opinion, the existing research meets the intent/need of this subaction.

- Recommendations: Need more work on fish/habitat associations in 2003-010-00 and 2005-001-00 and also incorporate fish/habitat research into the new AFEP one-pager for the 2010 planning process (i.e., a new RFP).

Subaction 59.5 -- Monitor habitat conditions periodically, including water surface elevation, vegetation cover, plan community structure, primary and secondary productivity, substrate characteristics, dissolved oxygen, temperature, and conductivity, at representative locations in the estuary as established through RM&E.

- Coverage: Gap in coverage estuary-wide. Status and trends monitoring for habitat conditions in the estuary has been limited in scope to two or three sites per year since 2005 in the 246-mile long lower river and estuary. This is not sufficient to meet the needs of this RPA subaction.
- Recommendations: Expand habitat sampling in F&WP project 2003-007-00.

Monitor and Evaluate Habitat Actions in the Estuary (RPA 60)

Subaction 60.1 -- Develop a limited number of reference sites for typical habitats (e.g., tidal swamp, marsh, island, and tributary delta to use in action effectiveness evaluations).

- Coverage: No gap assuming reference site characterizations among multiple projects are integrated into one network. This work is well underway with about 40 reference sites throughout the lower river and estuary for use in action effectiveness research.
- Recommendations: F&WP project 2003-011-00 needs to complete the reference site integration and provide a dissemination mechanism.

Subaction 60.2 -- Evaluate the effects of selected individual habitat restoration actions at project sites relative to reference sites and evaluate post-restoration trajectories based on project-specific goals and objectives.

- Coverage: No gap assuming the action effectiveness research is synthesized and the intensive monitoring continues that is currently being performed under F&WP project 2003-011-00 for an adequate number of years to ensure the restoration trajectory is understood.
- Recommendations: Make sure there's a project that synthesizes all AER in the estuary, something like AFEP project EST-02-P-04 is doing regarding cumulative effects in 2010/2011.

Subaction 60.3 -- Develop and implement a methodology to estimate the cumulative effects of habitat conservation and restoration projects in terms of cause-and-effect relationships between ecosystem and controlling factors, structures, and processes affecting salmon habitats and performance.

- Coverage: No gap assuming the cumulative effects methodology and an initial assessment are completed as scheduled in 2011. AFEP project EST-02-P-04 is well along on this RPA subaction.

- Recommendations: None, except make sure the deliverables from this project are carried forward after the projects ends in spring 2011.

Investigate Estuary/Ocean Critical Uncertainties (RPA 61)

Subaction 61.1 -- Continue work to define the ecological importance of the tidal freshwater, estuary, plume, and nearshore ocean environments to the viability and recovery of listed salmonid populations in the Columbia River Basin.

- Coverage: There is a gap because a roll-up has not been programmed.
- Recommendations: Continue ongoing work, but need to add work elements to 1998-014-00, 2003-010-00, and 2005-001-00 and do periodic roll-ups to provide up-to-date, comprehensive summaries of the research for managers to use to make decisions.

Subaction 61.2 -- Continue work to define the causal mechanisms and migration/behavior characteristics affecting survival of juvenile salmon during their first weeks in the ocean.

- Coverage: No gap. There are ongoing AFEP and F&WP program projects that are addressing this RPA subaction.
- Recommendations: None.

Subaction 61.3 -- Investigate the importance of early life history of salmon populations in tidal fresh water of the lower Columbia River.

- Coverage: There is a gap because a roll-up has not been programmed.
- Recommendations: Continue ongoing work, but need to add work elements to 2003-010-00 and 2005-001-00 and do periodic roll-ups to provide up-to-date, comprehensive summaries of the research for managers to use to make decisions.

Subaction 61.4 -- Continue development of a hydrodynamic numerical model for the estuary and plume to support critical uncertainties investigations

- Coverage: No gap although examining other modeling approaches should be considered.
- Recommendations: Evaluate the applicability of different hydrodynamic models for design and evaluation needs related to habitat restoration.

Summary Table

	58.1	58.2	58.3	58.4	59.1	59.2	59.3	59.4	59.5	60.1	60.2	60.3	61.1	61.2	61.3	61.4
Gap (red) No Gap (green)	A		B	C	D	E		F	G				H		I	

[A] No gap for survival, but there is one for fitness.

[B] Gap in that more (TBD) representative sample sites are needed, as is an estuary-wide roll-up. The Corps, however, respectfully disagrees as this subaction is being addressed with intensive data from action effectiveness research on the realized benefits from habitat restoration.

[C] Defer to Hydro/Predation Workgroup.

[D] Gap until the bathymetry and topographic mapping are completed.

[E] Gap in that estuarine ecosystem classification and associated maps will be for only 2 of 8 reaches.

[F] Gap in knowledge of the relative importance of various habitat types to juvenile salmon. The Corps respectfully disagrees because, in their opinion, the existing research meets the intent/need of this subaction.

[G] Gap in coverage estuary-wide.

[H] Gap because a roll-up has not been programmed.

[I] Ibid.

RPA Coverage Analysis: Tributary Habitat and Fish Population

The Tributary Habitat and Fish Population Workgroup examined projects and work elements identified in Pisces, and linked them to RPAs 50, 51, 56, and 57. In addition, the Workgroup sought input from local biologists, who currently monitor fish and habitat attributes within their respective areas. The information collected from local biologists and information contained within Pisces was used by the Workgroup to identify current monitoring efforts and possible gaps in monitoring fish populations and tributary habitat. What follows is a summary of the Workgroup findings.

Priority Recommendations

After completing the assessments described above, the Tributary Habitat and Fish Population Workgroup identified RPA gaps that need to be addressed as soon as possible. Those priority gaps were identified in RPAs 50.1, 50.5, 50.6, and 50.7. These are also highlighted below.

Monitoring the Status of Selected Fish Populations Related to FCRPS Actions -- RM&E Strategy 1

Fish Population Status Monitoring (RPA 50)

The Action Agencies will enhance existing fish population status monitoring performed RM&E by fish management agencies through the specific actions listed below. In addition, ancillary population status and trend information is being obtained through several ongoing habitat and hatchery improvement projects.

RPA 50.1 -- Implement and maintain the Columbia River Basin passive integrated transponder (PIT)-Tag Information System.

- ***RM&E projects - coverage assessment:*** This RPA was addressed by the Hydro/Predation Workgroup. They noted that there is no gap and that PTAGIS is funded annually, which operates the PIT tag system throughout the basin and maintains the database. The Tributary Habitat and Fish Population Workgroup noted that PTAGIS is very mainstem focused. To make it more useful for tagging studies in tributaries (e.g., tributary survival studies), the structure of the database needs to be revised, expanded, or improved.

- ***Recommendation (Implement as soon as possible):*** The Workgroup recommends that the existing database be revised and expanded to include information from interrogation systems that are being installed in tributaries to measure population-scale abundance and survival. In addition, the Workgroup recommends that a systematic approach be developed for tagging adults at all mainstem dams. The approach needs to identify the species and number of fish to be tagged at each dam, and the program must be long-term and supported by an appropriate data-management structure in PTAGIS (the proposed PIT-Tagging Workgroup would further develop this approach). The tagging of adults at mainstem projects will inform studies on the effectiveness of habitat and hatchery actions, and improve harvest estimates.

RPA 50.2 -- Monitor adult returns at mainstem hydroelectric dams using both visual counts and the PIT-tag detection system.

- ***RM&E projects - coverage assessment:*** This RPA was addressed by the Hydro/Predation Workgroup. They noted that there are no gaps and that all "key" dams have adult monitoring systems. The Tributary Habitat and Fish Population Workgroup agree with the Hydro/Predation Workgroup.

- ***Recommendation:*** Except for the recommendation to develop a systematic approach to tagging adults at all mainstem dams (see RPA 50.1), the Workgroup has no other recommendation for this RPA.

RPA 50.3 -- Monitor juvenile fish migrations at mainstem hydroelectric dams using smolt monitoring and the PIT-tag detection system.

- ***RM&E projects - coverage assessment:*** This RPA was addressed by the Hydro/Predation Workgroup. They noted that there are no gaps and that PTAGIS and SMP operate annually. The Tributary Habitat and Fish Population Workgroup noted that a there is a lack of sufficient numbers of natural-origin juveniles being PIT tagged in nearly every Chinook and steelhead population identified by the TRT in the Interior Columbia Basin.

- ***Recommendation:*** The Workgroup recommends increasing the number of natural-origin juvenile Chinook and steelhead PIT tagged within all populations, or at least within one population per MPG. This needs to be based upon a coordinated, basin-wide approach that will provide valid smolt and adult data (the proposed PIT Tagging Workgroup will further develop this approach). This work will inform studies on the effects of habitat and hatchery actions.

RPA 50.4 -- Fund status and trend monitoring as a component of the pilot studies in the Wenatchee, Methow, and Entiat river basins in the Upper Columbia River, the Lemhi and South Fork Salmon river basins, and the John Day River Basin to further advance the methods and information needed for assessing the status of fish populations.

- ***RM&E projects - coverage assessment:*** The Workgroup conducted an inventory of current fish status and trend monitoring in the Wenatchee, Methow, and Entiat River basins in the Upper Columbia, the Lemhi and South Fork Salmon River basins, and the John Day River Basin (see Bruce's tables). The John Day, Lemhi, and South Fork Salmon populations appear to have sufficient status and trend monitoring with no significant gaps. The Wenatchee, Entiat, and Methow have gaps that should be filled.

- ***Recommendation:*** The Workgroup recommends the following in the Wenatchee, Entiat, and Methow:

    1. Conduct a three-year telemetry study to determine origin and escapement of steelhead into the Wenatchee, Methow, and Entiat basins. Adult steelhead would be tagged at Priest Rapids Dam. Given the current and proposed installation of PIT-tag interrogation

systems in Upper Columbia tributaries, the use of PIT-tags may also be useful in estimating steelhead origin and spawning escapement.

2. Increase accuracy and precision in abundance estimates of spring Chinook and steelhead smolts produced in the Wenatchee, Methow, and Entiat basins. Current estimates have very wide confidence intervals.

3. Increase the number of PIT-tagged, naturally produced spring Chinook and steelhead in the Entiat and Methow systems to better estimate migrating timing, residence, and life-stage survivals (e.g., parr-smolt, SAR, etc.).

4. Estimate precision and accuracy of redd counts wherever these counts are used to estimate spawning escapements. This work could be conducted within smaller watersheds within the three basins. There also needs to be research on the number of redds per female and estimates of "fish/redd," which are used to estimate spawning escapements.

RPA 50.5 -- Provide additional status monitoring to ensure a majority of Snake River B-Run steelhead populations are being monitored for population productivity and abundance.

- ***RM&E projects - coverage assessment:*** The Workgroup conducted an inventory on the current level of status monitoring of B-Run steelhead (see Bruce's tables; Rishi 2009). The Workgroup identified significant gaps in monitoring B-Run steelhead. Because the watersheds of the Clearwater and Salmon River are remote and snow filled in early spring when adult steelhead spawn, the state and tribes have not been able to make meaningful spawner surveys. This is because of access problems and the effects of spring runoff and turbidity on redd and spawner visibility. Likewise the use of weirs and smolt traps has been problematic due to the same high-runoff conditions. Therefore, adult spawner abundance has been extrapolated by determining summer low-flow parr densities and then back calculating the densities to estimate the number of spawners needed to produce those densities. The accuracy of such back calculations is highly questionable. The second strategy has been to use dam counts at Lower Granite Dam as a firm known count for the entire upper Salmon and Clearwater Rivers and to manage at a multi-MPG scale for spawner escapement. The present strategy for juvenile migrants has been to place smolt traps in accessible smaller tributaries where water conditions are more manageable and then extrapolate such index sites to the entire population. Juvenile density monitoring until recently was at fixed sites so that their utility for determining changes in distribution have been limited. In addition, diversity measures associated with cohorts, sex ratio, size, etc. have suffered from the same difficulties in obtaining adult fish for sampling. Limited sampling has occurred through creek surveys and some limited trap sites at hatcheries.

  The following are being pursued as possible solutions. They may or may not provide the expected outcome in its entirety, but appear to be on a reasonable and prudent course.

- Use a series of PIT-tagging programs coupled with strategically placed detection arrays in order to determine adult migration timing, distribution, and survival of tagged fish. It is likely that PIT tags would be able to detect behavioral and distributional differences in A Run and B Run, if they exist, or it may confirm that the two runs are an artificial demarcation.

- Obtain detailed DNA SNP information about each population within the steelhead MPGs in Idaho in order to be able to obtain a genetic fingerprint of each population that can be detected at Lower Granite Dam. DNA SNP sampling should also contribute to the A-Run/B Run question as they move through Lower Granite.

- Obtain DNA fingerprint of each hatchery stock so that they can be detected passing through the fisheries and into the spawning grounds. This fingerprint would be done each year based upon known DNA sequences for each female spawned.

- Continue to use tributary traps and weirs where feasible.

- Move toward probabilistic juvenile sampling where feasible to improve distribution information and to make better unbiased estimates of juvenile parr densities.

- **Recommendation (Implement as soon as possible): The Workgroup recommends that following:**

    1. Maintain current contracts ISMES 19905500, and INPMEP 199107300. ISS 198909800 is scheduled to end in 2014. However, the location and information derived from the weirs and traps associated with this project are extremely valuable for evaluating status of B-Run steelhead in many tributary streams. This project should be re-configured in 2014 based on results of FPG 200732300 to continue to collect adult and juvenile data for strategic locations in the basin or combined with ISMES 199005500.

    2. Fund FPG 200732300 through at least one more funding cycle to ascertain results of project DNA objectives.

    3. If the above strategy is successful, reconfiguring of adult and juvenile monitoring may be appropriate in 2013.

    4. Systematically sample returning adult steelhead at Lower Granite Dam for genetics (tissue samples) and age structure (scale samples), and mark the fish with PIT tags (tagging will be consistent with the PIT-tagging approach recommended for RPA 50.1). Establish remote PIT-tag interrogation systems near the mouths of the Selway, Lochsa, South Fork, and Lolo Creek populations (part of the Clearwater MPG). As part of RPA 56.2, an interrogation system already exists near the mouth of the South Fork Salmon River population. Finally, place another interrogation system in the Salmon River upstream from the confluence of the Middle Fork Salmon River. The latter system can be used to determine if B-Run steelhead occur in areas upstream from the Middle Fork population (the assumed most-upstream population of B-Run steelhead). These systems can be used to assess the

distribution, abundance, and productivity of steelhead within a majority of the B-Run populations.

5. Provide hand-held PIT-tag detectors to harvest managers to determine the harvest of steelhead in fisheries upstream from Lower Granite Dam.

RPA 50.6 -- Review and modify existing Action Agencies' fish population status monitoring projects to improve their compliance with regional standards and protocols, and ensure they are prioritized and effectively focused on critical performance measures and populations.

- RM&E projects - coverage assessment: The Workgroup determined that existing fish population status monitoring projects should comply with the guidance document being prepared by NOAA Fisheries (Crawford and Rumsey 2009). The Workgroup identified some gaps; however, because the document is draft and has just been released for public comment, the Workgroup offers only an initial assessment. A more complete investigation of how well existing programs comply with the guidance document will be completed after the document is final.

In an effort to help address RPA 3 (Comprehensive Evaluations), the Workgroup expanded the scope of RPA 50.6 to include population status monitoring in at least one population within each MPG.

- **Recommendation (Implement as soon as possible):** The Workgroup recommends the following:

1. Table 1 identifies possible recommendations to fill gaps in existing steelhead population status monitoring. These recommendations are tentative, because the standard by which gaps were assessed (NOAA Guidance Document) has not be finalized.

Table 1. Recommended changes to existing population status and trend monitoring projects.

MPG	Status/Trend Contract No.	Possible Recommendations
Snake River Steelhead DPS		
Lower Snake	200205300	Implement GRTS adult sampling in the Tucannon Basin.
Grande Ronde	199800702, 199202604, 200708300	Extend trapping period at Lostine weir and install second screw trap on Minam River. Fund ODFW 2007-09 proposal 200733700 at $400,000/year to implement EMAP sampling.
Imnaha	199701501	Develop GSI characterization of Imnaha River system.
Clearwater	ISMES 19905500, INPMEP 199107300, ISS 198909800	Fund full parental genotyping (200732300) through at least one more funding cycle to complete DNA objectives.
Salmon	ISMES 19905500, INPMEP 199107300, ISS 198909800	Fund full parental genotyping (200732300) through at least one more funding cycle to complete DNA objectives.
Mid Columbia Steelhead DPS		

MPG	Status/Trend Contract No.	Possible Recommendations
Umatilla/Walla Walla	199000501, 198902401, 200003300, 200003900	None
John Day	199801600, 200301700	Expand the work to increase density of sampling sites (using master sample list) to improve population-scale resolution for VSP in the lower and upper mainstem. Develop PHOS and DNA baseline in the MPG.
Yakima	199603501, 199506325	Develop GRTS juvenile sampling in the tributaries to determine steelhead distribution and juvenile abundance. Conduct additional DNA evaluations at Prosser Dam and lower river tributaries to accurately parse out adult steelhead spawners.
Cascade East Slope	199506335, 200715600	Combine 199506425 with 19881205 or 19950633. Complete modification of Lyle Falls trap and Castile Falls trap under 198811535.
Upper Columbia Steelhead DPS		
Upper Columbia	ISEMP 200301700, OBMEP 200302200	See RPA 50.4.

