

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

Based on AA/NOAA/NPCC RM&E Workgroup Assessments

May 2010

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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) including additional RM&E actions identified in the BiOp Adaptive Management Implementation Plan (AMIP) filed on September 15, 2009 and the Supplemental BiOp issued on May 20, 2010¹. 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 (NPCC). Each workgroup focused on one or more BiOp Strategies: 1) Hydro and Predation; 2) Estuary and Ocean; 3) Fish Population and Tributary Habitat; 4) Hatchery and Harvest; and 5) Regional Coordination and Data Management. The major tasks of these workgroups included a review of the BiOp and AMIP RM&E strategies/actions/subactions, the associated objectives, management questions and adaptive management needs, and the expectations regarding work and information needed for successful implementation. This was followed by assessments of the current coverage of BiOp RM&E needs under existing or planned AA programs/projects, identification of any gaps in coverage and recommendations on needed actions or projects to insure the BiOp RM&E needs were on track to efficient and successful implementation.

This May 2010 report is an update to the first assessment and report issued in June 2009. The June report and associated project inventory and gap assessments were a key component of a collaborative process in 2009 with Columbia Basin fish management agencies and tribes, and other state and federal agencies that are monitoring anadromous salmonids and/or their habitat. This collaborative process produced a Columbia Basin Anadromous Salmonid Monitoring Strategy (ASMS)² and identified additional monitoring projects or project expansions that contribute to BiOp critical viable salmonid population and hatchery and habitat action effectiveness monitoring. The BiOp components of the ASMS and associated projects identified to implement it have been incorporated into this recommendations report for RPA coverage. In addition to updates associated with the ASMS, the report addresses new RM&E actions identified in the BiOp AMIP and Supplemental BiOp. This update to the report also includes updates to inventory work, project-RPA linkage assessments, RPA coverage assessments, sensitivity analyses, progress in ongoing work, and adaptive management of the BiOp RM&E reflected in the 2010 – 2013 FCRPS BiOp Implementation Plan³.

The recommendations provided in this report identify 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. Action Agency funded projects that are being

¹ See <http://www.salmonrecovery.gov/ResearchReportsPublications.aspx>

² See <http://www.cbfwa.org/ams/FinalDocs.cfm>

³ See www.salmonrecovery.gov

implemented and that support specific RPA subactions are provided in Appendix A with web links for detailed information about the projects.

The AA, NOAA and NPCC Research, Monitoring and Evaluation (RM&E) Work Groups and an oversight Planning Group will continue to meet and oversee the progress of FCRPS BiOp RM&E Implementation working collaboratively with other federal, state, and tribal agencies. The primary objectives of these RM&E Workgroups are to:

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 is 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.

This report will be updated again in the future as needed.

Hydro and Predation RM&E Workgroup Assessments

The Hydro and Predation workgroup BiOp assessment is organized by RM&E strategies as specified in the BiOp. There are three BiOp 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 and recommendations 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).
- ***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 the 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. 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.
- ***Recommendation:*** Performance monitoring needs should be assessed to ensure appropriate stock coverage and an adequate number of fish are tagged. Power analyses should be used to estimate the number of fish that need to be tagged. 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 -- Monitor and evaluate salmonid dam survival rates for a subset of FCRPS projects. (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 (JSATS acoustic transmitters in these applications). The preferred experimental design has been selected. In 2010, under the AFEP program a new multi-dam experimental design is being implemented (SPE-06-2).
- **Recommendations:** None.

RPA 52.2 -- Monitor and evaluate juvenile salmonid in-river 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.

- **RM&E projects - coverage assessment:** No gap exists. PIT tag based survival estimates using tagged smolts entering and migrating through the FCRPS (Lower Granite Pool 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 2010 will augment the effort.
- **System survival monitoring.** The community has adopted the use of 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 Regional PIT tag Planning Work Group is addressing these matters. The first step has been to establish an inventory of PIT tag-based research and monitoring activities throughout

the Basin. As of February a preliminary inventory has been compiled as a database. However, managers need to clarify some points. It is not clear if estimates of D are required each year. Also, the desired precision levels associated with smolt survival have never been formally established. Thus, the scale of the required PIT-tagging effort, including acceptable population coverage has not been specified.

- **Recommendations:** NOAA (regional office and Science Center), under the auspices of the Federal RME Hydro Work Group, will propose analytical guidelines with respect to expected precision and population coverage. Specifically they should address the follows issues:
 - Specify precision criteria for system survival estimates.
 - Demonstrate the quantitative advantage of installing some spillway detectors at BON.
 - Demonstrate the advantage of doubling or tripling the estuary trawl effort.
 - Explain the seemingly incongruous smolt survival estimates observed from JD-BON in some years and implications. Is it an issue of small sample size, or bias associated with the sampling scheme at BON or JD?
 - D issues-
 - The COMPASS model will be used as an analytical tool for the Check-ins. Modelers are exploring relationships between D and assorted variables to build into the model. To better explore the relationship, SAR should be obtained on a weekly time-step over several years. How many more years of data are needed for what species is not clear at this juncture. This issue is important for long term PIT tag planning for Snake River salmonid populations.
 - Currently D is obtained somewhat opportunistically from tagged fish emanating upstream. Will this opportunity persist in supplying adequate sample sizes, and what is adequate?
 - These topics should be treated in the upcoming August Delayed Differential Mortality workshop that will focus on transportation effects.
 - Once these matters are clarified, the next step will be to improve coordination among various tagging projects, e.g., SMP, CSS, and NOAA, to ensure efficient allocation of tags, and adequacy of effort in terms of numbers released. This will be accomplished under the auspices of the regional Collaboration PIT tag planning group.

RPA 52.3 -- Monitor and evaluate adult salmonid system survival upstream through the FCRPS.

- **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. The Pacific Fishery Management Council's

Technical Advisory Committee (TAC) currently reports harvest information. The Colville and CRITFC harvest projects may improve these estimates. Stray rates are based on information from previous radio-telemetry studies, and/or new stream-based PIT detectors.

- **Recommendations:** To execute this RPA, stream-based PIT tag detectors are required at strategic locations. These locations should be identified in the regional PIT Tagging Plan. In addition, there is a need for inclusion of a description of analytical methods and precision requirements. The AA's need to determine how operation and maintenance of these systems will be funded. This effort needs to be coordinated with Habitat and Hatchery workgroups, since they will be relying on some stream-based detectors as well. Update with IP

RPA 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.

- **RM&E projects - coverage assessment:** Even though some tagging is underway and more is anticipated, a gap exists until the PIT Tag RME Plan is formulated. Until then the required numbers of tagged fish, and the specific stocks within each ESU have not yet been adequately specified. Funds have been allocated to initiate this effort (2008-724-00). 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 in terms of sample sizes and population coverage should be addressed in the upcoming regional PIT-tagging plan (RPA 52.6).

RPA 52.5 -- Assess the feasibility of PIT-tag marking of juvenile Snake River Sockeye Salmon for specific survival tracking of this ESU from the Stanley Basin to Lower Granite Dam and through the mainstem FCRPS projects.

- **RM&E projects - coverage assessment:** No gap exists. The Action Agencies funded this effort starting in 2009 (2008-724-00). Tagging will continue in 2010. This is a pilot study 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). Future needs should be ascertained after examining results from 2009 and 2010.

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

- **RM&E projects - coverage assessment:** A gap exists since efforts are underway to execute this in 2010. As a first step NOAA and the AA identified the need for a regional PIT-tagging plan. Population coverage and sample sizes need to be specified in that document, as well as analytical approaches and protocols. This will require input from the AA, NOAA, other federal agencies, as well as state and tribal agencies. A PIT tag planning sub-group has been formed to draft the plan and an initial inventory of PIT tagging and detection arrays. There is no specific single project dedicated to this effort.
- **Recommendations:** Fill gap by convening a regional PIT tag planning Work Group, specify sample size and population coverage needs with NOAA, AA, and other federal, state/tribal agencies input, and draft the plan. In addition, the Plan should treat detection limitations and needs for improved tag recovery coverage in tributaries, estuary, and at dams (e.g., spillways). Coordination among the other BiOp RM&E Work Group's is necessary.