2. Table 2 identifies one or more populations per MPG that should be monitored for fish status and trend (fish in-fish out; see Bruce's tables). The following populations were identified as populations with currently some fish monitoring (usually associated with hatchery programs) and those with relatively large habitat/survival gaps, which were identified in Table 5 in the BiOp. The Workgroup recommends linking fish in-fish out monitoring to populations with relatively large habitat/survival gaps. These populations were also recommended for habitat status and trend monitoring (under RPA 56.3). Monitoring of populations that will receive habitat actions should help support RPA 56.1.

Table 2. Identification of Chinook salmon and steelhead populations that should be monitored for population (fish in/fish out) status and trends.

ESU/DPS	MPG	Population	Has Current Fish Population Monitoring	Comments
Chinook Salmon				
Snake River Spring/Summer Chinook	South Fork	South Fork	Yes	Required in RPA 50.4
	Middle Fork	Big Creek	No	Only pop with a habitat gap (1%)
	Upper Salmon	Lemhi	Yes	Required in RPA 50.4

ESU/DPS	MPG	Population	Has Current Fish Population Monitoring	Comments
		Pahsimeroi	No	Has a large habitat gap (41%)
		Yankee Fork	No	Has a large habitat gap (30%)
	Lower Snake	Tucannon	Yes	Only pop with habitat gap (17%)
	Grande Ronde/Imnaha	Upper Grande Ronde	Yes	Has large habitat gap (23%)
		Catherine Creek	Yes	Has large habitat gap (23%)
Upper Columbia Spring Chinook	Upper Columbia	Wenatchee	Yes	Required in RPA 50.4
		Entiat	Yes	Required in RPA 50.4
		Methow	Yes	Required in RPA 50.4
Steelhead				
Snake River Steelhead	Clearwater	S. Fk. Clearwater	Yes	Has a large habitat gap (14%)
	Salmon	Lemhi River	Yes	Required in RPA 50.4
		South Fork	No	Required in RPA 50.4
	Lower Snake	Tucannon	Yes	Has largest habitat gap (5%)
	Grande Ronde	Upper Grande Ronde	Yes	Has largest habitat gap (4%)
		Joseph Creek	No	Has largest habitat gap (4%)
	Imnaha	Imnaha	Yes	Only population in MPG
Upper Columbia Steelhead	Upper Columbia	Wenatchee	Yes	Required in RPA 50.4
		Entiat	Yes	Required in RPA 50.4
		Methow	Yes	Required in RPA 50.4
		Okanogan	Yes	Covered under OBMEP
Middle Columbia Steelhead	Eastern Cascades	Klickitat River	Yes	Has largest habitat gap (4%)
		Fifteen Mile	No	Has winter-run steelhead
	Yakima	Upper Yakima	Yes	Monitoring at Roza Dam
	John Day	Lower Mainstem	Yes	Required in RPA 50.4
		North Fork	Yes	Required in RPA 50.4

ESU/DPS	MPG	Population	Has Current Fish Population Monitoring	Comments
		Upper Mainstem	Yes	Required in RPA 50.4
		Middle Fork	Yes	Required in RPA 50.4
		South Fork	Yes	Required in RPA 50.4
	Umatilla/Walla Walla	Umatilla	Yea	Has current monitoring

RPA 50.7 -- Fund marking of hatchery releases from Action Agencies' funded facilities to enable monitoring of hatchery-origin fish in natural spawning areas and the assessment of status of wild populations.

- ***RM&E projects - coverage assessment:*** The workgroup reviewed the marking rates at hatcheries funded by the Action Agencies. Based on that review, it was determined that not all fish produced in hatcheries funded by the Action Agencies are marked.

- ***Recommendation (Implement as soon as possible):*** The Workgroup recommends that hatchery managers, who operate hatcheries funded by the AA, provide written documentation that all (100%) of hatchery produced fish are marked externally. If 100% of the fish are not marked externally, the Workgroup recommends that all (100%) hatchery fish receive an external mark. This RPA is linked with RPA 62.4.

RPA 50.8 -- Report available information on population viability metrics in annual and comprehensive evaluation reports.

- ***RM&E projects - coverage assessment:*** The Workgroup determined that the Action Agencies need to coordinate their status/trend assessments with NOAA Fisheries to meet the deadlines set by BiOp Coordinators (Creason, Hall, etc.). The analyses need to be initiated in time for the annual and comprehensive reports. There is also a need to ensure consistency of project level reporting with guidelines identified under RPAs 50.6 and 72.

- The Workgroup also noted that crucial status/trend contracts contain data in numerous locations and in numerous formats.

- ***Recommendation:*** The Workgroup recommends the following:

  1. Finalize the NOAA VSP data dictionary in coordination with NWEIS and PNAMP.

  2. All monitoring contracts should be required, as a condition of their 2010 contract, to use the terms and definitions outlined in the NOAA VSP data dictionary and that these data be

contained in databases (including Pisces) that are downloadable to NOAA and the Action Agencies.

3. Funding should be provided to integrate the results of the workgroup monitoring evaluation tables with ongoing NOAA data compilation and documentation efforts consistent with recommendation #2.

Collaboration Regarding Fish Population Status Monitoring (RPA 51)

The Action Agencies will enhance existing fish population status monitoring preformed RM&E by fish management agencies through the following collaboration commitments:

RPA 51.1 -- Support the coordination, data management, and annual synthesis of fish population metrics through Regional Data Repositories and reports.

- ***RM&E projects - coverage assessment:*** The Workgroup identified no gap for this RPA. This work is ongoing through BPA contracts, PNAMP initiatives, and data management RPAs (71 and 72).
- ***Recommendation:*** The Workgroup has no recommendation for this RPA.

RPA 51.2 -- Facilitate and participate in an ongoing regional RM&E collaboration process to develop a regional strategy for status and trend monitoring for key ESA fish populations.

- ***RM&E projects - coverage assessment:*** The workgroup identified no gap for this RPA. This work is ongoing with participation in NWEIS Task 2, PNAMP Fish Population Workgroup, and coordination with the Hydro Action Plan for marking and tagging.
- ***Recommendation:*** The Workgroup recommends that program development be consistent with GRTS-based, master-sample management tools.

RPA 51.3 -- Provide cost-shared funding support and staff participation in regional coordination forums such as the Pacific Northwest Aquatic Monitoring Partnership (PNAMP) fish population monitoring workgroup and the Northwest Environmental Data Network to advance regional standards and coordination for more efficient and robust monitoring and information management.

- ***RM&E projects - coverage assessment:*** The workgroup identified no gap for this RPA. This work is ongoing with participation in PNAMP and NED, Action Agency contracts, PNAMP initiatives, and data management RPAs 71 and 72.
- ***Recommendation:*** The Workgroup has no recommendation for this RPA.

Tributary Habitat Research, Monitoring, and Evaluation -- RM&E Strategy 3

Monitor and Evaluate Tributary Habitat Conditions and Limiting Factors (RPA 56)

The Action Agencies will:

RPA 56.1 -- Implement research in select areas of the pilot study basins (Wenatchee, Methow and Entiat river basins in the Upper Columbia River, the Lemhi and South Fork Salmon river basins, and the John Day River Basin) to quantify the relationships between habitat conditions and fish productivity (limiting factors) to improve the development and parameterization of models used in the planning and implementation of habitat projects. These studies will be coordinated with the influence of hatchery programs in these habitat areas.

- ***RM&E projects - coverage assessment:*** The Workgroup reviewed the current list of limiting factors within each of the pilot basins and compared those to the metrics that are being measured under existing monitoring programs within those basins. The Workgroup determined that, with the exception of the Methow Basin, existing monitoring programs are collecting information on the primary limiting factors identified for each pilot basin. In addition, these programs are also assessing the status of fish populations within these basins. In the pilot basins, monitoring is focusing on the relationship between limiting factors, habitat actions, and fish productivity. This is required under RPAs 57.1, 57.2, 57.3, and 57.4, all of which will be used to help address RPA 56.1.

In the Methow Basin, the BOR has proposed an intensive, effectiveness monitoring program that will address the effects of actions intended to address the primary limiting factors there (i.e., lack of riparian/off-channel habitat and obstructions) (Connolly 2009). This program will begin in 2009.

In addition, monitoring needed to infer relationships based on correlation among limiting factors, habitat actions, and productivity in support of RPA 3 (comprehensive evaluations) will also be addressed under RPAs 50.6 and 56.3.

- ***Recommendation:*** The Workgroup recommends that for this specific RPA, mechanistic research on relationships between limiting factors and fish productivity should occur only within the pilot basins. This research will greatly benefit from increased PIT-tagging of adults at mainstem dams (see RPA 50.1) and juveniles in tributaries (see RPA 50.3). Information generated from focused studies and correlative studies will be shared with other regions and will also be used in multistage Beverton-Holt models.

RPA 56.2 -- Implement habitat status and trend monitoring as a component of the pilot studies in the Wenatchee, Methow and Entiat river basins in the Upper Columbia River, the Lemhi and South Fork Salmon river basins, and the John Day River Basin.

- ***RM&E projects - coverage assessment:*** The Workgroup conducted an inventory of current habitat status and trend monitoring in the Wenatchee, Methow, and Entiat River basins in the Upper Columbia, the Lemhi and South Fork Salmon River basins, and the John Day River Basin (see Bruce's tables). All pilot basins, except the Methow, appear to have sufficient habitat status and trend monitoring with no significant gaps. Habitat monitoring in the Lemhi, South Fork Salmon and John Day focuses on specific limiting habitat factors. In contrast, habitat monitoring in the Wenatchee and Entiat focuses on a large suite of physical/environmental factors (64 indicators) that address water quality, habitat access, habitat quality, channel condition, riparian habitat condition, watershed condition, and flows. The Methow Basin currently lacks an appropriate level of habitat monitoring to support this RPA.

- ***Recommendation:*** The Workgroup recommends implementing the GRTS-based, master-sample management tools for monitoring habitat status and trend in the Methow Basin. However, rather than collect data on the same metrics currently measured in the Wenatchee and Entiat basins, the Workgroup recommends postponing habitat status and trend monitoring in the Methow until results from the analysis (consistent with results from RPA 56.1) of the Wenatchee and Entiat data are complete. Analysis of those data will be completed in late 2009. Those analyses should identify the number of sites needed to monitor, spatial and temporal arrangement of sites, and which metrics provide the most useful information for predicting fish population abundance and productivity. These results will be used to guide the implementation of habitat status and trend monitoring in the Methow Basin in 2010.

RPA 56.3 -- Facilitate and participate in an ongoing collaboration process to develop a regional strategy for limited habitat status and trend monitoring for key ESA fish populations. This monitoring strategy will be coordinated with the status monitoring needs and strategies being developed for hydropower, habitat, hatchery, harvest, and estuary/ocean.

- ***RM&E projects - coverage assessment:*** The Workgroup noted that this work is ongoing with AA participation in NWEIS, PNAMP, Fish Accords, and Recovery Planning efforts. To this end, the Workgroup identified no gaps. However, in an effort to help address RPA 3 (Comprehensive Evaluations), the Workgroup expanded the scope of RPA 56.3 to include habitat status monitoring in at least one population within each steelhead and Chinook MPG.

Recommendation: The Workgroup recommends the following:

Table 3 identifies one or more populations per MPG that should be monitored for habitat status and trend. The recommended populations were identified as populations with relatively large habitat/survival gaps in Table 5 in the BiOp and have, or will have, fish in-fish out monitoring (identified in RPA 50.6). Habitat monitoring should focus on measuring at least the habitat impairments identified in the table below. Local biologists identified these impairments as factors that potentially limit population VSP parameters. A core set of habitat metrics that need to be measured within the recommended populations will be generated based on IMW analyses, Workgroup recommendations (from RPA 57.5), and regional discussions on monitoring needed to

support high-level indicators (NWEIS and PNAMP). Those habitat metrics that have a strong relationship with population processes will be included in the core set of metrics. The habitat status and trend monitoring design should follow the GRTS-based, master-sample management tools whenever possible. In addition, habitat restoration actions occurring in these population watersheds should be monitored for their physical and biological habitat effects. Monitoring these actions, or a representative set thereof, will support the extrapolation of pilot watershed habitat restoration effects on population processes to a broader, Columbia River Basin context. A limited set of response metrics for project-scale monitoring will be generated based on IMW analyses and previous BiOp workgroup implementation plans. This work will greatly benefit from increased PIT-tagging of adults at mainstem dams (see RPA 50.1) and juveniles in tributaries (see RPA 50.3).

Table 3. Recommended population watersheds for habitat status and trend monitoring.

ESU/DPS	MPG	Population	Has Current Habitat Monitoring	Habitat Impairments Identified by Local Biologists	Comments
Chinook Salmon					
Snake River Spring/Summer Chinook	South Fork	South Fork	Yes	Water quality (metals); Obstructions; Sediment; Pools; Substrate	Required in RPA 56.2
	Middle Fork	Big Creek		Water quality (mining pollutants); Obstructions; Sediment; Pools	Only pop with a habitat gap (1%)
	Upper Salmon	Lemhi	Yes	Entrainment; Obstructions; Flow; Temperature	Required in RPA 56.2
		Pahsimeroi		Entrainment; Obstructions; Flow; Temperature	Has a large habitat gap (41%)
		Yankee Fork		Flow; Obstructions; Habitat diversity; Water quality; Bank stability	Has a large habitat gap (30%)
	Lower Snake	Tucannon		Obstructions; LWD; Temperature; Turbidity; Flow; Riparian/Off-Channel habitat	Only pop with habitat gap (17%)
	Grande Ronde/Imnaha	Upper Grande Ronde		Flow; Habitat diversity; Obstructions; Riparian/Off-Channel habitat; Water quality;	Has large habitat gap (23%)

ESU/DPS	MPG	Population	Has Current Habitat Monitoring	Habitat Impairments Identified by Local Biologists	Comments
				Sediment	
		Catherine Creek		Flow; Habitat diversity; Obstructions; Riparian/Off-Channel habitat; Temperature	Has large habitat gap (23%)
Upper Columbia Spring Chinook	Upper Columbia	Wenatchee	Yes	Obstructions; Habitat diversity; Temperature; Habitat quantity; Flow; Nutrients; Riparian/Off-Channel habitat	Required in RPA 56.2
		Entiat	Yes	Habitat diversity; Habitat quantity; Flow; Obstructions; Riparian/Off-Channel habitat; Water quality	Required in RPA 56.2
		Methow	Yes	Obstructions; Sediment; Temperature; Flow; Habitat quantity; Riparian/Off-Channel habitat	Required in RPA 56.2
Steelhead					
Snake River Steelhead	Clearwater	S. Fk. Clearwater		Obstructions; Habitat diversity; Pools; Nutrients; LWD; Riparian/Off-Channel habitat; Sediment; Temperature	Has a large habitat gap (14%)
	Salmon	Lemhi River	Yes	Entrainment; Obstructions; Flow; Temperature	Required in RPA 56.2
		South Fork	Yes	Water quality (metals); Obstructions; Sediment; Pools; Substrate	Required in RPA 56.2
	Lower Snake	Tucannon		Obstructions; LWD; Temperature; Turbidity; Flow; Riparian/Off-Channel habitat	Has largest habitat gap (5%)
	Grande Ronde	Upper		Flow; Habitat diversity;	Has largest

ESU/DPS	MPG	Population	Has Current Habitat Monitoring	Habitat Impairments Identified by Local Biologists	Comments
		Grande Ronde		Obstructions; Riparian/Off-Channel habitat; Water quality; Sediment; Temperature	habitat gap (4%)
		Joseph Creek	No	Obstructions; LWD; Temperature; Turbidity; Flows; Riparian/Off-Channel habitat; Sediment; Excessive nutrients	Has largest habitat gap (4%)
	Imnaha	Imnaha		Obstructions; Flows; Excessive nutrients; Sediment; Temperature	Only population in MPG
Upper Columbia Steelhead	Upper Columbia	Wenatchee	Yes	Obstructions; Habitat diversity; Temperature; Habitat quantity; Flow; Nutrients; Riparian/Off-Channel habitat	Required in RPA 56.2
		Entiat	Yes	Habitat diversity; Habitat quantity; Flow; Obstructions; Riparian/Off-Channel habitat; Water quality	Required in RPA 56.2
		Methow	No	Obstructions; Sediment; Temperature; Flow; Habitat quantity; Riparian/Off-Channel habitat	Required in RPA 56.2
		Okanogan	Yes	Obstructions; Sediment; Temperature; Disease; Flow; Habitat quantity; Riparian/Off-Channel habitat	Covered under OBMEP
Middle Columbia Steelhead	Eastern Cascades	Klickitat River		Habitat diversity; Riparian/Off-Channel habitat; Flow; Obstructions; Sediment; Temperature; Nutrients	Has largest habitat gap (4%)
		Fifteen		Flow; Temperature;	Has winter-

ESU/DPS	MPG	Population	Has Current Habitat Monitoring	Habitat Impairments Identified by Local Biologists	Comments
		Mile		Riparian/Off-Channel habitat; Sediment; Habitat diversity	run steelhead
	Yakima	Upper Yakima		Habitat diversity; Flow; Obstructions; Temperature; Riparian/Off-Channel habitat; Water quality	Has good fish in-fish out monitoring at Roza Dam
	John Day	Lower Mainstem	Yes	Habitat diversity; Temperature	Required in RPA 56.2
		North Fork	Yes	Habitat diversity; Temperature	Required in RPA 56.2
		Upper Mainstem	Yes	Flow; Temperature; Habitat diversity	Required in RPA 56.2
		Middle Fork	Yes	Habitat diversity; Temperature	Required in RPA 56.2
		South Fork	Yes	Flow; Habitat diversity; Obstructions; Temperature	Required in RPA 56.2
	Umatilla/Walla Walla	Umatilla	Yes	Temperature; Sediment; Obstructions; Flow; Riparian/Off-Channel habitat	Has some habitat monitoring

Evaluate the Effectiveness of Tributary Habitat Actions (RPA 57)

The Action Agencies will evaluate the effectiveness of habitat actions through RM&E projects that support the testing and further development of relationships and models used for estimating habitat benefits. These evaluations will be coordinated with hatchery effectiveness studies.