RPA 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.

- **RM&E projects - coverage assessment:** No gap exists. An analysis is currently being conducted by Paulsen and The Colville Tribe and a report will be available in summer 2010. PIT tagged adults are used in the analysis. Harvest monitoring projects (Colville Tribes and CRITFC Accord projects) could provide improved harvest rate estimates, but TAC estimates are needed now.
- **Recommendations:** None.

RPA 52.8 – Monitoring adult passage counts is a cornerstone activity performed on an annual basis. Adult fish counting is typically performed 16 hours per day, during daylight hours, by either video or visual counting methods, at all of the Corps projects that pass fish. Adult counting should at a minimum continue as prescribed in Table 8 of the BiOp.

- **RM&E projects - coverage assessment:** The FCRPS COE dam fish counting program has been a long- term, consistent index of abundance with correlations among Snake dam

counts for steelhead and spring-summer Chinook of 0.98 +. The SRWG regional AFEP oversight group recently rated changing this program a low priority for CRFM funding. Night counting has occurred at times over the years to address specific question such as sockeye passage at LGR and to determine diel passage patterns by species. PIT tag counts at the key check in dams (BON, MCN, LGR) are used to estimate fallback and reascensions and as an independent measure of comparative conversion estimates. PIT based conversions are the basis for BiOp evaluation of adult performance standards.

- The accuracy and precision of the index counts have recently been questioned related to apparent discrepancies when counts at adjacent dams are compared. Differences in counts at dams can occur as a result of variations in the extent of navlock passage; fallback and reascension rates; nighttime passage rates; counter errors in species, number, and age class identification; and passage of overwintering fish early the following year. Environmental factors greatly influence the extent to which these factors occur at any given dam on any given day and are highly variable.
- Differences currently exist between the COE and upstream PUDs in the size limits for delineating jack that can lead to apparent discrepancies in adult counts. Making the determination of jack sized fish consistent through the region would help reduce these apparent discrepancies.
- **Recommendations:** The existing count program should to be evaluated for potential cost-effective methods to improve estimates and implemented if warranted. Methodologies to use existing data to adjust counts to improve accuracy should be explored (PIT based fallback and reascension rates at critical check-in dams, expected nighttime passage based on historic diel patterns of passage, adjustments for early upstream passage related to overwintering fish, etc). PIT conversion precision is currently being evaluated by BPA and NMFS. Installation of additional adult PIT tag detection systems at TDA and JDA to improve conversion estimates are being evaluated as part of the AMIP actions. These evaluations can potentially be used as an independent conversion estimate to compare with or correct adult ladder counts.

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 as population estimates

at LGR Dam. Smolt Monitoring Program (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 explore analytical methods, and recommend an approach that can be vetted in 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. However, whether the ESU and/or, population coverage and sample sizes are satisfactory needs clarification.
- **Recommendations:** Review the SMP to determine the extent to which population-specific (PIT tagged) data are needed to describe timing, or if ESU-level information is adequate.

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

- **RM&E projects - coverage assessment:** No gap exists. SMP monitoring of fish condition is an ongoing needed activity.
- **Recommendations:** NOAA will discuss fish sampling needs with the FPC, to determine if current handling rates are appropriate.

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. See coverage under RPAs 52.8 and 52.3.
- **Recommendations:** See recommendations under RPAs 52.8 and 52.3.

RPA 53.5 -- In addition to current operations (generally April 10 – August 31), 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. Research is completed and management is now using the

information to formulate a plan that describes operating guidelines. The plan is expected to be released in March 2010.

- **Recommendations:** None.

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 their 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 smolt 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. The AFEP regularly evaluates bypass performance as new systems are built or upgrades to existing facilities occur.
- **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. The 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. The newly adopted JSATS multi-dam survival study will also provide passage route distribution information.
- **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. The 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 toward 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.

- For the near-term, Pikeminnow efforts should be stabilizing, but other non-native fish species are being considered for additional study. Specific to avian studies, terns may require less basic research, but perhaps some level of general monitoring. Cormorants will likely continue to receive emphasis.
- **Recommendations:** The collective predation studies (fish, birds and mammals) should be reviewed as a complex of complementary research activities. The AA's should incorporate predation effects into the Comprehensive analysis, using information generated by the collective predation studies conducted up to that point in time. Results from those analyses may assist in revising research and monitoring objectives.

RPA 54.9 -- Investigate, evaluate and deploy alternative technologies and methodologies for fish passage and the RM&E Action.

- **RM&E projects - coverage assessment:** No gap exists. New passage technologies (e.g., SFO, TSW) 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, in that the PIT tagging Plan (under development) is addressing the adequacy of geographic coverage. 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. Poor estimates of steelhead harvest estimates in Zone 6 are suspected as a major factor. Increased effort in assessing accurate harvest rates is proposed and being implemented. Stream based systems are proposed for implementation at several tributaries and are continuing to be developed and tested in 2010/11. A feasibility study for detectors at The Dalles and John Day dams has been proposed.
- **Recommendations:** Strategically placed detectors need to be planned and implemented along with additional, targeted sampling of catch. NOAA will address

these topics in an issue paper addressing the needs, opportunities, limitations and potential for improving survival estimates that treats TDA and JDA dams, as well as major tributaries in Zone 6. This need should also be addressed in the PIT Tagging Plan.

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 -- 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 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. This study will be complete by 31 March 2010, providing a second year of information.
- **Recommendations:** None.

RPA 54.14 -- Investigate surface-flow outlets during wintertime as a means to provide safer fallback opportunity for over-wintering steelhead (needs 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 the frequency and sample size for acquiring estimates needs clarification for future years. This complements 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:** This issue should be taken up at the upcoming Delayed Differential Mortality Workshop to be held in August 2010. That activity should specify tagging needs (e.g., population coverage and N) to be incorporated into 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:** The upcoming Delayed Differential Mortality Workshop (August 2010) needs to synthesize the existing information and identify additional research needs. Since tagged fish used in most evaluations emanate from other projects upstream from LGR, tagging needs (N, populations) required for generating useful delayed mortality indices should be clarified and incorporated into 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.

- **RM&E projects - coverage assessment:** A gap currently exists since the prescribed activity has not yet occurred. However, actions are in place to comply. The AA, NPCC and NOAA are planning two different workshops in 2010. BPA and the Corps have the lead on this matter. One will focus on delayed effects associated with transportation, and the other will explore additional sources of latent mortality. The workshops will synthesize research results and identify future research needs and objectives.
- **Recommendations:** Execute the two workshops in 2010 and incorporate information into long-term planning.

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. In May 2010 a fall Chinook workshop was held to synthesize research information to date, and identify future research needs. Early life history studies and transport evaluations can be viewed in the context of a cohesive well-coordinated program.
- **Recommendations:** None.

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 which will be coordinated through the Regional Forum.

- **RM&E projects - coverage assessment:** No gap exists. A multi-year research study has been conducted by the University of Idaho, and the report has been published.
- **Recommendations:** The AA and NOAA should determine how this information can be incorporated into the life cycle analysis as part of the Comprehensive Analysis called for under the BiOp.

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. As part of this program new turbine designs are being formulated for use at Ice Harbor Dam.
- **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:** This topic should be a critical component of the regional PIT tagging Plan that is under development. The PIT Tag Working Group needs to ensure this topic gets thorough treatment in the plan.

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. JSATS, POST and Genetic markers are examples of new technologies being investigated for application in accordance with the BiOp.
- **Recommendations:** Coordinate JSATS and POST investigations to provide complementary information.

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 -- 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)

- **RM&E projects - coverage assessment:** No gap exists. Both JSATS 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. This is occurring through improved coordination led by the Corps and BPA.
- **Recommendations:** None.