RPA 57.1 -- Action effectiveness pilot studies in the Entiat River Basin to study treatments to improve channel complexity and fish productivity.

- ***RM&E projects - coverage assessment:*** The Workgroup noted that effectiveness monitoring in the Entiat Basin has been ongoing for at least the last three years (a product of the 2004 FCRPS BiOp). The monitoring program takes a "traditional" approach to monitoring by tracking changes in physical and biological indicators in treated and reference/control areas. The intent of the

program is to assess habitat restoration effects at the project or reach scale and the population scale. Teasing out treatment effects at the population scale will likely be based on an intervention analysis approach. Results from this work will also support RPA 56.1.

- The Workgroup noted that there are several habitat actions identified for implementation in the Entiat, but few are actually being funded and implemented at this time. The implementation of actions appears to be a gap in the Entiat.

- ***Recommendation:*** The Workgroup recommends that the number of actions implemented should be evaluated through power analysis to determine if the extent and number of projects is sufficient to cause a detectable treatment effect. If not, the Workgroup recommends that additional actions be implemented to cause a measurable treatment effect. The Workgroup also recommends that habitat effectiveness monitoring address potential confounding effects of the hatchery programs in the Entiat. This work will benefit from increased PIT-tagging of adults at mainstem dams (see RPA 50.1) and juveniles in tributaries (see RPA 50.3).

RPA 57.2 -- Pilot study in the Lemhi River Basin to study treatments to reduce entrainment and provide better fish passage flow conditions.

- ***RM&E projects - coverage assessment:*** The Workgroup noted that effectiveness monitoring in the Lemhi Basin has been under development since the 2004 FCRPS BiOp and is now on track with the implementation of the Lemhi Conservation Strategy. The monitoring program takes a "stage-based modeling" approach to assessing the effects of entrainment, connectivity, and flow actions on the abundance, productivity, condition, and distribution of anadromous and resident salmonids. Although the approach links survival to both habitat quality and quantity, a large amount of effort will focus on quantity (capacity). Results from this work will also support RPA 56.1. The Workgroup identified no gaps for this RPA.

- ***Recommendation:*** The Workgroup has no recommendation for this RPA. However, this work will benefit from increased PIT-tagging of adults at mainstem dams (see RPA 50.1) and juveniles in tributaries (see RPA 50.3).

RPA 57.3 -- Action effectiveness pilot studies in Bridge Creek of the John Day River Basin to study treatments of channel incision and its effects on passage, channel complexity, and consequentially fish productivity.

- ***RM&E projects - coverage assessment:*** The Workgroup noted that effectiveness monitoring in Bridge Creek has been underway since the 2004 FCRPS BiOp. The monitoring program takes a focused, "research" approach to assessing the effectiveness of ameliorating incision and sediment recruitment in Bridge Creek. Results from this work will also support RPA 56.1. The Workgroup identified no gaps for this RPA.

- ***Recommendation:*** The Workgroup has no recommendation for this RPA. However, this work will benefit from increased PIT-tagging of adults at mainstem dams (see RPA 50.1) and juveniles in tributaries (see RPA 50.3).

RPA 57.4 -- Project and watershed level assessments of habitat, habitat restoration and fish productivity in the Wenatchee, Methow, and John Day basins.

- ***RM&E projects - coverage assessment:*** The Workgroup understands that the purpose of this RPA is to continue monitoring the status and trend of habitat and fish within the Wenatchee, Methow, and John Day basins. This RPA is linked closely with RPAs 50.4 and 56.2. Results from this work will also support RPA 56.1. The largest gap identified for this RPA is the lack of habitat status and trend monitoring in the Methow Basin (see RPA 56.2). This gap is addressed under RPA 56.2.

- ***Recommendation:*** The Workgroup has no recommendation for this RPA. However, this work will benefit from increased PIT-tagging of adults at mainstem dams (see RPA 50.1) and juveniles in tributaries (see RPA 50.3).

RPA 57.5 -- Action Agencies will convene a regional technical group to develop an initial set of relationships in FY 2008, and then annually convene the group to expand and refine models relating habitat actions to ecosystem function and salmon survival by incorporating research and monitoring results and other relevant information.

- ***RM&E projects - coverage assessment:*** The Workgroup noted that the Tributary Habitat and Fish Population Workgroup met several times beginning in early 2008 to evaluate survival models. However, the technical group did not include other technical staff from the co-managers (feds, states, and tribes). Implementation of this action will require coordination with PNAMP, NWEIS, Fish Accords, and Recovery Planning efforts. The technical group will use the data resulting from the BiOp IMWs, population-scale adult and juvenile monitoring, watershed condition data, and project-scale habitat impact information to develop estimates of basin-wide biological impacts of tributary habitat restoration actions in the Columbia Basin. The technical group will build on current habitat capacity/population productivity life-cycle modeling methods to develop a systematic approach to estimating the freshwater survival benefit of basin-wide restoration actions.

- ***Recommendation:*** The Workgroup recommends that NOAA and the AA expand the group to include technical staff from federal, state, and tribal agencies.

RPA Coverage Analysis: Hatchery and Harvest

The Hatchery and Harvest Workgroup examined projects and work elements identified in Pisces, and linked them to RPAs 62, 63, 64, and 65. After work elements were assigned to each RPA (if appropriate; some RPAs did not have any existing WEs that were associated with them), the Workgroup then determined if the RPA was fully satisfied by the existing projects. To determine if the RPA was being satisfied, the appropriate metrics for each RPA segment was determined and compared to the information within each WE. If an RPA was not fully addressed by existing projects, then a gap was identified. The results are described below and shown in a table at the end of this section.

High Priority Recommendations

Some of the gaps that were identified are considered high priority by the workgroup. Implementing recommendations to fill these gaps should begin as soon as possible to satisfy the RPAs. The recommendations for RPAs 62.3, 63.1-1, 64.3, and 65.1 are high priorities and are highlighted below.

Harvest Research, Monitoring, and Evaluation -- RM&E Strategy 5

Fund Selected Harvest Investigations (RPA 62)

RPA 62.1 -- Evaluate the feasibility of obtaining PIT-tag recoveries between Bonneville and McNary dams (Zone 6) to determine whether recoveries can help refine estimates of in-river harvest rates and stray rates used to assess adult survival rates. For FY 2009, focus on a pilot to test the feasibility of PIT-tag recoveries of harvested fish in this reach (spring, summer, and fall Chinook salmon and summer steelhead) (Initiate in FY 2007-2009 Projects)**.**

- ***RM&E projects - coverage assessment:*** The Workgroup determined that existing projects currently address this RPA.
- ***Recommendation****:* The Workgroup offers no recommends for this RPA.

RPA 62.2 -- Evaluate methods to develop or expand use of selective fishing methods and gear (Initiate in FY 2007-2009 Projects).

- ***RM&E projects - coverage assessment:*** The Workgroup determined that existing projects currently address this RPA.
- ***Recommendation****:* The Workgroup offers no recommends for this RPA.

RPA 62.3 -- Evaluate post-release mortality rates for selected fisheries (Initiate in FY 2007-2009 Projects).

- ***RM&E projects - coverage assessment:*** This RPA is in part addressed by the CCT project, which is evaluating specific capture methods. There are other types of fisheries or methods however, that should be evaluated.

- ***Recommendation (<u>HIGH PRIORITY</u>):*** Evaluate post-release mortality from different types of fisheries across a wide range of natural temperature regimes. Effects need to be tracked to the spawning grounds to determine pre-spawning mortality of fish captured and released (need control group for comparison). The group also recommends that individual coded tags (and associated externally visible tag) are used to assess this. A workshop that focuses on defining goals, objectives, and methodology to measure post-release mortality of fish to the spawning areas should be convened as soon as possible. The information developed in this workshop can then be used to develop a targeted RFP. A preliminary assumption on effort is approximately $1.5 million per year over three years. All efforts should be made to collaborate on this research with other entities, like the USACE or PUDs if they have research needs that could utilize radio tags.

RPA 62.4 -- Support coded-wire tagging and coded-wire tag recovery operations that inform survival, straying, and harvest rates of hatchery fish by stock, rearing facility, release treatment, and location (Initiate in FY 2007-2009 Projects).

- ***RM&E projects - coverage assessment:*** There are many programs that recapture CWTs; however, the current level of effort to recapture tagged fish on spawning grounds is inadequate. There is a need to increase sampling effort on spawning grounds, improved QA/QC and data management, and regulate data upload timing through appropriate contract requirements.

- ***Recommendation:*** Encourage additional sampling effort on the spawning grounds to ensure that at least 20% of the spawning escapement is sampled (see Hankin et al.[1]). This may require shifting some effort from the ocean fisheries to in-river monitoring. The Workgroup also recommends that contracts include language to improve QA/QC, analysis, and data management.

RPA 62.5 -- Investigate the feasibility of genetic stock identification monitoring techniques (Initiate in FY 2007-2009 Projects).

- ***RM&E projects - coverage assessment:*** The Workgroup believes that there are no gaps associated with this RPA. The CRITFC Accord project covers this RPA.

- ***Recommendation:*** There are no recommendations for this RPA.

[1] Hankin, D.G., J.H. Clark, G.S. Morshima, B.E. Riddell, R.B. Deriso, C. Schwarz, J.C. Garza, and J.B. Scott. 2005. Report for the expert panel on the future of the coded wire tag recovery program for Pacific Salmon. Pacific Salmon Commission, Vancouver, B.C.

Hatchery Research, Monitoring, and Evaluation -- RM&E Strategy 6

Monitor Hatchery Effectiveness (RPA 63)

RPA 63.1 -- Determine the effect that safety-net and conservation hatchery programs have on the viability and recovery of the targeted populations of salmon and steelhead (Initiate in FY 2007-2009 Projects).

- ***RM&E projects - coverage assessment:*** This RPA addresses those populations identified within Tables 7 and 8 of the FCRPS Biological Opinion (see Table 4). Most populations identified within those tables appear to be covered. However, some populations appear to either not be covered, or their status (in relationship to the RPA) was difficult to determine based on the information available.

Table 4. Populations linked to RPA 63.1 from Tables 7 and 8 (actions are combined from both tables per population) of the FCRPS Biological Opinion.

Population	Description/Action	RPA Coverage Status
Snake River sockeye	Continue to fund the safety net program to achieve the interim goal of annual releases of 150,000 smolts while also continuing to implement other release strategies in nursery lakes such as fry and parr releases, eyed-egg incubation boxes, and adult releases for volitional spawning	Current programs cover this action
	Fund further expansion of the sockeye program to increase total smolt releases to between 500,000 and 1million fish.	Current programs cover this action
	The Action Agencies will work with appropriate parties to investigate feasibility and potentially develop a plan for ground transport of adult sockeye from LGR Dam to Sawtooth Valley lakes or artificial propagation facilities.	Current programs cover this action

Population	Description/Action	RPA Coverage Status
Snake River Spring/Summer Chinook		
Tucannon River	For the Tucannon River spring/summer Chinook safety-net supplementation program fund capital construction, operation and monitoring and evaluation costs to implement a program that builds genetic diversity using local broodstock and a sliding scale for managing the composition of natural spawners comprised of hatchery-origin fish.	Current programs cover this action
Upper Grande Ronde and Catherine Creek	For the Upper Grande Ronde and Catherine Creek safety net supplementation programs fund capital construction, operation and monitoring and evaluation costs to implement a program that builds genetic diversity using local broodstock, and a sliding scale for managing the composition of natural spawners comprised of hatchery origin fish.	Current programs cover this action
Johnson Creek / South Fork Salmon River	Fund the Johnson Creek / South Fork Salmon River safety net supplementation program, as described in the existing Section 10 permit.	Current programs cover this action
East Fork and West Fork Yankee Fork Salmon River	Fund the experimental captive rearing program for East Fork and West Fork Yankee Fork Salmon River (until phased out by IDFG).	Current programs cover this action

Population	Description/Action	RPA Coverage Status
Lostine and Imnaha rivers	For the Lostine and Imnaha rivers, contingent on a NOAA approved HGMP, fund these hatchery programs including capital construction, operation and monitoring and evaluation costs to implement supplementation programs using local broodstock and following a sliding scale for managing the composition of natural spawners comprised of hatchery origin fish.	Current programs cover this action
Snake River Steelhead		
	As a project to benefit primarily B-run steelhead, the Action Agencies will work with NOAA Fisheries to develop a trigger for future artificial propagation safety-net planning or to identify populations for immediate safety-net planning.	Currently, there is a gap for this RPA – see comments below table
East Fork Salmon River	For the East Fork Salmon River**,** fund a small-scale program (no more than 50,000 smolts) including trapping locally returning steelhead in the East Fork Salmon River for broodstock, and follow BMPs for rearing, release, and adult management strategies. Fund capital construction, operation and monitoring and evaluation costs to implement a program that builds genetic diversity using local broodstock and a sliding scale for managing the	Currently, there is a gap for this RPA – see comments below table

Population	Description/Action	RPA Coverage Status
	composition of natural spawners comprised of hatchery origin fish.	
Upper Columbia Spring Chinook	Fund reintroduction of spring Chinook salmon into the Okanogan Basin consistent with the Upper Columbia Salmon Recovery Plan including capital construction, operation and monitoring and evaluation costs to implement a transition to local broodstock and a sliding scale for managing the composition of natural spawners comprised of hatchery origin fish. Reintroduction will be coordinated with the restoration and improvement of spring Chinook habitat in the Okanogan Basin and will be contingent on the availability of within ESU broodstock from the Methow Basin.	Currently, there is a gap for this RPA – see comments below table
Upper Columbia Steelhead	Fund a program to recondition natural origin kelts for the Entiat, Methow and Okanogan basin including capital construction, operation and monitoring and evaluation costs.	Currently, there is a gap for this RPA – see comments below table
	Fund a program that builds genetic diversity using local broodstock and accelerates steelhead recovery in the Okanogan Basin as steelhead habitat is restored and improved, including capital construction, operation, and	Currently, there is a gap for this RPA – see comments below table

Population	Description/Action	RPA Coverage Status
	monitoring and evaluation costs.	
Middle Columbia Steelhead	Fund a program to recondition natural origin kelts in the Yakima River basin including capital construction, implementation and monitoring and evaluation costs	Currently covered under Project 2007-401-00
Columbia River Chum	Fund a hatchery program to re-introduce chum salmon in Duncan Creek including capital construction, implementation and monitoring and evaluation costs as long as NOAA Fisheries considers it beneficial to recovery and necessary to reduce extinction risk of the target population.	Current programs cover this action
	Fund assessment of habitat potential, development of reintroduction strategies, and implementation of pilot supplementation projects in selected Lower Columbia River tributaries below Bonneville Dam.	Current programs cover this action

Below, we discuss in more detail the RPAs that currently are believed to have a gap in coverage.

1. B-run steelhead – Current monitoring does not adequately address abundance, productivity, spatial structure, and diversity of B-run steelhead.

    - ***Recommendation (HIGH PRIORITY)****:* RFP for specific B-run monitoring (need to determine if CRITFC Accord project 2008-723 fills the gap for abundance and productivity), but "safety net" triggers still need to be investigated. Monitoring of B-Run steelhead is addressed in part under RPA 50.5. Additional information on the importance of filling this gap can be found in the fish population/tributary habitat workgroup recommendations section of this report.

2. Spring Chinook reintroduction in the Okanogan Basin – No specific work elements were identified for this population; however, OBMEP and monitoring for the Chief Joseph Hatchery Program should be fully address this RPA.

    - ***Recommendation**:* Evaluate OBMEP to ensure that there is adequate coverage for spring Chinook once the transfer program begins.

3. Kelt reconditioning in the Upper Columbia – There are no work elements that address this RPA; however, there is a proposal by the Yakama Tribe under review by the ISRP that may address this RPA. In addition, coordination is taking place between the Yakama Nation and the USFWS for the use of the Entiat National Fish Hatchery for the kelt program, which will fulfill this portion of the RPA. Support follow up review to ensure YN project adequately covers this portion of the RPA.

    - ***Recommendation**:* Evaluate the Yakama Nation proposal to determine if it adequately addresses this RPA.

4. East Fork Salmon River Steelhead – There currently appears to be a gap based on the information available. While there is general monitoring within the East Fork, there is no monitoring that is specific to steelhead (primarily adult monitoring).

    - ***Recommendation**:* Determine if the CRITFC proposal will fulfill this RPA. If not, develop a RFP for this monitoring gap.

RPA 63.2 -- Determine the effect that implemented hatchery reform actions have on the recovery of targeted salmon and steelhead populations (Initiate in FY 2007-2009 Projects).