RPA 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.

- **RM&E projects - coverage assessment:** One project (1998-014-00), Ocean survival of salmonids) is listed as supplying information relevant to this RPA. Among other things the study surveys predatory fish species off the mouth of the Columbia, but conducts no sampling in the estuary proper. NOAA incidentally catches of predatory fish in the estuary as part of their beach seine efforts. But systematic sampling targeting predatory fish is not in place. Predatory birds have, and continue to receive ample study in the estuary. On balance, fish predators in the estuary below Puget Island are not specifically targeted in current studies, but other predators, e.g. birds, are adequately investigated. Additionally, a Corps funded transport modeling project in 2008-2009, addressed avian and fish predator-related smolt mortality in the lower Columbia river to Astoria. Furthermore, both JSATS and POST provide smolt survival estimates through the estuary

and near ocean environments. These estimates characterize the magnitude of smolt loss in this zone and are useful context for evaluation predator impacts.

- **Recommendations:** It appears that there is substantial data being acquired in the estuary and plume to address elements in this RPA. It is not clear how predatory fish-related data in the estuary will be used by managers. Furthermore, the role of smaller pinnipeds as predators on smolts needs to be addressed as well. We recommend that as a first step, an issue paper be drafted that brings this RPA and the need and use of the requested data into sharper focus.

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.

RPA 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 out-migrating juvenile salmonids, as well as the effectiveness of the Caspian tern management plan.

- **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. This work is focused in the estuary and is funded jointly under AFEP and the FWP.
- **Recommendations:** None.

RPA 67-- The Action Agencies will monitor the cormorant population in the estuary and its impacts on out-migrating juvenile salmonids and develop and implement a management plan to decrease predation rates, if warranted.

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

RPA 68 -- The Action Agencies will monitor avian predator populations in the Mid-Columbia River and evaluate their impacts on out-migrating juvenile salmonids and develop and implement a management plan to decrease predations rates, if warranted.

- **RM&E projects - coverage assessment:** No gap exists. Several research objectives under contract AVS-W-03-01 investigate inland bird predation. The Corps and fishery

agencies and tribes have formed a work group to address issues associated with inland predation by birds.

- **Recommendations:** None.

RPA 69 – The Action Agencies will estimate overall sea lion abundance immediately below Bonneville Dam. (Initiate in FY 2007-2009 Projects), monitor the spatial and temporal distribution of sea lion predation attempts and estimate predation rates. (Initiate in FY 2007-2009 Projects), and monitor the effectiveness of deterrent actions (e.g., exclusion gates, acoustics, harassment and other measures) and their timing of application on spring runs of anadromous fish passing Bonneville Dam. (Initiate in FY 2007-2009 Projects)

- **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.

RPA 70 – The Action Agencies will continue to update and estimate the cumulative benefits of sustained removals of northern Pikeminnow since 1990. (Initiate in FY 2007-2009 Projects), Continue to evaluate if inter and intra compensation is occurring. (Initiate in FY 2007-2009 Projects), Evaluate the benefit of additional removals and resultant increase in exploitation rate's affect on reduction in predator mortality since the 2004 program incentive increase. (Initiate in FY 2007-2009 Projects), and develop a study plan to review, evaluate, and develop strategies to reduce non-indigenous piscivorous predation. (Initiate in FY 2007-2009 Projects)

- **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. A new project involving field work is expected to be initiated in the fall of 2010, and funds have been allocated. Plans are in place to address non-native species beyond Pikeminnow.
- **Recommendations:** None.

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Estuary and Ocean RM&E Workgroup Assessments

The Estuary/Ocean Research, Monitoring and Evaluation Workgroup (ERMEW) assessed the coverage of estuary/ocean RME Strategy 4 , RPAs 58-61.

General Findings

General findings include:

- None of the RPAs were complete and fully covered such that project work could be discontinued. On the other hand, no RPAs had zero project coverage.
- Most RPAs were either fully covered by ongoing projects or would be fully covered with additional work elements.
- There is an overarching need for synthesis of the collective information on many RPAs. This “roll-up” will be very relevant to BiOp reporting requirements under RPA 3. This is a high priority.
- Furthermore, the method to quantify the survival benefits of habitat restoration in the lower river and estuary will be applied and modified as needed under RPA 37. Assessment of survival benefits of habitat restoration must be quantified and scientifically-based to the extent possible.

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. In addition to the RPA-specific recommendations below, the ERMEW recommended that initiating a synthesis of estuary/ocean RME information is a high priority.

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

RPA 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.

RPA 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, and then design the monitoring effort to support it. AER2 to review the applicability of a life-cycle modeling approach.

RPA 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.

RPA 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)

RPA 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. This is a high priority.

RPA 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, if necessary. This is a high priority.

RPA 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.

RPA 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).

RPA 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.

- 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)

RPA 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. Note:

the reference sites are characterized by habitat conditions, e.g., vegetation, substrate, channel cross-section; the fish community and juvenile salmon density are monitoring at some of these sites.

- Recommendations: F&WP project 2003-011-00 needs to complete the reference site integration and provide a dissemination mechanism. The AA will assess whether the existing suite of reference sites is sufficient given the increase in the number of habitat restoration projects and the need for action effectiveness research for a subset of them.

RPA 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: Currently this RPA is covered with the existing level of monitoring. As additional types and intensities of actions are planned and implemented, there will be a need for additional action effectiveness monitoring and research. The action effectiveness research is being 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. There is concern that the four AER sites under project 2003-011-00 will not be sufficient to cover the breadth of restoration project types that will be implemented, e.g., pile structure removal. However, many of the BPA funded AER projects have ended or will be ending soon; more AER may be needed to fill the void, especially given the accelerated Habitat Restoration Program in the lower river and estuary.
- Recommendations: Develop additional action effectiveness monitoring and research as further types and intensity of actions are implemented. Make sure there's a regionally accepted program that synthesizes all AER in the estuary, something like AFEP project EST-02-P-04 is doing regarding cumulative effects in 2010/2011. An increase in the amount of action effectiveness research, either through an RFP or increases in scopes of work for existing projects or both needs to be evaluated annually. Instruct the Expert Regional Technical Group to the extent possible quantify the benefits of habitat restoration in the mainstem lower river and estuary.

RPA 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. This methodology will provide a synthesis of information from the AER efforts under RPA 60.2.
- Recommendations: Make sure the deliverables from this project are carried forward as regional products after the project ends in spring 2011. Regional periodic cumulative effects assessments are needed to understand if the restoration actions are having the

desired effects (actual timeframe will be dependent on number or restoration projects conducted annually).

Investigate Estuary/Ocean Critical Uncertainties (RPA 61)

RPA 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 BPA funded research projects; 1998-014-00, 2003-010-00, and 2005-001-00 to increase understanding of functional relationships in LCRE ecosystems supporting juvenile salmon and do periodic roll-ups to provide up-to-date, comprehensive summaries of the research for managers to use to make decisions.

RPA 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.

RPA 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.

RPA 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 (gray) | A | | B | C | D | E | | F | G | L | K | M | H | | I | |
| No Gap (white) | | | | | | | | | | | | | | | | |

^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. This is a high priority.

^E Gap in that estuarine ecosystem classification and associated maps will be for only 2 of 8 reaches. This is a high priority.

^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 started; the schedule call for it to commence in FY2010. The synthesis/roll-up is a high priority.

^I Ibid.

^K Currently this RPA is covered with the existing level of monitoring. As additional types and intensities of actions are planned and implemented, there will be a need for additional action effectiveness monitoring and research.

^L F&WP project 2003-011-00 needs to complete the reference site integration and provide a dissemination mechanism. The AA will assess whether the existing suite of reference sites is sufficient given the increase in the number of habitat restoration projects and the need for action effectiveness research for a subset of them.

^M Make sure the deliverables from this project are carried forward after the projects ends in spring 2011. Periodic cumulative effects assessments are needed to understand if the restoration actions are having the desired effects.

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Tributary Habitat and Fish Population Workgroup Assessments

The Tributary Habitat and Fish Population Workgroup assessed coverage under two BiOp RM&E Strategies: Strategy 1 – Monitor the Status of Fish Populations Related to FCRPS Actions (RPAs 50 and 51); and Strategy 3 – Tributary Habitat Research, Monitoring and Evaluation (RPAs 56 and 57). What follows is a summary of the Workgroup findings for each RPA subactions.

Priority Recommendations

After completing the assessments, 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.

Monitor 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.

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 recognizes that some hydro projects should increase their sampling effort to 24 hours. High precision/accuracy estimates of Snake Basin fall Chinook are currently provided by representative trapping at Lower Granite Dam.

- **Recommendation:** Assure 24 hour monitoring at Bonneville, McNary, and Lower Granite dams. Develop a systematic approach to tag adults at mainstem dams for population identification. The approach should identify the species and number of fish to be tagged, and the program should be long term and supported by an appropriate data-management structure in PTAGIS.

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 for steelhead and spring and summer migrating Chinook and that PTAGIS and SMP operate annually. The Tributary Habitat and Fish Population Workgroup notes that existing operations of mainstem fish bypass facilities and associated monitoring do not enable estimates of Snake River fall Chinook juvenile abundance. The Workgroup also noted that 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 for parr-to-smolt survival estimates.
- **Recommendation:** The workgroup recommends the testing of different methods to estimate Snake River fall Chinook juvenile production and more precise and accurate survival measurements.
- The Workgroup recommends increasing the number of natural origin Chinook and steelhead PIT tagged within all populations for estimating parr-to-smolt survivals.
- The Workgroup recommends that power analyses be conducted to estimate the number of fish that need to be tagged in each population to achieve a desired precision (based on the specific objective of the study). 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 a PIT tagging plan that will specify the numbers needed for hydro performance tracking). This tagging plan will also support monitoring and assessment 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 appendices in Columbia Basin Anadromous Fish Monitoring Strategy (CBAFMS)). 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 basins:
 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 Wenatchee, Entiat, and Methow systems to better estimate migrating timing, residence, and life-stage survivals (e.g., parr-smolt, SAR, etc.). Power analysis is needed to estimate the total number of fish to tag in each system.
 4. Estimate precision and accuracy of redd counts wherever these counts are used to estimate spawning escapements in the three Upper Columbia pilot basins. This work could be conducted within smaller watersheds within the three pilot 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 inventoried the current level of status monitoring of A and B-Run steelhead (see appendices in CBAFMS; Sharma 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 onto 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 the following:
 1. Maintain current contracts ISMES 19905500 and INPMEP 199107300. Contract 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 full parental genotyping to continue to collect adult and juvenile data for strategic locations in the basin or combined with ISMES 199005500.
 2. Fund full parental genotyping through at least one 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). Initially

establish/maintain remote PIT-tag interrogation systems near the mouths of the South Fork Clearwater River, and Lolo Creek populations and consider future installations in the Selway and Lochsa Rivers (part of the Clearwater MPG). As part of RPA 56.2, the interrogation system already exists near the mouth of the South Fork Salmon River population. 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. In addition, establish and maintain remote PIT-tag interrogation systems in the Imnaha River, Lower Grande Ronde River, and Joseph Creek to quantify the distribution, abundance, and productivity of steelhead within a subset of A-Run populations and validate absence of B-run fish.

5. Depending on the success of using PIT-tag interrogators in the South Fork Clearwater, Lolo Creek, mainstem Salmon, and the South Fork Salmon, additional PIT-tag interrogation systems may need to be added to the Selway and Lochsa systems so that a majority of the B-Run populations are monitored.

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 AA and NOAA participated in a collaborative process in 2009 with Columbia Basin fish management agencies and tribes, and other state and federal agencies that are monitoring anadromous salmonids and/or their habitat. The collaborative process produced a Columbia Basin Anadromous Salmonid Monitoring Strategy (ASMS)⁴ and identified additional monitoring projects or project expansions that contribute to BiOp critical viable salmonid population and hatchery and habitat action effectiveness monitoring. The BiOp components of the ASMS and associated projects identified to implement it have been incorporated into this recommendations report for RPA coverage. The Workgroup recommends that these BiOp fish population status monitoring projects should comply with the guidance document prepared by NOAA Fisheries (Crawford and Rumsey 2010).

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 recommendations to fill gaps in existing Chinook and steelhead population status monitoring programs. The workgroup recommends that the population status

⁴ See www.cbfwa.org

monitoring programs follow NOAA Guidance for sampling and response design (NOAA Guidance document is scheduled for completion in 2010).

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

| MPG | Status/Trend Contract No. | Recommendations |
|-----------------------------------|---|---|
| Snake River Steelhead DPS | | |
| Lower Snake | 200205300, 201004200, 201002600, 201002800 | <p>PIT tag juvenile steelhead in the Tucannon to support monitoring the effectiveness of steelhead supplementation in the Tucannon.</p> <p>Fully fund the steelhead monitoring program in Asotin Creek.</p> <p>Use mark-recapture techniques to estimate pre-spawn survival.</p> <p>Conduct redd surveys in all Major Spawning Areas (MSAs) and minor Spawning Areas (mSAs) in Asotin and Tucannon.</p> |
| Grande Ronde | 199800702, 199202604, 200708300, 200301700, 199703000 | <p>Extend trapping period at Lostine weir and install second screw trap on Minam River.</p> <p>Fund ODFW 2007-09 proposal 200733700.</p> <p>Expand proposal 199703000 to quantify adult steelhead escapement in Joseph Creek.</p> <p>Add PIT-tag interrogation system in the lower Grande Ronde (as low in the system as possible) and in Joseph Creek.</p> |
| Imnaha | 199701501, 200301700 | <p>Extend trapping period to enable estimate of juvenile production.</p> <p>Add PIT tag interrogation system in the lower Imnaha (as low in the system as possible).</p> |
| Clearwater | ISMES 19905500, INPMEP 199107300, ISS 198909800 | Fund full parental genotyping through at least one funding cycle to complete DNA objectives. |
| Salmon | ISMES 19905500, INPMEP 199107300, ISS 198909800 | Fund full parental genotyping through at least one funding cycle to complete DNA objectives. |
| Mid Columbia Steelhead DPS | | |
| John Day | 199801600, 200301700 | <p>Expand the work to increase density of sampling sites (using GRTS master sample list) to improve population-scale resolution for VSP in the lower and upper mainstem.</p> <p>Develop proportion hatchery origin spawners (pHOS) and DNA baseline in the MPG, including analysis of the backlog of DNA samples.</p> |
| Yakima | 199603501, 199506325 | Conduct additional DNA evaluations at |

| MPG | Status/Trend Contract No. | Recommendations |
|-------------------------------------|----------------------------------|---|
| | | Prosser Dam and all mainstem Yakima tributaries to accurately parse out adult steelhead spawners and juvenile productivity. For the Toppenish Population, conduct complete census surveys for redds in all MSAs and mSAs. Use GRTS to sample for redds outside MSAs and mSAs in Toppenish Creek. |
| 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 recommendations. |
| Snake River Chinook ESU | | |
| Lower Snake | 201004200 | Increase the number of PIT tag juvenile Chinook in the Tucannon. |