- This RPA addresses those populations identified within Table of the FCRPS Biological Opinion (see Table 5).

Table 5. Populations linked to RPA 63.2 from Table 6 of the FCRPS Biological Opinion.

Population	Description/Action	RPA Coverage Status
Lower Columbia Chinook	The COE will review the John Day Hatchery Mitigation Program	NA
Snake River Steelhead	Fund the Tucannon River steelhead supplementation program to transition to local broodstock using BMPs	Currently, there is a gap for this RPA – see comments below table
Middle Columbia Steelhead	Fund the Touchet River steelhead supplementation program to transition to local broodstock using BMPs.	Currently, there is a gap for this RPA – see comments below table
Upper Columbia Steel	For the Winthrop NFH	Currently, there is a gap for this

	steelhead program, implement measures to transition to local broodstock and to manage the number of Winthrop NFH-produced steelhead on the spawning grounds. Such broodstock and adult escapement reform measures, including capital construction, would be identified through development of an updated HGMP and ESA consultation. Implementation of reform measures is contingent on a finding, in consultation with NOAA, that the measures are biologically and economically feasible and effective. Implementation of reforms will be prioritized and sequenced.	RPA – see comments below table

- There are currently no work elements that appear to address this RPA for the Tucannon, Touchet, and Winthrop NFH steelhead programs. However, the USFWS is currently evaluating means to implement the reform recommendations at Winthrop NFH, and WDFW is evaluating means to implement the reform recommendations for the Tucannon and Touchet programs.
- In addition to development of local broodstock for all three programs, the WNFH will need to assist in monitoring whether hatchery origin spawners are being controlled (reduced) on the spawning grounds.
- ***Recommendation****:* PIT tagging efforts should be included in the USFWS plan for monitoring steelhead spawners. In addition, ensure differential tagging (with PIT tags) of 1-yr and 2-yr smolt experiment.

Investigate Hatchery Critical Uncertainties (RPA 64)

RPA 64.1 -- Continue to estimate the relative reproductive success (RSS) of hatchery – origin salmon and steelhead compared to reproductive success of their natural-origin counterparts for ESA-listed spring/summer Chinook population in the Upper Grande Ronde, Lostine River, and Catherine Creek; listed spring Chinook in the Wenatchee River; and listed steelhead in the Hood River. Continue to fund

the ongoing RRS feasibility study for Snake River fall Chinook to completion in 2009 (Initiate in FY 2007-2009 Projects).

- ***RM&E projects - coverage assessment:*** The Workgroup identified no gaps associated with this RPA.
- ***Recommendation****:* The Workgroup offers no recommends for this RPA.

RPA 64.2 -- Determine if properly designed intervention programs using artificial production make a net positive contribution to recovery of listed populations (Initiate in FY 2007-2009 Projects**).**

- Basically all intervention programs fit this RPA and therefore the Workgroup assigned most work elements to this RPA. Additional analysis may be needed to determine if hatchery supplementation programs are having a negative effect on recovery, i.e., are all threats from hatchery programs being monitored?
- ***RM&E projects - coverage assessment:*** There are no gaps associated with this RPA, unless additional information is needed to assess whether all threats are being monitored.
- ***Recommendation****:* The Workgroup offers no recommends for this RPA.

RPA 64.3 -- In collaboration with the other entities responsible for steelhead mitigation in the Methow River, BPA will fund a new RSS study for ESA-listed steelhead in the Methow River. BPA will also fund a new RSS study for listed fall Chinook in the Snake River. NOAA Fisheries will provide technical assistance to the Action Agencies in development of conceptual study designs suitable for use by the Action Agencies in obtaining a contractor to implement the new studies (Initiate in FY 2007-2009 Projects).

- ***RM&E projects - coverage assessment:*** The Workgroup identified gaps for Methow steelhead and Snake River fall Chinook.
- ***Recommendation (HIGH PRIORITY)****:* Develop RFPs for both populations, with potential cost sharing for Methow steelhead. For Methow steelhead, there is a need to coordinate with Douglas PUD through their HCP Hatchery Coordinating Committee (and potentially the USFWS). BPA has initiated discussions.
- The workgroup recommends convening a meeting with appropriate stakeholders to determine goals, objectives, and methods. Additional discussion will need to take place to determine potential cost sharing. The results of the meetings will aid in the development of a targeted RFP.

Investigate Hatchery Critical Uncertainties (RPA 65)

RPA 65.1 -- In the mainstem Snake River above the Lower Granite Dam, estimate the effectiveness/fitness in nature of hatchery-origin fall Chinook salmon from federally funded Snake River hatchery programs relative to natural origin Snake River fall Chinook.

- ***RM&E projects - coverage assessment:*** The Workgroup identified a gap associated with this RPA.

- ***Recommendation (<u>HIGH PRIORITY</u>):*** RFP needs to be developed. The workgroup recommends convening a meeting with appropriate stakeholders to determine goals, objectives, and methods. Additional discussion will need to take place to determine potential cost sharing. The results of the meetings will aid in the development of a targeted RFP.

RPA 65.2 -- Estimate fall Chinook hatchery program effects on the productivity of the fall Chinook salmon ESU.

- ***RM&E projects - coverage assessment:*** There are no gaps associated with this RPA. Additional input by NMFS is needed to determine if the RPA is fully covered.

- ***Recommendation:*** The Workgroup offers no recommends for this RPA.

RPA 65.3 -- NOAA Fisheries will provide technical assistance to the Action Agencies in development of conceptual study designs suitable for use by the Action Agencies in obtaining a contractor to implement new studies.

- ***RM&E projects - coverage assessment:*** There is no gap currently, but NOAA Fisheries will need to begin coordination with the AAs prior to the development of RFPs.

- ***Recommendation:*** The Workgroup offers no recommends for this RPA.

RPA Coverage Analysis: RM&E Coordination and Data Management

The RM&E Coordination and Data Management Workgroup assessed the needs of RPA actions 71 Coordination, 72 Data Management, and 73 Implementation and Compliance Monitoring. The group then assessed the extent of AA projects (including specific work elements identified in PISCES), and other staff support relative to these RPA action needs. After ongoing and planned work was assigned to each RPA, the Workgroup then determined if the RPA is on track to be satisfied by the combination of existing projects, other regional level actions, or other AA or NOAA Agency level internal support. Recommendations are provided for any additional steps or work needed to insure successful implementation of RPA actions.

Coordination and Data Management Research, Monitoring, and Evaluation – RM&E Strategy 8

Coordination (RPA 71) - The Action Agencies will coordinate RM&E activities with other Federal, State, and Tribal agencies on an ongoing annual basis, including:

RPA 71.1 -- Organizing and supporting the Corps AFEP.

- ***RM&E projects - coverage assessment:*** Coordination is ongoing and there is no gap in this sub-action. The AFEP RM&E is being planned and implementing on an annual basis with an extensive and well established review process. Some increased efficiencies and avoidance of duplication of effort may be realized with further coordination of this COE program with other AA programs.

- ***Recommendation****:* Increase coordination with RM&E being planned and implemented under AFEP and the Columbia Basin Fish and Wildlife Program. Part of this increased coordination should be provided through the ongoing planning and implementation work of the AA/NOAA/NPCC RM&E work groups. Additional coordination could be realized through more direct interaction of BPA and NPCC staff within AFEP planning and review and direct interaction between COE staff and the F&W Program ISRP review panel. Further investigation into the coordination of the Willamette and Columbia AFEP programs is needed to better meet the needs of both Biological Opinions.

RPA 71.2 -- Supporting and participating in the Council's Columbia River Basin Fish and Wildlife Program project planning and review efforts.

- ***RM&E projects - coverage assessment:*** Coordination is ongoing and there is no gap in this sub-action.

- ***Recommendation****:* The Action Agencies and NOAA should brief the ISRP and Council on the BiOp's Annual & Comprehensive Report. Further steps are needed to increase coordination with the AFEP program to better meet the needs of the Fish and Wildlife program. Need to clearly identify BiOp priorities, while recognizing the broader needs of other Fish and Wildlife Program objectives.

RPA 71.3 -- Supporting the standardization and coordination of tagging and monitoring efforts through participation and leadership in regional coordination forums such as PNAMP.

- ***RM&E projects - coverage assessment:*** There are several ongoing processes addressing this RPA (PNAMP, NWEIS, Federal Caucus RM&E Team, CBFWA support, RIOG, etc) and there is no gap in this sub-action.

- ***Recommendation:*** Continue coordination within Columbia Basin while recognizing opportunities outside of the Columbia Basin. Ensure adequate, ongoing staff and resources are prioritized for product and infrastructure development.

RPA 71.4 -- Working with regional monitoring agencies to develop, cooperatively fund, and implement standard metrics, business practices, and information collection and reporting tools needed to cooperatively track and report on the status of regional fish improvement and fish monitoring projects.

- ***RM&E projects - coverage assessment:*** Ongoing regional monitoring coordination and data management work has identified multiple areas where monitoring coordination and data sharing could be improved.

- ***Recommendation:*** Work with the PNAMP and NWEIS to develop standard data management guidelines for all monitoring projects that collect fish and aquatic habitat data that specify how specific categories of data should be handled, stored and made available to the region. Improve metadata documentation for all monitoring projects by supporting development of PNAMP's master sample design, monitoring glossary and protocol catalog projects. Support pilot projects such as the ISEMP and PNAMP ISTM projects to demonstrate implementation of coordination and standardization tools. Implement regionally developed guidelines and business rules for Fish and Wildlife Program, BOR and AFEP RM&E projects through contract specifications. Provide implementation and coordination support through a regional network of data steward positions. Complete the development of regional High Level Indicators (HLIs), associated metrics, and information mapping to help focus coordination needs and products.

RPA 71.5 -- Coordinating the further development and implementation of Hydrosystem, Tributary Habitat, Estuary/Ocean, Harvest, Hatchery, and Predation RM&E through leadership and participation in ongoing collaboration and review processes and workgroups.

- ***RM&E projects - coverage assessment:*** There is no gap for this RPA. Action Agencies are currently meeting this requirement through leadership, participation, and funding support for workgroups and products associated with NWEIS, PNAMP, Federal Caucus RM&E team, Fish and Wildlife Program, AFEP, CBFWA, RIOG, and other ad hoc RM&E collaboration processes (i.e., Fish Management Agencies collaboration on prioritization of RM&E projects).

- ***Recommendation:*** Continue to participate and support these processes and products including the current AA, NOAA, and NPCC work group collaboration on implementation planning, annual/comprehensive progress reporting, and adaptive management of RM&E strategies.

RPA 71.6 -- Coordinating implementation with other appropriate regional collaboration processes. This includes coordination related to statutory provisions for the Federal government (BPA/Council), voluntary coordination among Federal agencies (Federal Caucus), and coordination with regional processes for Federal/non-Federal engagement (Technical Management Team (TMT), System Configuration Team (SCT), PNAMP, Northwest Environmental Data-Network (NED)), and others.

- ***RM&E projects - coverage assessment:*** Action agencies are actively participating in regional forums and accomplishing this sub-action through sub actions 71.1-71.5 above. No subsequent needed actions have been identified at this time.

- ***Recommendation****:* No recommendation needed.

Data Management (RPA 72)

RM&E needs and directives: The Action Agencies will ensure that the information obtained under the auspices of the FCRPS RM&E Program is archived in appropriate data management systems.

RPA 72.1 -- Continue to work with regional, Federal, State and Tribal agencies to establish a coordinated and standardized information system network to support the RM&E program and related performance assessments. The coordination of this development will occur primarily through leadership, participation, and joint funding support in regional coordination forums such as the NED workgroup, and PNAMP and the ongoing RM&E pilot studies in the Wenatchee River, John Day River, Upper Salmon River, and Columbia River Estuary (Initiate in FY 2007-2009 Projects).

- ***RM&E projects - coverage assessment:*** Work related to this RPA is currently being advanced and managed primarily at a regional level through PNAMP workgroup oversight, guidance, and products. Increased technical and policy level support for these products is needed to help move them along to implementation stages. Additional support is also being provided through ISEMP, Streamnet, Fish Passage Center, CBFWA SOTR, and DART projects.

- ***Recommendation****:* Continue working with PNAMP to develop data management tools and standards i.e. Protocol Manager, Master Sample Design, the Monitoring Glossary, and other data management products identified in RPA 71.4. Continue development of the Aquatic Resource Schema (ARS), developed under the ISEMP pilot projects, and the outreach to data sources. Continue efforts to map data flow for priority BiOp fish and habitat data for agencies at the project level consistent with ongoing methods used by NOAA NWFSC efforts to update and maintain TRT population datasets. Develop a data strategy guide to facilitate and implement the ARS Schema across the Columbia Basin that support BiOp needs. Develop and implement a network of Data Stewards and infrastructure to support the ARS Schema and data strategy guide in partnership with regional natural resource management entities and PNAMP. Coordinate and develop a strategy for integrating and data sharing among regional implementation tracking systems (e.g, PISCES, PCSRF, PNSHP databases) and regional action/program planning tools under development. Support the development of regional level data management workgroups for specific BiOp critical information to standardize development

of data management tools and procedures for data collection, storage, and access. Specifically support a juvenile fish data exchange group (connect to WA Puget Sound effort), an adult fish data exchange workgroup, the Water Quality Data Exchange, a Water Flow data exchange , a habitat environmental condition exchange for other habitat attributes (i.e. riparian condition, sediment/substrate conditions, habitat complexity/diversity, etc), a project implementation tracking exchange workgroup and other data exchanges as needed.

RPA 72.2 -- Contribute funding for data system components that support the information management needs of individual Hydrosystem, Tributary Habitat, Estuary/Ocean, Harvest, Hatchery, and Predation RM&E (Initiate in FY 2007-2009 Projects).

- ***RM&E projects - coverage assessment:*** The action agencies provided funding for multiple data management tools to support BiOp RM&E efforts. Additional advancement in data system components for BiOp critical information management is needed.

- ***Recommendation****:* Action Agencies should co-fund and provide staff support with other natural resource management entities the data stewards and infrastructure identified in 72.1. Continue support of PNAMP Data management products and guidelines identified in RPA 72.1, 71.3 and 71.4.

RPA 72.3 -- Participate in Northwest regional coordination and collaboration efforts such as the current PNAMP and NED efforts to develop and implement a regional management strategy for water, fish and habitat data (Initiate in FY 2007- 2009 Projects).

- ***RM&E projects - coverage assessment:*** Action agencies are actively participating in regional forums and accomplishing this sub-action through implementation of AA projects.

- ***Recommendation****:* Continue to support funding of staff and agency participation in workgroups, such as PNAMP data management team to advance the data strategy under RPA 72.1.

Project Implementation and Compliance Monitoring Research, Monitoring, and Evaluation – RM&E Strategy 9

Implementation and Compliance Monitoring (RPA73)

The Action Agencies will:

RPA 73.1 -- Annually monitor the successful implementation of projects through standard procedures and requirements of contract oversight and management, and review of project deliverables and final reports.

- ***RM&E projects - coverage assessment:*** BPA has implemented an advanced project tracking system (PISCES and Taurus) to facilitate implementation and compliance monitoring and reporting; and is working with the Corp and BOR to integrate their reporting into the BPA tracking system.

- ***Recommendation****:* Continue to advance the coordination, standardization, and development of AA project tracking systems with NOAA PCSRF, BPA PISCES programs, and BOR and COE programs. Conduct independent audit/surveys of projects to verify they were implemented as stated in the contract and continue to function as intended.

RPA 73.2 -- Maintain project and action level details for planning and reporting purposes. This approach will provide the most up-to-date information about the status of actions and projects being implemented.

- ***RM&E projects - coverage assessment:*** BPA is in the process of revising PISCES and developing the TAURUS program to track RPA implementation. Additional work on development of a regionally endorsed data dictionary for environmental resource action and project implementation metrics has been initiated.

- ***Recommendation****:* The Corps and BOR need to integrate project and action implementation with NOAA and BPA's project tracking systems to support BiOp and recovery implementation tracking, coordination, and reporting needs. Develop standardized project tracking metrics for all RPA action and project types such as habitat restoration and protection, harvest and hatchery management, and research and monitoring. When updated metrics and crosswalks for a standard project tracking data dictionary is drafted from NOAA and the AAs, we recommend using PNAMP as a forum to work with other environmental resource management entities to finalize and endorse standard implementation tracking metrics for regional use.

RPA 73.3 -- Maintain a comprehensive habitat project tracking system where relevant project information is contained in an accessible comprehensive data system. The data system will contain project level information that is needed for both implementation and effectiveness monitoring. The system will include the set of minimum metrics and meta data for RM&E data design listed in Data Management Needs for Regional Project Tracking to Support Implementation and Effectiveness Monitoring (Katz et al. 2006) (Initiate in FY 2008).

- ***RM&E projects - coverage assessment:*** BPA's PISCES program has implemented a process to integrate the PISCES, PCSRF, NPCC ISRP and Pacific Northwest Salmon Habitat project database (PNSHP)/Katz et al. metrics to meet project tracking needs.

- ***Recommendation****:* Regional habitat restoration and protection tracking metrics should be updated from Katz et al. standards to include additional metrics from PCSRF, PISCES, PNSHP and the NPCC ISRP. When updated metrics and crosswalks are drafted from NOAA and BPA, we recommend using PNAMP as a forum to work with other environmental resource management entities to finalize and endorse the metrics for regional use. To support action effectiveness monitoring evaluations in the Northwest, the Action Agencies should provide regional access to habitat project tracking data consistent with these regionally endorsed metrics.