2. Table 2 identifies one or more populations per MPG that should be monitored for fish status and trend (fish in-fish out; see appendices CBAFMS). 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 FCRPS 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, steelhead, sockeye salmon, and coho salmon 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 |
| | | Pahsimeroi | No | Has a large habitat gap (41%) |

| ESU/DPS | MPG | Population | Has Current Fish Population Monitoring | Comments |
|-------------------------------|---------------------|--------------------|--|---|
| | | 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%). Could be a possible IMW. |
| | | 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 |
| Snake River Fall Chinook | | | Yes | RRS and productivity monitoring required in RPA 64 and 65. |
| Lower Columbia Chinook | Gorge | Hood | Yes | |
| <i>Steelhead</i> | | | | |
| Snake River Steelhead | Clearwater | Lolo Creek | Yes | Has a large habitat gap (12%). Could be a possible IMW. |
| | Salmon | Lemhi River | Yes | Required in RPA 50.4. |
| | | South Fork | No | Required in RPA 50.4. |
| | Lower Snake | Asotin | Yes | Has a 4% gap and is a non-supplemented population with an existing IMW. |
| | Grande Ronde | Upper Grande Ronde | Yes | Has largest habitat gap (4%). Could be a possible IMW. |
| | 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%) |

| ESU/DPS | MPG | Population | Has Current Fish Population Monitoring | Comments |
|--------------------------|---------------------|------------------------------------|--|---|
| | | Fifteen Mile | No | Has winter-run steelhead |
| | Yakima | Toppenish | Yes | Monitoring at mouth of Toppenish and Prosser Dam (possible IMW) |
| | John Day | Lower Mainstem | Yes | Required in RPA 50.4 (use rotating panel design) |
| | | North Fork | Yes | Required in RPA 50.4 (use rotating panel design) |
| | | Upper Mainstem | Yes | Required in RPA 50.4 (use rotating panel design) |
| | | Middle Fork | Yes | Required in RPA 50.4 (IMW) |
| | South Fork | Yes | Required in RPA 50.4 (IMW) | |
| Umatilla/Walla Walla | Umatilla | Yes | Has current monitoring | |
| Lower Columbia Steelhead | Gorge | Upper Gorge WA (Wind and Hamilton) | Has historic data | Non-supplemented population with both winter and summer life history types and could be a possible IMW. |
| Coho Salmon | | | | |
| Lower Columbia Coho | Gorge | Upper Gorge WA (Wind and Hamilton) | No | |
| Sockeye Salmon | | | | |
| Snake River Sockeye | Snake River Sockeye | Red Fish Lake | Yes | |

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. Recently, a simulation

exercise was completed that examined how the precision and accuracy of estimation of the proportion of hatchery-origin spawning escapement is influenced by marking fraction, sampling rate, true proportion of hatchery-origin escapement, total escapement, and spawner inputs from multiple hatcheries (Hinrichsen and Sharma 2010⁵). The key finding is that using the same marking fraction of 1.0 for all the input hatcheries minimizes the bias and maximizes the precision of the estimate of the proportion of hatchery-origin spawners (pHOS). When there are spawner inputs from multiple hatcheries and different marking fractions are used at different hatcheries, then accuracy and precision of the pHOS estimator depends on estimates of escapement from each input hatchery. In this case, accuracy and precision of pHOS will be highest when 100% of marked spawners are given unique tags that identify hatchery of origin (e.g., coded-wire tags).

- **Recommendation (Implement as soon as possible):** The workgroup recommends, based on technical and logistical reasons and current sampling rates, that 100% of all hatchery fish should be marked to meet VSP, hatchery, and habitat action effectiveness evaluation needs identified under several RPAs and regional recovery plans.⁶ Based on the simulation exercise by Hinrichsen and Sharma (2010)⁷, it is apparent that there either needs to be 100% marking of hatchery fish to meet the multiple objectives of marking hatchery fish (see below), or an increase in the sampling rate if 100% marking is not implemented. The effort to mark 100% of the hatchery fish is much more feasible than increasing the sampling rate.
- Marking hatchery fish is important for estimating the following:
 - pHOS (proportion hatchery origin spawners)
 - pNOB (proportion natural origin broodstock)
 - Escapement of NOF (natural origin fish)
 - stray rates (out of population and MPG)
- The workgroup believes that adipose fin clipping is the most cost efficient and universally accepted mark for hatchery fish and will be the most effective in meeting the needs of managers in estimating escapement, strays, and managing hatchery fish within the hatchery and natural environments. However, the workgroup understands that the marking of fish is a complex

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⁶ The NOAA Fisheries RM&E Guidance (Crawford and Rumsey, draft) states in Section 5.2.3 that, *The quality of adult abundance information for naturally reared salmon and steelhead is questionable without knowing the contribution of hatchery fish to the spawning grounds. One hundred percent marking of hatchery salmon combined with systematic spawning ground surveys in natural areas and near hatcheries likely to incur hatchery straying will allow for more accurate information. Evaluation of hatchery contributions should be conducted in such a manner as to provide an unbiased sample. Rivers where this cannot be accomplished will have difficulty showing that naturally produced adults are increasing. In those cases where a portion of the hatchery fish are needed for supplementation an internal CWT should be used to insure detection at counting weirs, fisheries, and spawning ground surveys.*

⁷ Hinrichsen, R.A., and R. Sharma. 2010. The precision and accuracy of estimates of the proportion of hatchery-origin escapement. Draft Report, May 27, 2010, 52 pages. <http://www.pnamp.org/node/2904>

management process subject to existing legal forums and conflicting management objectives, some of which may be compromised with fin-clip marking. There are a number of internal and external methods besides adipose fin-clipping that could be used to distinguish hatchery-origin fish, e.g., CWT, PIT-tag, visible implant elastomer (VIE), and otolith thermal marking. These marking methods have varying costs, ease of implementation/detection, and effectiveness relative to management needs. Therefore, the workgroup recommends that alternative external and internal marks and marking rates can be used provided they generate the necessary information needed to assess VSP and habitat and hatchery effectiveness called for under the BiOp and Columbia Basin Recovery Plans. Given the potential problems and shortcomings in effectiveness of alternative marks, the workgroup recommends alternative marks and marking rates be considered only for conservation and safety-net hatchery programs and that other hatchery programs mark all fish with adipose fin clips. All marks need to be coordinated through RMIS and other regional efforts so that all field managers will know what to look for during spawning surveys.

- For determining stray rates (out of population and MPG), it is necessary to have each hatchery program institute unique marking (e.g., PBT, CWT, PIT, and otolith).

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

- **RM&E projects - coverage assessment:**
- Current assessment and reporting is not consistent throughout the Columbia Basin. Because of these inconsistencies and lack of documentation, it is difficult to compile and analyze data sets among regions.
- 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 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, metadata guidelines, and data exchange protocols in coordination with PNAMP and other fishery co-managers.
 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:** Work is ongoing through BPA contracts, PNAMP initiatives, and data management RPAs (71 and 72); however, not all entities, contractors, and co-managers possess adequate infrastructure or staffing to enable web assessable data.
- **Recommendation:** Implement the recommendations identified under RPAs 71 and 72.

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 RIOG, PNAMP, and NED, and through Action Agency contracts, PNAMP initiatives, and data management RPAs 71 and 72. In addition, support and participation is being provided in the regional collaboration process for development of a Columbia Basin-wide forum to develop an RM&E strategy
- **Recommendation:** The Workgroup has no recommendation for this RPA. Collaboration in these areas is taking place under the basin-wide strategy for RM&E.

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

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

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 (habitat impairments) 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 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 appendices in CBAFMS). 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, use the results from the Wenatchee and Entiat pilot studies to develop the habitat status and trend monitoring program for the Methow. Habitat status and trend monitoring in the Methow Basin should be implemented 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 notes that this work is ongoing with AA participation in PNAMP and Recovery Planning efforts. The AA and NOAA also participated in a collaborative process in 2009 with Columbia Basin fish management agencies and tribes, and other state and federal agencies that are monitoring anadromous salmonids and/or their habitat. The collaborative process produced a Columbia Basin Anadromous Salmonid Monitoring Strategy (ASMS)⁸ and identified additional monitoring projects or project expansions that contribute to BiOp critical viable salmonid population and hatchery and habitat action effectiveness monitoring. The BiOp components of the ASMS and associated projects identified to implement it have been incorporated into this recommendations report for RPA coverage. As a part of this strategy to meet RPA 56.3, RPA 57, and RPA 3 and the need to characterize stream and fish responses to watershed restoration and/or management actions, the AA have committed to include habitat status monitoring in at least one population within each steelhead and Chinook MPG.
- **Recommendation:** The Workgroup recommends the following:
 1. 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 FCRPS BiOp and have, or will have, fish in-fish out monitoring (identified in RPA 50.6). This information will help evaluate expected benefits of habitat actions. At a minimum, habitat monitoring should focus on measuring the metrics associated with the habitat impairments identified in the table below. Local biologists identified these impairments as factors that potentially limit population VSP

⁸ See www.cbfwa.org

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 should be included in the core set of metrics.