Appendix of RPA Measures and Projects by Workgroup

RPA Number	RPA Description	Project Number	Project Title	Primary Workgroup
50.1	Implement and maintain the Columbia River Basin passive integrated transponder (PIT)-Tag Information System. (Annually)	1990-080-00	Columbia Basin PIT - Tag Information	Hydrosystem / Predation
50.2	Monitor adult returns at mainstem hydroelectric dams using both visual counts and the PIT-tag detection system (see Hydrosystem section). (Annually)	2005-002-00	Lower Granite Dam Adult Trap Operations	Hydrosystem / Predation
50.3	Monitor juvenile fish migrations at mainstem hydro electric dams using smolt monitoring and the PIT-tag detection system (see Hydrosystem section). (Annually)	1987-127-00	Smolt Monitoring By Non-Federal Agencies	Hydrosystem / Predation
		1994-033-00	Fish Passage Center	Hydrosystem / Predation
		2008-724-00	PIT Tag Snake River Sockeye and Upper Columbia Spring Chinook	Hydrosystem / Predation
50.4	Fund status and trend monitoring as a component of the pilot studies in the Wenatchee, Methow, and Entiat river basins in the Upper Columbia River, the Lemhi and South Fork Salmon river basins, and the John Day River Basin to further advance the methods and information needed for assessing the status of fish populations. (Initiate in FY 2007-2009 Project Funding, review and modify annually to ensure that these projects continue to provide a means of evaluating the effectiveness of tributary mitigation actions).	1982-013-01	Coded Wire Tag - PSMFC	Fish Populations / Habitat
		1983-319-00	New Marking & Monitoring Technology	Fish Populations / Habitat
		1987-127-00	Smolt Monitoring By Non-Federal Agencies	Fish Populations / Habitat

RPA Number	RPA Description	Project Number	Project Title	Primary Workgroup
		1988-053-03	Hood River Production M&E - Warm Springs	Fish Populations / Habitat
		1989-107-00	Statistical Support For Salmon	Fish Populations / Habitat
		1989-108-00	Modeling & Evaluate Supplementation / CRISP	Fish Populations / Habitat
		1991-073-00	Idaho Natural Production Monitoring	Fish Populations / Habitat
		1993-066-00	Oregon Fish Screens Project	Fish Populations / Habitat
		1994-042-00	Trout Creek O&M	Fish Populations / Habitat
		1998-016-00	Escapement / Productivity Spring Chinook	Fish Populations / Habitat
		1998-022-00	Pine Creek / Wagner Management	Fish Populations / Habitat
		2003-017-00	Integrated Status / Effect Program	Fish Populations / Habitat
		2003-039-00	Monitoring Reproductive In Wenatchee River	Fish Populations / Habitat
		2008-306-00	Deschutes River Fall Chinook Research and Monitoring	Fish Populations / Habitat
50.5	Provide additional status monitoring to ensure a majority of Snake River B-Run Steelhead populations are being monitored for population productivity and abundance. (Initiate by FY 2009, then annually)	1982-013-01	Coded Wire Tag - PSMFC	Fish Populations / Habitat
		1991-073-00	Idaho Natural Production Monitoring	Fish Populations / Habitat
		1996-020-00	PIT Tagging Spring / Summer Chinook	Fish Populations / Habitat
		2003-017-00	Integrated Status / Effect Program	Fish Populations / Habitat
		2005-002-00	Lower Granite Dam Adult Trap Operations	Fish Populations / Habitat
		2008-748-00	Additional B-Run Steelhead Work	Fish Populations / Habitat

RPA Number	RPA Description	Project Number	Project Title	Primary Workgroup
50.6	Review and modify existing Action Agencies' fish population status monitoring projects to improve their compliance with regional standards and protocols, and ensure they are prioritized and effectively focused on critical performance measures and populations. (Initiate in FY 2008, develop proposed modification in FY 2009, implement modification in FY 2009)	1982-013-01	Coded Wire Tag - PSMFC	Fish Populations / Habitat
		1982-013-02	Coded Wire Tag - ODFW	Fish Populations / Habitat
		1982-013-03	Coded Wire Tag - USFWS	Fish Populations / Habitat
		1983-350-00	Nez Perce Tribal Hatchery M&E	Fish Populations / Habitat
		1983-350-03	Nez Perce Tribal Hatchery M&E	Fish Populations / Habitat
		1984-025-00	NE Oregon Habitat Projects	Fish Populations / Habitat
		1986-050-00	Umatilla Anadromous Fish Habitat - CTUIR	Fish Populations / Habitat
		1987-100-01	Umatilla Anadromous Fish Habitat - CTUIR	Fish Populations / Habitat
		1987-100-02	Umatilla Anadromous Fish Habitat - ODFW	Fish Populations / Habitat
		1987-127-00	Smolt Monitoring By Non-Federal Agencies	Fish Populations / Habitat
		1988-022-00	Umatilla Fish Passage Operations	Fish Populations / Habitat
		1988-053-03	Hood River Production M&E - Warm Springs	Fish Populations / Habitat
		1991-073-00	Idaho Natural Production Monitoring	Fish Populations / Habitat
		1992-026-04	Life Studies Of Spring Chinook	Fish Populations / Habitat
		1996-020-00	PIT Tagging Spring / Summer Chinook	Fish Populations / Habitat
		1996-043-00	Johnson Creek Artificial Propagation	Fish Populations / Habitat
		1997-015-01	Imnaha River Smolt Monitoring NPT	Fish Populations / Habitat

RPA Number	RPA Description	Project Number	Project Title	Primary Workgroup
		1997-030-00	Listed Stock Adult Escapement	Fish Populations / Habitat
		1998-010-03	Spawning distribution of Snake River fall Chinook	Fish Populations / Habitat
		2000-039-00	Walla Walla River Basin Monitoring	Fish Populations / Habitat
		2002-032-00	Snake River Fall Chinook Life History Investigation	Fish Populations / Habitat
		2002-053-00	Assess Salmonids Asotin Creek WS	Fish Populations / Habitat
		2003-017-00	Integrated Status / Effect Program	Fish Populations / Habitat
		2003-039-00	Monitoring Reproductive In Wenatchee River	Fish Populations / Habitat
		2007-083-00	Grande Ronde Supplementation M&E	Fish Populations / Habitat
		2007-403-00	ID Spring Chinook Captive Propagation	Fish Populations / Habitat
		2007-404-00	OR Spring Chinook Captive Propagation	Fish Populations / Habitat
		2008-306-00	Deschutes River Fall Chinook Research and Monitoring	Fish Populations / Habitat
		2008-311-00	Natural Production Management & Monitoring	Fish Populations / Habitat
50.7	Fund marking of hatchery releases from Action Agencies funded facilities to enable monitoring of hatchery-origin fish in natural spawning areas and the assessment of status of wild populations. (Annually)	1982-013-01	Coded Wire Tag - PSMFC	Fish Populations / Habitat
		1982-013-02	Coded Wire Tag - ODFW	Fish Populations / Habitat
		1982-013-02	Coded Wire Tag - ODFW	Hatcheries / Harvest
		1982-013-03	Coded Wire Tag - USFWS	Fish Populations / Habitat
		1982-013-03	Coded Wire Tag - USFWS	Hatcheries / Harvest
		1983-350-00	Nez Perce Tribal Hatchery M&E	Hatcheries / Harvest
		1983-350-03	Nez Perce Tribal Hatchery M&E	Fish Populations / Habitat

RPA Number	RPA Description	Project Number	Project Title	Primary Workgroup
		1983-350-03	Nez Perce Tribal Hatchery M&E	Hatcheries / Harvest
		1987-127-00	Smolt Monitoring By Non-Federal Agencies	Fish Populations / Habitat
		1988-053-03	Hood River Production M&E - Warm Springs	Fish Populations / Habitat
		1988-053-03	Hood River Production M&E - Warm Springs	Hatcheries / Harvest
		1988-053-07	Hood River Production O&M - WS / ODFW	Hatcheries / Harvest
		1989-108-00	Modeling & Evaluate Supplementation / CRISP	Fish Populations / Habitat
		1990-005-00	Umatilla Hatchery - M&E	Hatcheries / Harvest
		1996-020-00	PIT Tagging Spring / Summer Chinook	Fish Populations / Habitat
		1996-020-00	PIT Tagging Spring / Summer Chinook	Hydrosystem / Predation
		1996-043-00	Johnson Creek Artificial Propagation	Fish Populations / Habitat
		1996-043-00	Johnson Creek Artificial Propagation	Hatcheries / Harvest
		1997-015-01	Imnaha River Smolt Monitoring NPT	Fish Populations / Habitat
		1997-015-01	Imnaha River Smolt Monitoring NPT	Hatcheries / Harvest
		2007-083-00	Grande Ronde Supplementation M&E	Fish Populations / Habitat
		2007-404-00	OR Spring Chinook Captive Propagation	Hatcheries / Harvest
		2008-740-00	Additional Marking Hatchery Fish	Hydrosystem / Predation
50.8	Report available information on population viability metrics in annual and comprehensive evaluation reports. (Initiate in FY 2008)	None Identified		Fish Populations / Habitat

RPA Number	RPA Description	Project Number	Project Title	Primary Workgroup
51.1	Support the coordination, data management, and annual synthesis of fish population metrics through Regional Data Repositories and reports. (Annually)	1982-013-01	Coded Wire Tag - PSMFC	Hatcheries / Harvest
		1982-013-01	Coded Wire Tag - PSMFC	Project Management / Coordination
		1988-108-04	Streamnet (CIS / NED)	Project Management / Coordination
		1994-033-00	Fish Passage Center	Project Management / Coordination
		1996-043-00	Johnson Creek Artificial Propagation	Project Management / Coordination
		1997-038-00	Listed Stock Chinook Salmon Gamete	Project Management / Coordination
		1998-031-00	Implement Wy - Kan - Ush - Mi Wa - Kis	Project Management / Coordination
		2007-407-00	Upper Snake River Tribes Regional Coord	Project Management / Coordination
		2008-505-00	Streamnet Library	Project Management / Coordination
51.2	Facilitate and participate in ongoing regional RM&E collaboration process to develop a regional strategy for status and trend monitoring for key ESA fish populations. (Initiate in FY 2008)	None Identified		Project Management / Coordination

RPA Number	RPA Description	Project Number	Project Title	Primary Workgroup
51.3	Provide cost-shared funding support and staff participation in regional coordination forums such as the Pacific Northwest Aquatic Monitoring Partnership (PNAMP) fish population monitoring workgroup and the Northwest Environmental Data Network to advance regional standards and coordination for more efficient and robust monitoring and information management. (Annually)	1982-013-01	Coded Wire Tag - PSMFC	Project Management / Coordination
		1988-108-04	Streamnet (CIS / NED)	Project Management / Coordination
		1994-033-00	Fish Passage Center	Project Management / Coordination
		1996-043-00	Johnson Creek Artificial Propagation	Project Management / Coordination
		1998-031-00	Implement Wy-Kan-Ush-Mi Wa-Kis	Project Management / Coordination
		2004-002-00	PNAMP Funding	Project Management / Coordination
		2008-505-00	Streamnet Library	Project Management / Coordination
52	Monitor and Evaluate Fish Performance within the FCRPS. The Action Agencies will monitor the following biological responses and/or environmental attributes involved in passage through the hydrosystem, and report these estimates on an annual basis:	2008-735-00	Adult and Juvenile Passage Performance Tracking	Hydrosystem / Predation
		2008-737-00	Compass Modeling Support	Hydrosystem / Predation
52.1	Monitor and evaluate salmonid dam survival rates for a subset of FCRPS projects.	1987-127-00	Smolt Monitoring By Non-Federal Agencies	Hydrosystem / Predation
		1991-051-00	M&E Statistical Support For Life Cycle Models	Hydrosystem / Predation

RPA Number	RPA Description	Project Number	Project Title	Primary Workgroup
		2003-041-00	Evaluate Salmon Through Snake River Dams	Hydrosystem / Predation
		SPE-06-2	Comparative Performance of Acoustic - Tagged and PIT - Tagged Juvenile Salmonids	Hydrosystem / Predation
		SPE-P-08-3	Studies of Surface Spill at John Day Dam	Hydrosystem / Predation
		SPE-W-04-2	Juvenile Survival and Passage at Little Goose Dam.	Hydrosystem / Predation
		SPE-W-05-1	Evaluation of Temporary Spillway Weirs (TSW's) at McNary Dam	Hydrosystem / Predation
		SPE-W-08-4	Fish passage and survival at Lower Monumental Dam after installation of an RSW	Hydrosystem / Predation
52.2	Monitor and evaluate juvenile salmonid inriver and system survival through the FCRPS, including estimates of differential post-Bonneville survival of transported fish relative to in-river fish (D-value) as needed.	1983-319-00	New Marking & Monitoring Technology	Hydrosystem / Predation
		1987-127-00	Smolt Monitoring By Non-Federal Agencies	Hydrosystem / Predation
52.3	Monitor and evaluate adult salmonid system survival upstream through the FCRPS.	1987-127-00	Smolt Monitoring By Non-Federal Agencies	Hydrosystem / Predation
		1991-051-00	M&E Statistical Support For Life Cycle Models	Hydrosystem / Predation
		2005-002-00	Lower Granite Dam Adult Trap Operations	Hydrosystem / Predation
		ADS-00-4	Investigation of Fate of Fish; Straying in Adult Salmon and Steelhead. (RM&E)	Hydrosystem / Predation

RPA Number	RPA Description	Project Number	Project Title	Primary Workgroup
52.4	Provide additional PIT-tag marking of Upper Columbia River populations to provide ESU specific estimates of juvenile and adult survival through the Federal mainstem dams.	1987-127-00	Smolt Monitoring By Non-Federal Agencies	Hydrosystem / Predation
		2008-724-00	PIT Tag Snake River Sockeye and Upper Columbia Spring Chinook	Hydrosystem / Predation
52.5	Assess the feasibility of PIT-tag marking of Snake River Sockeye Salmon for specific survival tracking of this ESU through the FCRPS.	2008-724-00	PIT Tag Snake River Sockeye and Upper Columbia Spring Chinook	Hydrosystem / Predation
		NEW	Pilot study of Snake River Sockeye survival to Lower Granite Dam and SAR of in - river and transported smolts.	Hydrosystem / Predation
52.6	Develop an action plan for conducting hydrosystem status monitoring (analytical approaches, tagging needs, methods, and protocols) in ongoing collaboration with the State and Federal fishery agencies and Tribes. This will be done in coordination with status monitoring needs and strategies being developed for estuary/ocean, habitat, hatcheries, and harvest. (Initiate in FY 2009)	1994-033-00	Fish Passage Center	Hydrosystem / Predation
		2008-738-00	Technical Support Hydro Tagging/Marking	Hydrosystem / Predation

RPA Number	RPA Description	Project Number	Project Title	Primary Workgroup
52.7	Cooperate with NOAA Fisheries, US v Oregon parties, Confederated Tribes of the Colville Reservation, and other co-managers to 1) review relevant information and identify factors (migration timing, spatial distribution, etc.) that might explain the differential conversion rates (BON to MCN) observed for UCR steelhead and spring Chinook salmon compared to SR steelhead and spring/summer Chinook salmon (see RPA Table 7 and SCA - Adult Survival Estimates Appendix); 2) develop a monitoring plan to determine the most likely cause of these differential losses (considering the potential use of flat plate PIT tag detectors in tributaries or fishery areas, additional adult detectors at the Dalles and John Day fishways, etc. to provide improved estimates of harvest or stray rates for improved conversion rate estimates in the future); and 3) implement the monitoring plan.	1987-127-00	Smolt Monitoring By Non-Federal Agencies	Hydrosystem / Predation
		2005-002-00	Lower Granite Dam Adult Trap Operations	Hydrosystem / Predation
		ADS-00-4	Investigation of Fate of Fish; Straying in Adult Salmon and Steelhead. (RM&E)	Hydrosystem / Predation
53	Monitor and Evaluate Migration Characteristics and River Condition The Action Agencies will monitor and evaluate the following biological and physical attributes of anadromous fish species migrating through the FCRPS on an annual basis:	1987-127-00	Smolt Monitoring By Non-Federal Agencies	Hydrosystem / Predation

RPA Number	RPA Description	Project Number	Project Title	Primary Workgroup
53.1	Monitor and estimate the abundance of smolts passing index dams.	1987-127-00	Smolt Monitoring By Non-Federal Agencies	Hydrosystem / Predation
		1991-029-00	Flow Augmentation On S.R. Fall Chinook	Hydrosystem / Predation
		1991-051-00	M&E Statistical Support For Life Cycle Models	Hydrosystem / Predation
		1994-033-00	Fish Passage Center	Hydrosystem / Predation
		2008-506-00	PSMFC - Smolt Monitoring	Hydrosystem / Predation
53.2	Monitor and describe the migration timing of smolts at index dams, identify potential problems, and evaluate implemented solutions. Monitor and document the condition (e.g., descaling and injury) of smolts at all dams with JBS systems, identify potential	1987-127-00	Smolt Monitoring By Non-Federal Agencies	Fish Populations / Habitat
		1987-127-00	Smolt Monitoring By Non-Federal Agencies	Hydrosystem / Predation
		1991-029-00	Flow Augmentation On S.R. Fall Chinook	Hydrosystem / Predation
		1991-051-00	M&E Statistical Support For Life Cycle Models	Hydrosystem / Predation
		1994-033-00	Fish Passage Center	Hydrosystem / Predation
		1996-020-00	PIT Tagging Spring / Summer Chinook	Hydrosystem / Predation
		1996-021-00	Gas Bubble Disease Monitoring & Research	Hydrosystem / Predation
		2003-041-00	Evaluate Salmon Through Snake River Dams	Hydrosystem / Predation
		2008-506-00	PSMFC - Smolt Monitoring	Hydrosystem / Predation
53.3	Monitor and document the condition (e.g., descaling and injury) of smolts at all dams with JBS systems, identify potential problems, and evaluate implemented solutions.	1987-127-00	Smolt Monitoring By Non-Federal Agencies	Hydrosystem / Predation

RPA Number	RPA Description	Project Number	Project Title	Primary Workgroup
		1996-020-00	PIT Tagging Spring / Summer Chinook	Hydrosystem / Predation
		2003-041-00	Evaluate Salmon Through Snake River Dams	Hydrosystem / Predation
		2008-506-00	PSMFC - Smolt Monitoring	Hydrosystem / Predation
53.4	Monitor and enumerate adult salmonids passing through fishways in the FCRPS, identify potential problems, and evaluate implemented solutions.	1987-127-00	Smolt Monitoring By Non-Federal Agencies	Hydrosystem / Predation
53.5	In addition to current operations (generally April 10 - August 31), evaluate operation of the Bonneville Dam PH2 corner collector from March 1 – start of spill as a potential means to provide a safer downstream passage route for steelhead kelts, and implement if warranted.	1983-319-00	New Marking & Monitoring Technology	Hydrosystem / Predation
		ADS-P-00-6	Evaluation of Steelhead Kelt and Overwintering Summer Steelhead Downstream Passage Through Columbia and Snake River dams.	Hydrosystem / Predation
54.1	Monitor and evaluate the effects of existing spillways, modifications, and operations on smolt survival.	SPE-P-08-3	Studies of Surface Spill at John Day Dam	Hydrosystem / Predation
		SPE-W-04-2	Juvenile Survival and Passage at Little Goose Dam.	Hydrosystem / Predation
		SPE-W-05-1	Evaluation of Temporary Spillway Weirs (TSW's) at McNary Dam	Hydrosystem / Predation
		SPE-W-08-4	Fish passage and survival at Lower Monumental Dam after installation of an RSW	Hydrosystem / Predation

RPA Number	RPA Description	Project Number	Project Title	Primary Workgroup
54.2	Monitor and evaluate the effectiveness of traditional juvenile bypass systems and modifications to such, on smolt survival and condition.	1994-033-00	Fish Passage Center	Hydrosystem / Predation
		SPE-P-08-2	Condition and Gatewell Retention Time Evaluation for Subyearling Chinook (Spring Creek Hatchery Origin & Run - of - the - River) through FGE modified units at the Second Powerhouse Bonneville Dam.	Hydrosystem / Predation
		SPE-P-08-3	Studies of Surface Spill at John Day Dam	Hydrosystem / Predation
		SPE-W-04-2	Juvenile Survival and Passage at Little Goose Dam.	Hydrosystem / Predation
		SPE-W-05-1	Evaluation of Temporary Spillway Weirs (TSW's) at McNary Dam	Hydrosystem / Predation
		SPE-W-08-4	Fish passage and survival at Lower Monumental Dam after installation of an RSW	Hydrosystem / Predation
54.3	Monitor and evaluate the effectiveness of surface bypass structures and modifications on smolt survival and condition.	SPE-P-08-1	Evaluation of a Behavioral Guidance Structure at Bonneville Dam Second Powerhouse	Hydrosystem / Predation
		SPE-P-08-3	Studies of Surface Spill at John Day Dam	Hydrosystem / Predation
		SPE-W-04-2	Juvenile Survival and Passage at Little Goose Dam.	Hydrosystem / Predation
		SPE-W-05-1	Evaluation of Temporary Spillway Weirs (TSW's) at McNary Dam	Hydrosystem / Predation
		SPE-W-08-4	Fish passage and survival at Lower Monumental Dam after installation of an RSW	Hydrosystem / Predation

RPA Number	RPA Description	Project Number	Project Title	Primary Workgroup
		SPE-W-09-New	Direct Injury and Survival of Juvenile Salmonids through the Spillway at Little Goose Dam.	Hydrosystem / Predation
54.4	Monitor and evaluate the effectiveness of turbine operations and modifications on smolt survival and condition.	SPE-P-08-3	Studies of Surface Spill at John Day Dam	Hydrosystem / Predation
		SPE-W-04-2	Juvenile Survival and Passage at Little Goose Dam.	Hydrosystem / Predation
		SPE-W-05-1	Evaluation of Temporary Spillway Weirs (TSW's) at McNary Dam	Hydrosystem / Predation
		SPE-W-08-4	Fish passage and survival at Lower Monumental Dam after installation of an RSW	Hydrosystem / Predation
		TSP-05-1	Pressure Investigations to Support Biological Index Testing	Hydrosystem / Predation
54.5	Monitor and evaluate overall dam passage with respect to modifications at projects (including forebay delay and survival).	SPE-P-08-3	Studies of Surface Spill at John Day Dam	Hydrosystem / Predation
		SPE-W-04-2	Juvenile Survival and Passage at Little Goose Dam.	Hydrosystem / Predation
		SPE-W-05-1	Evaluation of Temporary Spillway Weirs (TSW's) at McNary Dam	Hydrosystem / Predation
		SPE-W-08-4	Fish passage and survival at Lower Monumental Dam after installation of an RSW	Hydrosystem / Predation
54.6	Monitor and evaluate the effectiveness of the juvenile fish transportation program and modifications to operations.	1987-127-00	Smolt Monitoring By Non-Federal Agencies	Hydrosystem / Predation
		1996-020-00	PIT Tagging Spring / Summer Chinook	Hydrosystem / Predation
		2003-041-00	Evaluate Salmon Through Snake River Dams	Hydrosystem / Predation

RPA Number	RPA Description	Project Number	Project Title	Primary Workgroup
		NEW	Pilot study of Snake River Sockeye survival to Lower Granite Dam and SAR of in - river and transported smolts.	Hydrosystem / Predation
		TPE-W-00-06	Analyze the Benefits of Transporting Lower Snake River Juvenile Fall Chinook Salmon	Hydrosystem / Predation
		TPE-W-04-1	Determine the Seasonal Effects of Transporting fish from the Snake River to optimize a Transportation Strategy.	Hydrosystem / Predation
54.7	Monitor and evaluate the effects of environmental conditions affecting juvenile fish survival.	1987-127-00	Smolt Monitoring By Non-Federal Agencies	Hydrosystem / Predation
		1996-020-00	PIT Tagging Spring / Summer Chinook	Hydrosystem / Predation
		2003-041-00	Evaluate Salmon Through Snake River Dams	Hydrosystem / Predation
54.8	Monitor and evaluate the effectiveness of reducing predation towards improving juvenile fish survival.	1996-020-00	PIT Tagging Spring / Summer Chinook	Hydrosystem / Predation
		1997-024-00	Avian Predation On Juvenile Salmon	Hydrosystem / Predation
		2003-041-00	Evaluate Salmon Through Snake River Dams	Hydrosystem / Predation
		AVS-08–01	Evaluate Management Measures and Develop Baseline Information on Double - crested Cormorants Directed at Reducing the Impact of Their Predation on Salmonid Smolts in the Columbia River Estuary	Hydrosystem / Predation

RPA Number	RPA Description	Project Number	Project Title	Primary Workgroup
		AVS-W-03-01	Evaluate the Impact of Avian Predation on Salmonid Smolts from the Columbia and Snake Rivers	Hydrosystem / Predation
54.9	Investigate, evaluate and deploy alternative technologies and methodologies for fish passage.	1983-319-00	New Marking & Monitoring Technology	Hydrosystem / Predation
		ADS-00-4	Investigation of Fate of Fish; Straying in Adult Salmon and Steelhead. (RM&E)	Hydrosystem / Predation
		SPE-06-2	Comparative Performance of Acoustic - Tagged and PIT - Tagged Juvenile Salmonids	Hydrosystem / Predation
		SPE-P-08-1	Evaluation of a Behavioral Guidance Structure at Bonneville Dam Second Powerhouse	Hydrosystem / Predation
		SPE-P-08-3	Studies of Surface Spill at John Day Dam	Hydrosystem / Predation
		SPE-W-04-2	Juvenile Survival and Passage at Little Goose Dam.	Hydrosystem / Predation
		SPE-W-05-1	Evaluation of Temporary Spillway Weirs (TSW's) at McNary Dam	Hydrosystem / Predation
		SPE-W-08-4	Fish passage and survival at Lower Monumental Dam after installation of an RSW	Hydrosystem / Predation
		SPE-W-09-New	Direct Injury and Survival of Juvenile Salmonids through the Spillway at Little Goose Dam.	Hydrosystem / Predation
54.10	Determine if actions directed at benefiting juveniles have an unintended effect on migrating adults (e.g., certain spill operations).	1996-020-00	PIT Tagging Spring / Summer Chinook	Hydrosystem / Predation
		2003-041-00	Evaluate Salmon Through Snake River Dams	Hydrosystem / Predation

RPA Number	RPA Description	Project Number	Project Title	Primary Workgroup
		ADS-W-08-1	Little Goose Adult Passage at Varying Spill Levels and Patterns.	Hydrosystem / Predation
54.11	Install and maintain adult PIT-tag detectors in fish ladders at key dams in the FCRPS and evaluate adult survival (conversion rates).	None Identified		Hydrosystem / Predation
54.12	Monitor and evaluate the effects of fish ladder operations and configurations on adult passage rates.	1996-020-00	PIT Tagging Spring / Summer Chinook	Hydrosystem / Predation
		2003-041-00	Evaluate Salmon Through Snake River Dams	Hydrosystem / Predation
		2008-742-00	PIT Tag Detectors In Natal Streams	Hydrosystem / Predation
		ADS-00-1	Evaluation of Adult Salmon and Steelhead Delay and Fallback at Snake and Columbia River Dams.	Hydrosystem / Predation
54.13	In addition to the current sluiceway operation (generally April 1 – November 30), evaluate operation of The Dalles Dam sluiceway from March 1 – March 31 and from December 1 – December 15 as a potential means to provide a safer fallback passage rout for overwintering steelhead and kelts, implement if warranted.	1983-319-00	New Marking & Monitoring Technology	Hydrosystem / Predation
		1994-033-00	Fish Passage Center	Hydrosystem / Predation
		ADS-P-00-6	Evaluation of Steelhead Kelt and Overwintering Summer Steelhead Downstream Passage Through Columbia and Snake River dams.	Hydrosystem / Predation
54.14	Investigate surface-flow outlets during wintertime to provide safer fallback opportunity for over wintering steelhead (need will be determined by results of further research).	1983-319-00	New Marking & Monitoring Technology	Hydrosystem / Predation

RPA Number	RPA Description	Project Number	Project Title	Primary Workgroup
		ADS-P-00-6	Evaluation of Steelhead Kelt and Overwintering Summer Steelhead Downstream Passage Through Columbia and Snake River dams.	Hydrosystem / Predation
55.1	Investigate and quantify delayed differential effects (D-value) associated with the transportation of smolts in the FCRPS as needed. (Initiate in FY 2007-2009 Projects)	1987-127-00	Smolt Monitoring By Non-Federal Agencies	Hydrosystem / Predation
		1996-020-00	PIT Tagging Spring / Summer Chinook	Hydrosystem / Predation
		2003-041-00	Evaluate Salmon Through Snake River Dams	Hydrosystem / Predation
		2005-002-00	Lower Granite Dam Adult Trap Operations	Hydrosystem / Predation
		2008-724-00	PIT Tag Snake River Sockeye and Upper Columbia Spring Chinook	Hydrosystem / Predation
		NEW	Pilot study of Snake River Sockeye survival to Lower Granite Dam and SAR of in - river and transported smolts.	Hydrosystem / Predation
		TPE-W-00-06	Analyze the Benefits of Transporting Lower Snake River Juvenile Fall Chinook Salmon	Hydrosystem / Predation
		TPE-W-04-1	Determine the Seasonal Effects of Transporting fish from the Snake River to optimize a Transportation Strategy.	Hydrosystem / Predation
55.2	Investigate the post-Bonneville mortality effect of changes in fish arrival timing and transportation to below Bonneville. (Initiate in FY 2007-2009)	1987-127-00	Smolt Monitoring By Non-Federal Agencies	Hydrosystem / Predation
		1994-033-00	Fish Passage Center	Hydrosystem / Predation

RPA Number	RPA Description	Project Number	Project Title	Primary Workgroup
		1996-020-00	PIT Tagging Spring / Summer Chinook	Hydrosystem / Predation
		2003-041-00	Evaluate Salmon Through Snake River Dams	Hydrosystem / Predation
		2005-002-00	Lower Granite Dam Adult Trap Operations	Hydrosystem / Predation
		2008-724-00	PIT Tag Snake River Sockeye and Upper Columbia Spring Chinook	Hydrosystem / Predation
		2008-743-00	Early-Ocean Productivity Assessment	Hydrosystem / Predation
		EST-02-01	A Study of Salmonid Survival and Behavior through the Columbia River Estuary Using Acoustic Tags	Hydrosystem / Predation
		TPE-W-00-06	Analyze the Benefits of Transporting Lower Snake River Juvenile Fall Chinook Salmon	Hydrosystem / Predation
		TPE-W-04-1	Determine the Seasonal Effects of Transporting fish from the Snake River to optimize a Transportation Strategy.	Hydrosystem / Predation
55.3	Conduct a workshop every other year with members of the Independent Scientific Advisory Board (ISAB) to review current research and monitoring approaches on post Bonneville mortality for transported and non-transported fish. (Initiate in FY 2009)	2008-725-00	Post Bonneville Mortality Workshop	Hydrosystem / Predation
55.4	Investigate, describe and quantify key characteristics of the early life history of Snake River Fall Chinook Salmon in the mainstem Snake, Columbia, and Clearwater rivers. (Initiate in FY 2007-2009 Project)	1983-319-00	New Marking & Monitoring Technology	Hydrosystem / Predation

RPA Number	RPA Description	Project Number	Project Title	Primary Workgroup
		1987-127-00	Smolt Monitoring By Non-Federal Agencies	Hydrosystem / Predation
		1991-029-00	Flow Augmentation On S.R. Fall Chinook	Hydrosystem / Predation
		2002-032-00	Snake River Fall Chinook Life History Investigation	Hydrosystem / Predation
		EST-02-01	A Study of Salmonid Survival and Behavior through the Columbia River Estuary Using Acoustic Tags	Hydrosystem / Predation
		TPE-W-00-06	Analyze the Benefits of Transporting Lower Snake River Juvenile Fall Chinook Salmon	Hydrosystem / Predation
55.5	Complete analysis and reporting of a multi-year (2000-2007) investigation on the effects of adult passage experience in the FCRPS on pre- spawning mortality (2008). Following reporting, SRWG will review the results and provide a recommendation on the need and nature of future research. Future research will be coordinated through the Regional Forum.	1983-319-00	New Marking & Monitoring Technology	Hydrosystem / Predation
		2008-724-00	PIT Tag Snake River Sockeye and Upper Columbia Spring Chinook	Hydrosystem / Predation
55.6	Continue development of state-of-the-art turbine units to obtain improved fish passage survival through turbines with the goal of using these new units in all future turbine rehabilitation or replacement programs.	TSP-05-1	Pressure Investigations to Support Biological Index Testing	Hydrosystem / Predation
55.7	Investigate feasibility of developing PIT tag detectors for spillways and turbines.	1983-319-00	New Marking & Monitoring Technology	Hydrosystem / Predation
		2008-741-00	PIT Tag Detectors Spillways-Turbines	Hydrosystem / Predation

RPA Number	RPA Description	Project Number	Project Title	Primary Workgroup
55.8	Evaluate new tagging technologies for use in improving the accuracy and assessing delayed or indirect hydro effects on juvenile or adult fish.	1983-319-00	New Marking & Monitoring Technology	Hydrosystem / Predation
		2008-744-00	Evaluate New Tagging Technology	Hydrosystem / Predation
		SPE-06-2	Comparative Performance of Acoustic - Tagged and PIT - Tagged Juvenile Salmonids	Hydrosystem / Predation
55.9	Assess the feasibility of developing PIT-tag detectors for use in natal streams and tributaries, or other locations, as appropriate to support more comprehensive and integrated All-H monitoring designs and assessments of stray rates.	1983-319-00	New Marking & Monitoring Technology	Hydrosystem / Predation
		ADS-00-4	Investigation of Fate of Fish; Straying in Adult Salmon and Steelhead. (RM&E)	Hydrosystem / Predation
56.1	Implement research in select areas of the pilot study basins (Wenatchee, Methow and Entiat river basins in the Upper Columbia River, the Lemhi and South Fork Salmon river basins, and the John Day River Basin) to quantify the relationships between habitat conditions and fish productivity (limiting factors) to improve the development and parameterization of models used in the planning and implementation of habitat projects. These studies will be coordinated with the influence of hatchery programs in these habitat areas. Review and modify annually to ensure that these projects continue to provide a means of evaluating the effectiveness of tributary mitigation actions.	1983-350-03	Nez Perce Tribal Hatchery M&E	Fish Populations / Habitat