2. 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 watershed-scale monitoring will be generated based on IMW analyses and previous BiOp workgroup implementation plans. Those metrics and needs were reviewed during a Workshop held in March 2010. 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).
3. Use habitat status and trend monitoring to characterize stream responses to watershed restoration and/or management actions. Assess the status relative to watershed condition objectives to identify and prioritize future management actions. Coordinate with PNAMP, CBFWA, and others to ensure protocols are consistent. Coordinate, integrate, and collaborate with other on-going and existing efforts (IMWs, ISEMP, etc.).
4. Collaborate with agencies performing projects that are supporting the watershed level habitat monitoring identified in Table 3 to implement the preliminary recommendations in the report “Tributary Habitat Monitoring at the Watershed or Population Scale: Preliminary Recommendations for Standardized Fish Habitat Monitoring in the Columbia Basin; 2010 draft” <http://www.salmonrecovery.gov/ResearchReportsPublications.aspx> The preliminary recommendations in this report should be the focus of a workshop with monitoring agencies. The workshop should review and refine the recommendations and agree on consistent protocols and training of monitoring crews across these strategic watersheds. This coordination and training is critical to ensure the results of these monitoring projects can be combined effectively in the development of relationships and models under RPA 57.5 and needed assessments in the future under RPA 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 Salmon | South Fork | Yes | Water quality (metals); Obstructions; Sediment; Pools; | Required in RPA 56.2 |

| ESU/DPS | MPG | Population | Has Current Habitat Monitoring | Habitat Impairments Identified by Local Biologists | Comments | |
|---------|-------------------------------|--------------------|--|--|---|----------------------|
| | | | | Substrate | | |
| | Middle Fork Salmon | Big Creek | No | 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 | No | Entrainment; Obstructions; Flow; Temperature | Has a large habitat gap (41%) | |
| | | Yankee Fork | No | Flow; Obstructions; Habitat diversity; Water quality; Bank stability | Has a large habitat gap (30%) | |
| | Lower Snake | Tucannon | No | Obstructions; LWD; Temperature; Turbidity; Flow; Riparian/Off-Channel habitat | Only pop with habitat gap (17%) | |
| | Grande Ronde/Imnaha | Upper Grande Ronde | Some water quality and sediment monitoring | Flow; Habitat diversity; Obstructions; Riparian/Off-Channel habitat; Water quality; Sediment | Has large habitat gap (23%) | |
| | | Catherine Creek | Some water quality and sediment monitoring | 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 | | | No | Obstructions; Sediment; | Required in RPA 56.2 | |

| ESU/DPS | MPG | Population | Has Current Habitat Monitoring | Habitat Impairments Identified by Local Biologists | Comments |
|------------------------------|--------------|--------------------|--------------------------------|---|--|
| | | | | Temperature; Flow; Habitat quantity; Riparian/Off-Channel habitat | |
| Snake River Fall Chinook | Snake River | Mainstem | No | Flows; Water Quality (Temperature and Pollution); Spawning habitat. | |
| Lower Columbia River Chinook | Gorge | Hood | No | Water Quality (Pollution and Turbidity); Channel Complexity; Riparian and Off-Channel Habitat | |
| Steelhead | | | | | |
| Snake River Steelhead | Clearwater | Lolo Creek | No | Obstructions; Habitat diversity; LWD; Riparian/Off-Channel habitat; Sediment; Temperature | Has a large habitat gap (12%). (possible IMW) |
| | 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 | Asotin | No | Obstructions; LWD; Temperature; Turbidity; Flow; Riparian/Off-Channel habitat | Coordinated with existing NOAA IMW. Has large habitat gap (4%) |
| | Grande Ronde | Upper Grande Ronde | No | Flow; Habitat diversity; Obstructions; Riparian/Off-Channel habitat; Water quality; Sediment; Temperature | Has largest habitat gap (4%) (possible IMW) |
| | Imnaha | Imnaha | No | Obstructions; Flows; Excessive nutrients; Sediment; Temperature | Only population in MPG |

| ESU/DPS | MPG | Population | Has Current Habitat Monitoring | Habitat Impairments Identified by Local Biologists | Comments |
|---------------------------|------------------|-----------------|--------------------------------|---|--|
| 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 | No | Habitat diversity; Riparian/Off-Channel habitat; Flow; Obstructions; Sediment; Temperature; Nutrients | Has largest habitat gap (4%) |
| | | Fifteen Mile | No | Flow; Temperature; Riparian/Off-Channel habitat; Sediment; Habitat diversity | Has winter-run steelhead |
| | Yakima | Toppenish | No | Flow; Obstructions; Temperature; Riparian/Off-Channel habitat | Has some fish in-fish out monitoring at watershed scale (possible IMW) |
| | John Day | Lower Mainstem | Yes | Habitat diversity; Temperature | Required in RPA 56.2 |
| | | North Fork | Yes | Habitat diversity; | Required in |

| ESU/DPS | MPG | Population | Has Current Habitat Monitoring | Habitat Impairments Identified by Local Biologists | Comments |
|--------------------------------|----------------------|------------------------------------|--------------------------------|---|--|
| | | | | Temperature | 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 |
| Lower Columbia River Steelhead | Gorge | Wind | Yes (but discontinued in 2007) | Complexity; Passage | Has some fish in-fish out monitoring at watershed scale (possible IMW) |
| Coho Salmon | | | | | |
| Lower Columbia River Coho | Gorge | Upper Gorge WA (Wind and Hamilton) | Yes (but discontinued in 2007) | Complexity, Passage, | |

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.

Hatchery and Harvest RM&E Workgroup Assessments

The Hatchery and Harvest Workgroup assessed coverage under two BiOp RM&E Strategies: Strategy 5 – Harvest Research, Monitoring and Evaluation (RPA 62); and Strategy 6 – Hatchery Research, Monitoring and Evaluation (RPA 64, 64, and 65). 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, 63.2 (for Methow Steelhead), 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 (e.g., 2008-502) currently address this RPA.
- ***Recommendation:*** The Workgroup offers no recommendations 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 the existing Colville Confederated Tribes project (2007-249-000) and SAFE project (Youngs Bay; 1993-060-000) currently address this RPA. Selective fishing methods will vary by habitat type and fishing group. Testing of unique methods or new areas would be prudent; alternative selective gear types have not been tested where mixed stock fisheries occur.
- ***Recommendation:*** Support small scale feasibility study of selective gear types for fisheries where mixed stock fisheries occur (e.g., Snake River Basin).

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 (2007-249-000), which is evaluating specific capture methods. However, there are other types of fisheries or methods that should be evaluated.
- **Recommendation (HIGH PRIORITY):** 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 estimate on effort/cost 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 benefit from individually coded tag studies.

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, for several management questions, the current marking level and effort to recapture tagged fish in the ocean, river fisheries, and on spawning grounds is inadequate. The timing of reporting CWT information also needs improvement.
- **Recommendation:** The workgroup recommends that a target of at least 20% of the spawning escapement be sampled (see Hankin et al. 2005)⁹.
- Estimation of sampling rate in the ocean and river fisheries should be further evaluated and identify steps for improvement if necessary. Increasing the tagging rate of hatchery fish would also increase the ability to understand the metrics above (according to RPA 50.7).
- Investigate ways to reduce the lag time and back log between CWT collection and availability of information.