RPA Number	RPA Description	Project Number	Project Title	Primary Workgroup
		1984-025-00	NE Oregon Habitat Projects	Fish Populations / Habitat
		1987-100-01	Umatilla Anadromous Fish Habitat - CTUIR	Fish Populations / Habitat
		1987-100-02	Umatilla Anadromous Fish Habitat - ODFW	Fish Populations / Habitat
		1988-053-03	Hood River Production M&E - Warm Springs	Fish Populations / Habitat
		1992-026-04	Life Studies Of Spring Chinook	Fish Populations / Habitat
		1994-018-05	Asotin Enhancement / Restoration	Fish Populations / Habitat
		1994-018-06	Tucannon Stream And Riparian R	Fish Populations / Habitat
		1994-042-00	Trout Creek O&M	Fish Populations / Habitat
		1996-020-00	PIT Tagging Spring / Summer Chinook	Fish Populations / Habitat
		1997-015-01	Imnaha River Smolt Monitoring NPT	Fish Populations / Habitat
		1997-056-00	Klickitat Watershed Enhance	Fish Populations / Habitat
		1998-010-03	Spawning distribution of Snake River fall Chinook	Fish Populations / Habitat
		2000-035-00	Rehabilitate Newsome Creek - S	Fish Populations / Habitat
		2000-036-00	Protect And Restoration Mill Creek	Fish Populations / Habitat
		2000-039-00	Walla Walla River Basin Monitoring	Fish Populations / Habitat
		2002-032-00	Snake River Fall Chinook Life History Investigation	Fish Populations / Habitat
		2002-070-00	Lapwai Creek Anadromous Habitat	Fish Populations / Habitat
		2002-072-00	Protect & Restoration Red River WS	Fish Populations / Habitat
		2003-017-00	Integrated Status / Effect Program	Fish Populations / Habitat
		2003-039-00	Monitoring Reproductive In Wenatchee River	Fish Populations / Habitat
		2007-083-00	Grande Ronde Supplementation M&E	Fish Populations / Habitat

RPA Number	RPA Description	Project Number	Project Title	Primary Workgroup
		2007-127-00	E Fork Of S Fork Salmon Passage R	Fish Populations / Habitat
		2007-325-00	UPA Wenatchee Complexity	Fish Populations / Habitat
		2007-332-00	Mitigation Of Marine - Derived Nutrients	Fish Populations / Habitat
		2007-397-00	John Day Tributary / Passage & Flow	Fish Populations / Habitat
		2008-471-00	Upper Columbia Nutrient Supplementation	Fish Populations / Habitat
		2008-745-00	Additional IMW Studies	Fish Populations / Habitat
		2009-003-00	Upper Columbia Habitat Restoration	Fish Populations / Habitat
56.2	Implement habitat status and trend monitoring as a component of the pilot studies in the Wenatchee, Methow and Entiat river basins in the Upper Columbia River, the Lemhi and South Fork Salmon river basins, and the John Day River Basin. (Initiate in FY 2007-2009 Projects, annually review and modify annually to ensure that these projects continue to provide a means of evaluating the effectiveness of tributary mitigation actions).	1998-022-00	Pine Creek / Wagner Management	Fish Populations / Habitat
		2003-017-00	Integrated Status / Effect Program	Fish Populations / Habitat
		2007-083-00	Grande Ronde Supplementation M&E	Fish Populations / Habitat
		2007-325-00	UPA Wenatchee Complexity	Fish Populations / Habitat
		2007-397-00	John Day Tributary / Passage & Flow	Fish Populations / Habitat
		2008-471-00	Upper Columbia Nutrient Supplementation	Fish Populations / Habitat
		2008-745-01	Additional IMW Studies	Fish Populations / Habitat
		2009-003-00	Upper Columbia Habitat Restoration	Fish Populations / Habitat

RPA Number	RPA Description	Project Number	Project Title	Primary Workgroup
56.3	Facilitate and participate in an ongoing collaboration process to develop a regional strategy for limited habitat status and trend monitoring for key ESA fish populations. This monitoring strategy will be coordinated with the status monitoring needs and strategies being developed for hydropower, habitat, hatchery, harvest, and estuary/ocean. (Initiate in FY 2008)	1986-050-00	Umatilla Anadromous Fish Habitat - CTUIR	Fish Populations / Habitat
		1987-100-01	Umatilla Anadromous Fish Habitat - CTUIR	Fish Populations / Habitat
		2002-032-00	Snake River Fall Chinook Life History Investigation	Fish Populations / Habitat
		2002-070-00	Lapwai Creek Anadromous Habitat	Fish Populations / Habitat
		2008-745-02	Additional IMW Studies	Fish Populations / Habitat
57	Evaluate the Effectiveness of Tributary Habitat Actions The Action Agencies will evaluate the effectiveness of habitat actions through RM&E projects that support the testing and further development of relationships and models used for estimating habitat benefits. These evaluations will be coordinated with hatchery effectiveness studies.	2008-745-03	Additional IMW Studies	Fish Populations / Habitat
		2008-746-00	Nutrient Supplementation Studies	Fish Populations / Habitat
57.1	Action effectiveness pilot studies in the Entiat River Basin to study treatments to improve channel complexity and fish productivity. (Initiate in FY 2007-2009 Projects, review and modify annually to ensure that these projects continue to provide a means of evaluating the effectiveness of tributary mitigation actions).	2003-017-00	Integrated Status / Effect Program	Fish Populations / Habitat

RPA Number	RPA Description	Project Number	Project Title	Primary Workgroup
57.2	Pilot study in the Lemhi River Basin to study treatments to reduce entrainment and provide better fish passage flow conditions. (Initiate in FY 2007-2009 Projects, review and modify annually to ensure that these projects continue to provide a means of evaluating the effectiveness of tributary mitigation actions).	2003-017-00	Integrated Status / Effect Program	Fish Populations / Habitat
57.3	Action effectiveness pilot studies in Bridge Creek of the John Day River Basin to study treatments of channel incision and its effects on passage, channel complexity, and consequentially fish productivity. (Initiate in FY 2007-2009 Projects, review and modify annually to ensure that these projects continue to provide a means of evaluating the effectiveness of tributary mitigation actions).	2003-017-00	Integrated Status / Effect Program	Fish Populations / Habitat
57.4	Project and watershed level assessments of habitat, habitat restoration and fish productivity in the Wenatchee, Methow and John Day basins. (Initiate in FY 2007-2009 Projects, review and modify annually to ensure that these projects continue to provide a means of evaluating the effectiveness of tributary mitigation actions).	1994-042-00	Trout Creek O&M	Fish Populations / Habitat
		2003-017-00	Integrated Status / Effect Program	Fish Populations / Habitat
		2007-083-00	Grande Ronde Supplementation M&E	Fish Populations / Habitat
		2007-325-00	UPA Wenatchee Complexity	Fish Populations / Habitat
		2007-397-00	John Day Tributary / Passage & Flow	Fish Populations / Habitat
		2009-003-00	Upper Columbia Habitat Restoration	Fish Populations / Habitat

RPA Number	RPA Description	Project Number	Project Title	Primary Workgroup
57.5	Action agencies will convene a regional technical group to develop an initial set of relationships in FY2008, then annually convene the group to expand and refine models relating habitat actions to ecosystem function and salmon survival by incorporating research and monitoring results and other relevant information. (initiate in FY2008)	None Identified		Fish Populations / Habitat
58.1	Monitor and evaluate smolt survival and/or fitness in select reaches from Bonneville Dam through the estuary. (Initiate in FY 2007-2009 Projects, annually review and modify until complete)	EST-02-01	A Study of Salmonid Survival and Behavior through the Columbia River Estuary Using Acoustic Tags	Estuary / Ocean
		EST-02-01	A Study of Salmonid Survival and Behavior through the Columbia River Estuary Using Acoustic Tags	Hydrosystem / Predation
		EST-09-P-new	Evaluation of Life History Diversity, Habitat Connectivity, and Survival Benefits Associated with Habitat Restoration Actions in the Lower Columbia River and Estuary	Hydrosystem / Predation
58.2	Develop an index and monitor and evaluate life history diversity of salmonid populations at representative locations in the estuary. (Initiate in FY 2007-2009 Projects)	EST-09-P-new	Evaluation of Life History Diversity, Habitat Connectivity, and Survival Benefits Associated with Habitat Restoration Actions in the Lower Columbia River and Estuary	Estuary / Ocean
		EST-09-P-new	Evaluation of Life History Diversity, Habitat Connectivity, and Survival Benefits Associated with Habitat Restoration Actions in the Lower Columbia River and Estuary	Hydrosystem / Predation

RPA Number	RPA Description	Project Number	Project Title	Primary Workgroup
58.3	Monitor and evaluate juvenile salmonid growth rates and prey resources at representative locations in the estuary and plume. (Initiate in FY 2007- 2009 Projects, annually review and modify until complete)	1998-014-00	Ocean Survival Of Salmonids	Estuary / Ocean
		2003-011-00	Columbia River / Estuary Habitat	Estuary / Ocean
		2008-743-00	Early-Ocean Productivity Assessment	Estuary / Ocean
58.4	Monitor and evaluate temporal and spatial species composition, abundance, and foraging rates of juvenile salmonid predators at representative locations in the estuary and plume. (Initiate in FY 2007- 2009 Projects, annually review and modify until complete)	1998-014-00	Ocean Survival Of Salmonids	Estuary / Ocean
59.1	Map bathymetry and topography of the estuary as needed for RM&E. (Initiate in FY 2007-2009 Projects)	2003-011-00	Columbia River / Estuary Habitat	Estuary / Ocean
		2007-513-00	Eelgrass Enhancement And Restoration	Estuary / Ocean
		AER7	JBH Tide Gate Replacement	Estuary / Ocean
		EST-02-P-04	Evaluating Cumulative Ecosystem Response to Habitat Restoration Projects in the Lower Columbia River and Estuary	Estuary / Ocean
59.2	Establish a hierarchical habitat classification system based on hydro- geomorphology, ground-truth it with vegetation cover monitoring data, and map existing habitats. (Initiate in FY 2007-2009 Projects)	EST-09-P-new	Evaluation of Life History Diversity, Habitat Connectivity, and Survival Benefits Associated with Habitat Restoration Actions in the Lower Columbia River and Estuary	Hydrosystem / Predation

RPA Number	RPA Description	Project Number	Project Title	Primary Workgroup
59.3	Develop an index of habitat connectivity and apply it to each of the eight reaches of the study area. (Initiate in FY 2007-2009 Projects)	EST-09-P-new	Evaluation of Life History Diversity, Habitat Connectivity, and Survival Benefits Associated with Habitat Restoration Actions in the Lower Columbia River and Estuary	Estuary / Ocean
		EST-09-P-new	Evaluation of Life History Diversity, Habitat Connectivity, and Survival Benefits Associated with Habitat Restoration Actions in the Lower Columbia River and Estuary	Hydrosystem / Predation
59.4	Evaluate migration through and use of a subset of various shallow-water habitats from Bonneville Dam to the mouth towards understanding specific habitat use and relative importance to juvenile salmonids. (Initiate in FY 2007-2009 Projects, then annually)	EST-02-01	A Study of Salmonid Survival and Behavior through the Columbia River Estuary Using Acoustic Tags	Estuary / Ocean
		EST-02-01	A Study of Salmonid Survival and Behavior through the Columbia River Estuary Using Acoustic Tags	Hydrosystem / Predation
59.5	Monitor habitat conditions periodically, including water surface elevation, vegetation cover, plant community structure, primary and secondary productivity, substrate characteristics, dissolved oxygen, temperature, and conductivity, at representative locations in the estuary as established through RM&E. (FY 2007-2009 Projects, then annually)	2003-011-00	Columbia River / Estuary Habitat	Estuary / Ocean
		EST-02-P-04	Evaluating Cumulative Ecosystem Response to Habitat Restoration Projects in the Lower Columbia River and Estuary	Estuary / Ocean

RPA Number	RPA Description	Project Number	Project Title	Primary Workgroup
		EST-09-P-new	Evaluation of Life History Diversity, Habitat Connectivity, and Survival Benefits Associated with Habitat Restoration Actions in the Lower Columbia River and Estuary	Hydrosystem / Predation
		STM3	Tides and Currents	Estuary / Ocean
		STM4	ODEQ Ambient Water Quality Monitoring	Estuary / Ocean
		STM5	USGS Discharge and WQ Monitoring	Estuary / Ocean
		STM6	WDOE Ambient WQ Monitoring	Estuary / Ocean
60.1	Develop a limited number of reference sites for typical habitats (e.g., tidal swamp, marsh, island, and tributary delta, to use in action effectiveness evaluations). (Initiate in FY 2007-2009 Projects)	EST-02-P-04	Evaluating Cumulative Ecosystem Response to Habitat Restoration Projects in the Lower Columbia River and Estuary	Estuary / Ocean
60.2	Evaluate the effects of selected individual habitat restoration actions at project sites relative to reference sites and evaluate post-restoration trajectories based on project-specific goals and objectives. (Initiate in FY 2007-2009 Projects, annually review and modify as appropriate or until complete)	2003-011-00	Columbia River / Estuary Habitat	Estuary / Ocean
		2007-513-00	Eelgrass Enhancement And Restoration	Estuary / Ocean
		AER10	Monitoring at Smith and Bybee Lakes	Estuary / Ocean
		AER12	Ramsey Lake Project Monitoring	Estuary / Ocean
		AER5	Pile Structure Evaluation Coal Creek	Estuary / Ocean
		AER7	JBH Tide Gate Replacement	Estuary / Ocean
		AER8	Crims Island Monitoring	Estuary / Ocean

RPA Number	RPA Description	Project Number	Project Title	Primary Workgroup
		AER9	Tenasillahe Is. Monitoring	Estuary / Ocean
		EST-02-P-04	Evaluating Cumulative Ecosystem Response to Habitat Restoration Projects in the Lower Columbia River and Estuary	Estuary / Ocean
60.3	Develop and implement a methodology to estimate the cumulative effects of habitat conservation and restoration projects in terms of cause-and- effect relationships between ecosystem controlling factors, structures, and processes affecting salmon habitats and performance. (Initiate in FY 2007-2009 Projects, annually review and modify as appropriate or until complete)	2003-011-00	Columbia River / Estuary Habitat	Estuary / Ocean
		AER10	Monitoring at Smith and Bybee Lakes	Estuary / Ocean
		AER12	Ramsey Lake Project Monitoring	Estuary / Ocean
		AER7	JBH Tide Gate Replacement	Estuary / Ocean
		AER8	Crims Island Monitoring	Estuary / Ocean
		EST-02-P-04	Evaluating Cumulative Ecosystem Response to Habitat Restoration Projects in the Lower Columbia River and Estuary	Estuary / Ocean
		EST-02-P-04	Evaluating Cumulative Ecosystem Response to Habitat Restoration Projects in the Lower Columbia River and Estuary	Hydrosystem / Predation
61.1	Continue work to define the ecological importance of the tidal freshwater, estuary, plume, and nearshore ocean environments to the viability and recovery of listed salmonid populations in the Columbia River Basin.	1998-014-00	Ocean Survival Of Salmonids	Estuary / Ocean

RPA Number	RPA Description	Project Number	Project Title	Primary Workgroup
		2003-009-00	Canada - USA Shelf Salmon Study	Estuary / Ocean
		2007-275-00	Impact Of American Shad	Estuary / Ocean
		EST-02-01	A Study of Salmonid Survival and Behavior through the Columbia River Estuary Using Acoustic Tags	Estuary / Ocean
61.2	Continue work to define the causal mechanisms and migration/behavior characteristics affecting survival of juvenile salmon during their first weeks in the ocean.	1998-014-00	Ocean Survival Of Salmonids	Estuary / Ocean
		2003-009-00	Canada - USA Shelf Salmon Study	Estuary / Ocean
		2003-114-00	Acoustic Tracking For Survival	Estuary / Ocean
		EST-02-01	A Study of Salmonid Survival and Behavior through the Columbia River Estuary Using Acoustic Tags	Hydrosystem / Predation
61.3	Investigate the importance of early life history of salmon populations in tidal fresh water of the lower Columbia River.	2003-011-00	Columbia River / Estuary Habitat	Estuary / Ocean
		EST-02-01	A Study of Salmonid Survival and Behavior through the Columbia River Estuary Using Acoustic Tags	Estuary / Ocean
		EST-02-01	A Study of Salmonid Survival and Behavior through the Columbia River Estuary Using Acoustic Tags	Hydrosystem / Predation
		EST-02-P-04	Evaluating Cumulative Ecosystem Response to Habitat Restoration Projects in the Lower Columbia River and Estuary	Estuary / Ocean
61.4	Continue development of a hydrodynamic numerical model for the estuary and plume to support critical uncertainties investigations.	1998-014-00	Ocean Survival Of Salmonids	Estuary / Ocean
		STM3	Tides and Currents	Estuary / Ocean