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

- **RM&E projects - coverage assessment:** This is addressed by the recommendations proposed under RPA 50.5. The CRITFC project (2009-005-00) also addresses this RPA.

⁹ 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.

- **Recommendation:** Perform feasibility study for B-run steelhead under RPA 50.5 in coordination with CRTIFC project 2009-005-00.

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 (summarized in Table 4 below).
- The workgroup recognizes that to quantify the effects that safety-net and conservation programs have on the viability and recovery of target populations, additional analyses may need to be employed beyond just monitoring VSP parameters (primarily for conservation programs).
- The workgroup focused on monitoring aspects of hatchery actions that are summarized in Table 4. The HGMPs that are currently in development will refine the monitoring needed for each program, so the recommendations below should be considered interim.
- **Recommendation:** To determine the effect of safety-net and conservation hatcheries on viability and recovery, the workgroup recommends the monitoring of VSP parameters in treatment and reference populations.
- Implement BiOp critical hatchery effectiveness monitoring that is a component of the Columbia Basin Anadromous Fish Monitoring Strategy. Facilitate the formation of a regional workgroup process to implement and further refine regionally based hatchery effectiveness monitoring. This strategy will further inform the monitoring required in individual HGMPs and will help ensure the monitoring will be coordinated to address the regional hatchery effectiveness questions. The workgroup's recommendations in Table 4 follow the recommendations of the ad-hoc supplementation work group (AHSWG; Beasley et al. 2008).¹⁰ In addition, all hatchery programs funded by the AA should be conducting a base level of implementation and compliance monitoring as recommended by the AHSWG.

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 and Recommendations |
|---------------------|---|---|
| Snake River sockeye | Continue to fund the safety net program to achieve the interim goal | Current programs cover this action. BPA Umbrella Project #200740200; |

¹⁰ Beasley C.A, B.A. Berejikian, R.W. Carmichael, D.E. Fast, M.J. Ford, P.F. Galbreath J.A. Hesse, L.L. McDonald, A.R. Murdoch, C.M. Peven, and D.A. Venditti). 2008. Recommendations for Broad Scale Monitoring to Evaluate the Effects of Hatchery Supplementation on the Fitness of Natural Salmon and Steelhead Populations. Final Report of the Ad Hoc Supplementation Monitoring and Evaluation Workgroup (AHSWG). 82 pgs. (<http://www.cbfwa.org/csmep/web/documents/general/Documents/FINAL%20REPORT%20AHSWG.pdf>)

| Population | Description/Action | RPA Coverage Status and Recommendations |
|------------|---|---|
| | <p>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</p> | <p>Contracts: <u>40909</u> (Shoshone-Bannock Tribes), <u>40175</u> (NOAA Captive Brood), <u>39681</u> (ODFW Smolt Rearing), <u>37981</u> (IDFG Captive Brood), <u>35436</u> (Facility Acquisition).</p> <p>The strategies that were developed through the collaborative RM&E process in fall, 2009, do not specifically relate to this action. This population was not addressed within the AHSWG for trend analysis.</p> <p>Performance measures for abundance and productivity, would be:</p> <ul style="list-style-type: none"> • Adult escapement to tributary • Spawner abundance • Index of juvenile abundance • Juvenile emigrant abundance • Pre-spawn mortality • Juvenile survival to first mainstem dam • Post release survival <p>For spatial structure and diversity:</p> <ul style="list-style-type: none"> • Adult spawner spatial distribution • Genetic diversity |
| | <p>Fund further expansion of the sockeye program to increase total smolt releases to between 500,000 and 1million fish.</p> | <p>Current programs cover this action. BPA Umbrella Project #<u>200740200</u>; Contracts: <u>40909</u> (Shoshone-Bannock Tribes), <u>40175</u> (NOAA Captive Brood), <u>39681</u> (ODFW Smolt Rearing), <u>37981</u> (IDFG Captive Brood), <u>35436</u> (Facility Acquisition).</p> <p>The strategies that were developed through the collaborative RM&E process in fall, 2009, are consistent with this action.</p> |

| Population | Description/Action | RPA Coverage Status and Recommendations |
|--|--|---|
| | <p>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.</p> | <ul style="list-style-type: none"> • Adult escapement to tributary • Spawner abundance • Index of juvenile abundance • Juvenile emigrant abundance • Pre-spawn mortality • Juvenile survival to first mainstem dam • Post release survival <p>For spatial structure and diversity:</p> <ul style="list-style-type: none"> • Adult spawner spatial distribution • Genetic diversity <p>Current programs cover this action. Current programs cover this action. . BPA Umbrella Project #200740200; Contracts: <u>40909</u> (Shoshone-Bannock Tribes), <u>40175</u> (NOAA Captive Brood), <u>39681</u> (ODFW Smolt Rearing), <u>37981</u> (IDFG Captive Brood), <u>35436</u> (Facility Acquisition).</p> <p>The strategies that were developed through the collaborative RM&E process in fall, 2009 are consistent with this action.</p> <p>This population was not addressed within the AHSWG for trend analysis.</p> <p>Performance measures for abundance and productivity, would be:</p> <ul style="list-style-type: none"> • Adult escapement to tributary • Spawner abundance • Pre-spawn mortality |
| 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 | <p>Current programs cover this action: VSP 200205300, LSRCP M&E WDFW; HATCHERY LSRCP M&E WDFW 200001900.</p> <p>The strategies that were developed through the collaborative RM&E process in fall, 2009, are consistent with this action.</p> |

| Population | Description/Action | RPA Coverage Status and Recommendations |
|--|--|--|
| | natural spawners comprised of hatchery-origin fish. | <p>The AHSWG recommended this population as a candidate for trend analysis.</p> <p>Performance measures for abundance and productivity, would be:</p> <ul style="list-style-type: none"> • Pre-spawn mortality • Adult escapement to tributary • Spawner abundance • Hatchery fraction • Fish per redd • Recruit per spawner • Index of juvenile abundance • Juvenile emigrant abundance • Juvenile survival to first mainstem dam • Post release survival • SAR <p>For spatial structure and diversity:</p> <ul style="list-style-type: none"> • Adult spawner spatial distribution • Proportion of non-target hatchery spawners in the target population. • Genetic diversity • Life history characteristics (e.g., age structure, age at return, size at return, etc.) |
| 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. | <p>Current programs cover this action; VSP: 199202604, 199800703, 200708300 (LSRCP M&E ODFW, LSRCP M&E NPT), 198909600,</p> <p>HATCHERY: 199800704, 199602000 (LSRCP M&E ODFW,</p> <p>The strategies that were developed through the collaborative RM&E process in fall, 2009, are consistent with this action.</p> <p>The strategies that were developed through the collaborative RM&E process in fall, 2009, are consistent with this action.</p> <p>The AHSWG recommended this population as a candidate for trend analysis.</p> |

| Population | Description/Action | RPA Coverage Status and Recommendations |
|---|--|--|
| | | <p>Performance measures for <i>abundance and productivity</i>, would be:</p> <ul style="list-style-type: none"> • Pre-spawn mortality • Adult escapement to tributary • Spawner abundance • Hatchery fraction • Fish per redd • Recruit per spawner • Index of juvenile abundance • Juvenile emigrant abundance • Juvenile survival to first mainstem dam • Progeny per parent • Post release survival • SAR <p>For <i>spatial structure and diversity</i>:</p> <ul style="list-style-type: none"> • Adult spawner spatial distribution • Proportion of non-target hatchery spawners in the target population. • Genetic diversity • Life history characteristics (e.g., age structure, age at return, size at return, etc.) |
| 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. | <p>Current programs cover this action; VSP: 198909800, 199604300, 199703000, 200301700, (LSRCP M&E NPT), 198909600.</p> <p>HATCHERY: 199604300.</p> <p>The strategies that were developed through the collaborative RM&E process in fall, 2009, are consistent with this action.</p> <p>The AHSWG recommended this population as a candidate for trend analysis.</p> <p>Performance measures for <i>abundance and productivity</i>, would be:</p> <ul style="list-style-type: none"> • Pre-spawn mortality • Adult escapement to tributary |