RPA Number	RPA Description	Project Number	Project Title	Primary Workgroup
		STM5	USGS Discharge and WQ Monitoring	Estuary / Ocean
62.1	Continue work to define the ecological importance of the tidal freshwater, estuary, plume, and nearshore ocean environments to the viability and recovery of listed salmonid populations in the Columbia River Basin.	1983-350-03	Nez Perce Tribal Hatchery M&E	Hatcheries / Harvest
		1988-053-03	Hood River Production M&E - Warm Springs	Hatcheries / Harvest
		1996-043-00	Johnson Creek Artificial Propagation	Hatcheries / Harvest
		1997-015-01	Imnaha River Smolt Monitoring NPT	Hatcheries / Harvest
		2008-502-00	Expanded Tribal Catch Sampling	Hatcheries / Harvest
		2008-508-00	Power Analysis Catch Sampling Rates	Hatcheries / Harvest
62.2	Evaluate methods to develop or expand use of selective fishing methods and gear. (Initiate in FY 2007-2009 Projects)	2007-083-00	Grande Ronde Supplementation M&E	Hatcheries / Harvest
62.3	Evaluate post-release mortality rates for selected fisheries. (Initiate in FY 2007-2009 Projects)	None Identified		Hatcheries / Harvest
62.4	Support coded-wire tagging and coded-wire tag recovery operations that inform survival, straying, and harvest rates of hatchery fish by stock, rearing facility, release treatment, and location. (Initiate in FY 2007-2009 Projects)	1982-013-01	Coded Wire Tag - PSMFC	Hatcheries / Harvest
		1982-013-02	Coded Wire Tag - ODFW	Hatcheries / Harvest
		1982-013-03	Coded Wire Tag - USFWS	Hatcheries / Harvest
		1983-350-03	Nez Perce Tribal Hatchery M&E	Hatcheries / Harvest
		1988-053-03	Hood River Production M&E - Warm Springs	Hatcheries / Harvest

RPA Number	RPA Description	Project Number	Project Title	Primary Workgroup
		1988-053-07	Hood River Production O&M - WS / ODFW	Hatcheries / Harvest
		1990-005-00	Umatilla Hatchery - M&E	Hatcheries / Harvest
		2008-740-00	Additional Marking Hatchery Fish	Hatcheries / Harvest
62.5	Investigate the feasibility of genetic stock identification monitoring techniques. (Initiate in FY 2007-2009 Projects)	1983-350-00	Nez Perce Tribal Hatchery M&E	Hatcheries / Harvest
		1983-350-03	Nez Perce Tribal Hatchery M&E	Hatcheries / Harvest
		1988-053-07	Hood River Production O&M - WS / ODFW	Hatcheries / Harvest
		1989-096-00	Genetic M&E Program For Salmon / Steelhead	Hatcheries / Harvest
		1996-043-00	Johnson Creek Artificial Propagation	Hatcheries / Harvest
		1997-038-00	Listed Stock Chinook Salmon Gamete	Hatcheries / Harvest
		2003-050-00	Evaluation Of Reproductive Success Of Steelhead	Hatcheries / Harvest
		2003-063-00	Reproductive Success Abernathy Creek	Hatcheries / Harvest
		2007-404-00	OR Spring Chinook Captive Propagation	Hatcheries / Harvest
		2008-311-00	Natural Production Management & Monitoring	Hatcheries / Harvest
		2008-907-00	Genetic Assessment of Columbia River Stocks	Hatcheries / Harvest

RPA Number	RPA Description	Project Number	Project Title	Primary Workgroup
63	Monitor Hatchery Effectiveness The Action Agencies will continue to fund selected monitoring and evaluation of the effectiveness of Hatchery Actions. The evaluation of hatchery projects will be coordinated with the Tributary Habitat monitoring and evaluation program.	2009-009-00	Basinwide Supplementation Evaluation	Hatcheries / Harvest
63.1	Determine the effect that safety-net and conservation hatchery programs have on the viability and recovery of the targeted populations of salmon and steelhead. (Initiate in FY 2007-2009 Projects)	1989-096-00	Genetic M&E Program For Salmon / Steelhead	Hatcheries / Harvest
		1992-026-04	Life Studies Of Spring Chinook	Hatcheries / Harvest
		1996-043-00	Johnson Creek Artificial Propagation	Hatcheries / Harvest
		1997-038-00	Listed Stock Chinook Salmon Gamete	Hatcheries / Harvest
		1998-007-04	Grande Ronde Sp Chinook - ODFW	Hatcheries / Harvest
		2001-053-00	Reintroduction Of Chum In Duncan Creek	Hatcheries / Harvest
		2007-083-00	Grande Ronde Supplementation M&E	Hatcheries / Harvest
63.2	Determine the effect that implemented hatchery reform actions have on the recovery of targeted salmon and steelhead populations. (Initiate in FY 2007-2009 Projects)	None Identified		Hatcheries / Harvest

RPA Number	RPA Description	Project Number	Project Title	Primary Workgroup
64.1	Continue to estimate the relative reproductive success (RSS) of hatchery- origin salmon and steelhead compared to reproductive success of their natural-origin counterparts for ESA-listed spring/summer Chinook population in the Upper Grande Ronde, Lostine River, and Catherine Creek; listed spring Chinook in the Wenatchee River; and listed steelhead in the Hood River. (Initiate in FY 2007-2009 Projects.)	1988-053-03	Hood River Production M&E - Warm Springs	Hatcheries / Harvest
		1988-053-07	Hood River Production O&M - WS / ODFW	Hatcheries / Harvest
		2007-083-00	Grande Ronde Supplementation M&E	Hatcheries / Harvest
64.2	Determine if properly designed intervention programs using artificial production make a net positive contribution to recovery of listed populations. (Initiate in FY 2007-2009)	1983-350-00	Nez Perce Tribal Hatchery M&E	Hatcheries / Harvest
		1983-350-03	Nez Perce Tribal Hatchery M&E	Hatcheries / Harvest
		1983-435-00	Umatilla Hatchery O&M - CTUIR	Hatcheries / Harvest
		1988-053-01	NE OR Hatchery Master Plan	Hatcheries / Harvest
		1988-053-03	Hood River Production M&E - Warm Springs	Hatcheries / Harvest
		1988-053-07	Hood River Production O&M - WS / ODFW	Hatcheries / Harvest
		1989-096-00	Genetic M&E Program For Salmon / Steelhead	Hatcheries / Harvest
		1990-005-00	Umatilla Hatchery - M&E	Hatcheries / Harvest
		1992-026-04	Life Studies Of Spring Chinook	Hatcheries / Harvest
		1996-043-00	Johnson Creek Artificial Propagation	Hatcheries / Harvest
		1997-015-01	Imnaha River Smolt Monitoring NPT	Hatcheries / Harvest

RPA Number	RPA Description	Project Number	Project Title	Primary Workgroup
		1997-038-00	Listed Stock Chinook Salmon Gamete	Hatcheries / Harvest
		1998-007-04	Grande Ronde Sp Chinook - ODFW	Hatcheries / Harvest
		1998-010-03	Spawning distribution of Snake River fall Chinook	Hatcheries / Harvest
		2000-019-00	Tucannon River Spring Chinook	Hatcheries / Harvest
		2002-031-00	Chinook Growth Rate Modulation	Hatcheries / Harvest
		2003-039-00	Monitoring Reproductive In Wenatchee River	Hatcheries / Harvest
		2003-050-00	Evaluation Of Reproductive Success Of Steelhead	Hatcheries / Harvest
		2003-063-00	Reproductive Success Abernathy Creek	Hatcheries / Harvest
		2007-083-00	Grande Ronde Supplementation M&E	Hatcheries / Harvest
		2007-401-00	Kelt Recondition / Reproductive Success	Hatcheries / Harvest
		2007-403-00	ID Spring Chinook Captive Propagation	Hatcheries / Harvest
		2007-404-00	OR Spring Chinook Captive Propagation	Hatcheries / Harvest
		2008-311-00	Natural Production Management & Monitoring	Hatcheries / Harvest
		2008-458-00	Steelhead Kelt Reconditioning	Hatcheries / Harvest

RPA Number	RPA Description	Project Number	Project Title	Primary Workgroup
64.3	In collaboration with the other entities responsible for steelhead mitigation in the Methow River, BPA will fund a new RSS study for ESA- listed steelhead in the Methow River. BPA will also fund a new RSS study for listed fall Chinook in the Snake River. NOAA Fisheries will provide technical assistance to the Action Agencies in development of conceptual study designs suitable for use by the Action Agencies in obtaining a contractor to implement the new studies. (Initiate in FY 2007-2009 Projects.)	None Identified		Hatcheries / Harvest
65	Investigate Hatchery Critical Uncertainties The Action Agencies will fund research directed at resolving critical uncertainties:	2008-724-00	PIT Tag Snake River Sockeye and Upper Columbia Spring Chinook	Hatcheries / Harvest
65.1	In the mainstem Snake River above the Lower Granite Dam, Estimate the effectiveness/fitness in nature of hatchery-origin fall Chinook salmon from federally funded Snake River hatchery programs relative to natural origin Snake River fall Chinook.	1998-010-03	Spawning distribution of Snake River fall Chinook	Hatcheries / Harvest
65.2	Estimate fall Chinook hatchery program effects on the productivity of the fall Chinook salmon ESU.	1998-010-03	Spawning distribution of Snake River fall Chinook	Hatcheries / Harvest
65.3	NOAA Fisheries will provide technical assistance to the Action Agencies in development of conceptual study designs suitable for use by the Action Agencies in obtaining a contractor to implement new studies.	None Identified		Hatcheries / Harvest

RPA Number	RPA Description	Project Number	Project Title	Primary Workgroup
66	Monitor and Evaluate the Caspian Tern Population in the Columbia River Estuary The Action Agencies will monitor the tern population in the estuary and its impacts on outmigrating juvenile salmonids, as well as the effectiveness of the Caspian tern management plan.	1997-024-00	Avian Predation On Juvenile Salmon	Hydrosystem / Predation
67	Monitor and Evaluate the Double-Crested Cormorant Population in the Columbia River Estuary The Action Agencies will monitor the cormorant population in the estuary and its impacts on outmigrating juvenile salmonids and develop and implement a management plan to decrease predation rates, if warranted.	1997-024-00	Avian Predation On Juvenile Salmon	Hydrosystem / Predation
68	Monitor and Evaluate Inland Avian Predators The Action Agencies will monitor avian predator populations in the Mid- Columbia River and evaluate their impacts on outmigrating juvenile salmonids and develop and implement a management plan to decrease predation rates, if warranted.	1997-024-00	Avian Predation On Juvenile Salmon	Hydrosystem / Predation
69.1	Estimate overall sea lion abundance immediately below Bonneville Dam. (Initiate in FY 2007-2009 Projects)	2008-004-00	Sea Lion Non - Lethal Hazing	Hydrosystem / Predation
69.2	Monitor the spatial and temporal distribution of sea lion predation attempts and estimate predation rates. (Initiate in FY 2007-2009 Projects)	2008-004-00	Sea Lion Non - Lethal Hazing	Hydrosystem / Predation

RPA Number	RPA Description	Project Number	Project Title	Primary Workgroup
69.3	Monitor the effectiveness of deterrent actions (e.g., exclusion gates, acoustics, and harassment) and their timing of application on spring runs of anadromous fish passing Bonneville Dam. (Initiate in FY 2007- 2009 Projects)	2008-004-00	Sea Lion Non - Lethal Hazing	Hydrosystem / Predation
70.4	Develop a study plan to review, evaluate, and develop strategies to reduce non-indigenous piscivorous predation. (Initiate in FY 2007-2009 Projects)	2008-720-00	Workshop Non-Indigenous Fishes	Hydrosystem / Predation
71.1	Organizing and supporting the Corps AFEP.	None Identified		Project Management / Coordination
71.2	Supporting and participating in the Council's Columbia River Basin Fish and Wildlife Program project planning and review efforts.	None Identified		Project Management / Coordination
71.3	Supporting the standardization and coordination of tagging and monitoring efforts through participation and leadership in regional coordination forums such as PNAMP.	1994-033-00	Fish Passage Center	Project Management / Coordination
		1996-020-00	PIT Tagging Spring / Summer Chinook	Project Management / Coordination
		1996-043-00	Johnson Creek Artificial Propagation	Project Management / Coordination
		2004-002-00	PNAMP Funding	Project Management / Coordination
71.4	Working with regional monitoring agencies to develop, cooperatively fund, and implement standard metrics, business practices, and information collection and reporting tools needed to cooperatively track and report on the status of regional fish improvement and fish monitoring projects.	1982-013-01	Coded Wire Tag - PSMFC	Project Management / Coordination

RPA Number	RPA Description	Project Number	Project Title	Primary Workgroup
		1988-108-04	Streamnet (CIS / NED)	Project Management / Coordination
		1994-033-00	Fish Passage Center	Project Management / Coordination
		2003-017-00	Integrated Status / Effect Program	Project Management / Coordination
		2003-072-00	Biodiversity System For Columbia	Project Management / Coordination
		2004-002-00	PNAMP Funding	Project Management / Coordination
		2007-403-00	ID Spring Chinook Captive Propagation	Project Management / Coordination
		2007-404-00	OR Spring Chinook Captive Propagation	Project Management / Coordination
		2008-505-00	Streamnet Library	Project Management / Coordination
		2008-727-00	Regional Data Management Support and Coordination	Project Management / Coordination
71.5	Coordinating the further development and implementation of Hydrosystem, Tributary Habitat, Estuary/Ocean, Harvest, Hatchery, and Predation RM&E through leadership and participation in ongoing collaboration and review processes and workgroups.	2002-077-00	Estuary / Ocean RM&E Support	Project Management / Coordination
		2003-017-00	Integrated Status / Effect Program	Project Management / Coordination
		2003-072-00	Biodiversity System For Columbia	Project Management / Coordination
		2004-002-00	PNAMP Funding	Project Management / Coordination

RPA Number	RPA Description	Project Number	Project Title	Primary Workgroup
71.6	Coordinating implementation with other appropriate regional collaboration processes. This includes coordination related to statutory provisions for the Federal government (BPA/Council), voluntary coordination among Federal agencies (Federal Caucus), and coordination with regional processes for Federal/non-Federal engagement [Technical Management Team (TMT), System Configuration Team (SCT), PNAMP, Northwest Environmental Data- Network (NED), and others].	2002-077-00	Estuary / Ocean RM&E Support	Project Management / Coordination
		2003-072-00	Biodiversity System For Columbia	Project Management / Coordination
		2004-002-00	PNAMP Funding	Project Management / Coordination
		2008-727-01	Regional Data Management Support and Coordination	Project Management / Coordination
72.1	Continue to work with regional Federal, State and Tribal agencies to establish a coordinated and standardized information system network to support the RM&E program and related performance assessments. The coordination of this development will occur primarily through leadership, participation, and joint funding support in regional coordination forums such as the NED workgroup, and PNAMP and the ongoing RM&E pilot studies in the Wenatchee River, John Day River, Upper Salmon River, and Columbia River Estuary. (Initiate in FY 2007- 2009 Projects)	1982-013-01	Coded Wire Tag - PSMFC	Project Management / Coordination

RPA Number	RPA Description	Project Number	Project Title	Primary Workgroup
		1987-127-00	Smolt Monitoring By Non-Federal Agencies	Hydrosystem / Predation
		1988-108-04	Streamnet (CIS / NED)	Project Management / Coordination
		1998-031-00	Implement Wy - Kan - Ush - Mi Wa - Kis	Project Management / Coordination
		2003-036-00	CBFWA Monitoring / Evaluate Program	Project Management / Coordination
		2008-505-00	Streamnet Library	Project Management / Coordination
		2008-727-02	Regional Data Management Support and Coordination	Project Management / Coordination
72.2	Contribute funding for data system components that support the information management needs of individual Hydrosystem, Tributary Habitat, Estuary/Ocean, Harvest, Hatchery, and Predation RM&E. (Initiate in FY 2007-2009 Projects)	1988-108-04	Streamnet (CIS / NED)	Project Management / Coordination
		2008-727-03	Regional Data Management Support and Coordination	Project Management / Coordination
72.3	Participate in Northwest regional coordination and collaboration efforts such as the current PNAMP and NED efforts to develop and implement a regional management strategy for water, fish and habitat data (Initiate in FY 2007-2009 Projects).	1982-013-01	Coded Wire Tag - PSMFC	Project Management / Coordination
		1988-108-04	Streamnet (CIS / NED)	Project Management / Coordination
		1998-031-00	Implement Wy - Kan - Ush - Mi Wa - Kis	Project Management / Coordination
		2008-505-00	Streamnet Library	Project Management / Coordination

RPA Number	RPA Description	Project Number	Project Title	Primary Workgroup
		2008-727-04	Regional Data Management Support and Coordination	Project Management / Coordination
73.1	Annually monitor the successful implementation of projects through standard procedures and requirements of contract oversight and management, and review of project deliverables and final reports.	1991-051-00	M&E Statistical Support For Life Cycle Models	Hydrosystem / Predation
		2008-726-00	Project Compliance Monitoring	Project Management / Coordination
73.2	Maintain project and action level details for planning and reporting purposes. This approach will provide the most up-to-date information about the status of actions and projects being implemented.	None Identified		Project Management / Coordination
73.3	Maintain a comprehensive project tracking system or systems where relevant project information is contained in an accessible comprehensive data system. The data system will contain project level information that is needed for both implementation and effectiveness monitoring; justification, design and performance requirements the data system will include the set of minimum metrics and meta data for RM&E data design listed in Data Management Needs for Regional Project Tracking to Support Implementation and Effectiveness Monitoring (Katz et al. 2006).	2008-727-05	Regional Data Management Support and Coordination	Project Management / Coordination