| Population | Description/Action | RPA Coverage Status and Recommendations |
|---|---|---|
| | | <ul style="list-style-type: none"> • Spawner abundance • Hatchery fraction • Fish per redd • Recruit per spawner • Index of juvenile abundance • Juvenile emigrant abundance • Juvenile survival to first mainstem dam • Progeny per parent • Post release survival • SAR <p>For spatial structure and diversity:</p> <ul style="list-style-type: none"> • Adult spawner spatial distribution • Proportion of non-target hatchery spawners in the target population. • Genetic diversity • Life history characteristics (e.g., age structure, age at return, size at return, etc.) |
| <p>East Fork and West Fork Yankee Fork Salmon River</p> | <p>Fund the experimental captive rearing program for East Fork and West Fork Yankee Fork Salmon River (until phased out by IDFG).</p> | <p>Current programs cover this action; 200740300</p> <p>The strategies that were developed through the collaborative RM&E process in fall, 2009, do not specifically relate to this action.</p> <p>The AHSWG recommended this population as a candidate for trend analysis.</p> <p>Performance measures for abundance and productivity, would be:</p> <ul style="list-style-type: none"> • Pre-spawn mortality • Recruit per spawner • Index of juvenile abundance • Juvenile emigrant abundance • Juvenile survival to first mainstem dam • Progeny per parent • Post release survival • SAR |

| Population | Description/Action | RPA Coverage Status and Recommendations |
|---------------------------|---|--|
| | | <p>For <i>spatial structure and diversity</i>:</p> <ul style="list-style-type: none"> • Adult spawner spatial distribution • Proportion of non-target hatchery spawners in the target population. • Genetic diversity • Life history characteristics (e.g., age structure, age at return, size at return, etc.) |
| Lostine and Imnaha rivers | <p>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.</p> | <p>Current programs cover this action; VSP: 199202604, 199800702, 200713200, 200740400, 199800703, 200708300 (LSRCP M&E ODFW, LSRCP M&E NPT), 200206000, 198909600, 199701501</p> <p>HATCHERY: 199800702, 200740400 199602000 (LSRCP M&E ODFW, LSRCP M&E NPT), 200206000,</p> <p>The strategies that were developed through the collaborative RM&E process in fall, 2009, are consistent with this action.</p> <p>The AHSWG recommended this population as a candidate for trend analysis.</p> <p>Performance measures for <i>abundance and productivity</i>, would be:</p> <ul style="list-style-type: none"> • Pre-spawn mortality • Adult escapement to tributary • Spawner abundance • Hatchery fraction • Fish per redd • Recruit per spawner • Index of juvenile abundance • Juvenile emigrant abundance • Juvenile survival to first mainstem dam • Progeny per parent • Post release survival • SAR <p>For <i>spatial structure and diversity</i>:</p> <ul style="list-style-type: none"> • Adult spawner spatial |

| Population | Description/Action | RPA Coverage Status and Recommendations |
|------------------------------|---|--|
| | | distribution <ul style="list-style-type: none"> • Proportion of non-target hatchery spawners in the target population. • Genetic diversity • Life history characteristics (e.g., age structure, age at return, size at return, etc.) |
| 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. The strategies that were developed through the collaborative RM&E process in fall, 2009, are consistent with this action. Performance measures for abundance and productivity , would be: <ul style="list-style-type: none"> • Pre-spawn mortality • Adult escapement to tributary • Spawner abundance • Hatchery fraction • Recruit per spawner • Index of juvenile abundance • Juvenile emigrant abundance • Juvenile survival to first mainstem dam • Post release survival • SAR For spatial structure and diversity : <ul style="list-style-type: none"> • Adult spawner spatial distribution • Proportion of non-target hatchery spawners in the target population. • Genetic diversity • Life history characteristics (e.g., age structure, age at return, size at return, etc.) |
| 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 | Current program is funded through LSRCF, and IDFG is the hatchery operator. The strategies that were developed through the collaborative RM&E process in fall, 2009, are consistent |

| Population | Description/Action | RPA Coverage Status and Recommendations |
|-------------------------------|--|--|
| | <p>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 composition of natural spawners comprised of hatchery origin fish.</p> | <p>with this action.</p> <p>The AHSWG recommended this population not be a candidate for trend analysis.</p> <p>Performance measures for abundance and productivity, would be:</p> <ul style="list-style-type: none"> • Pre-spawn mortality • Adult escapement to tributary • Spawner abundance • Hatchery fraction • Recruit per spawner • Index of juvenile abundance • Juvenile emigrant abundance • Juvenile survival to first mainstem dam • Post release survival • SAR <p>For spatial structure and diversity:</p> <ul style="list-style-type: none"> • Adult spawner spatial distribution • Proportion of non-target hatchery spawners in the target population. • Genetic diversity • Life history characteristics (e.g., age structure, age at return, size at return, etc.) |
| Upper Columbia Spring Chinook | <p>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</p> | <p>Currently, there is no gap for this RPA – Project 200302300</p> <p>The strategies that were developed through the collaborative RM&E process in fall, 2009, do not specifically relate to this action. However, this action is consistent with the Upper Columbia spring Chinook salmon and steelhead recovery plan.</p> <p>The AHSWG recommended this population not be a candidate for trend analysis. However, the other populations within the ESU are candidates.</p> <p>Performance measures for</p> |

| Population | Description/Action | RPA Coverage Status and Recommendations |
|--------------------------|---|--|
| | of within ESU broodstock from the Methow Basin. | <p>abundance and productivity, would be:</p> <ul style="list-style-type: none"> • Pre-spawn mortality • Adult escapement to tributary • Spawner abundance • Hatchery fraction • Recruit per spawner • Index of juvenile abundance • Juvenile emigrant abundance • Juvenile survival to first mainstem dam • Post release survival • SAR <p>For spatial structure and diversity:</p> <ul style="list-style-type: none"> • Adult spawner spatial distribution • Proportion of non-target hatchery spawners in the target population. • Genetic diversity • Life history characteristics (e.g., age structure, age at return, size at return, etc.) |
| 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. | <p>Currently, there is a gap for this RPA – see comments below table.</p> <p>The strategies that were developed through the collaborative RM&E process in fall, 2009, are consistent with this action.</p> <p>The AHSWG recommended this population as a candidate for trend analysis.</p> <p>Performance measures for abundance and productivity, would be:</p> <ul style="list-style-type: none"> • Pre-spawn mortality • Spawner abundance • Hatchery (and kelt) fraction • Recruit per spawner |

| Population | Description/Action | RPA Coverage Status and Recommendations |
|---------------------------|--|--|
| | <p>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 monitoring and evaluation costs.</p> | <p>target population.</p> <ul style="list-style-type: none"> • Genetic diversity • Life history characteristics (e.g., age structure, age at return, size at return, etc.) <p>Currently, there is a gap for this RPA – see comments below table</p> <p>The strategies that were developed through the collaborative RM&E process in fall, 2009, do not specifically relate to this action. However, this action is consistent with HSRG and HRT recommendations.</p> <p>The AHSWG recommended this population as a candidate for trend analysis.</p> <p>Performance measures for abundance and productivity, would be:</p> <ul style="list-style-type: none"> • Spawner abundance • Hatchery fraction • Recruit per spawner • Index of juvenile abundance • Juvenile emigrant abundance • Juvenile survival to first mainstem dam • Post release survival • SAR <p>For spatial structure and diversity:</p> <ul style="list-style-type: none"> • Adult spawner spatial distribution • Proportion of non-target hatchery spawners in the target population. • Genetic diversity • Life history characteristics (e.g., age structure, age at return, size at return, etc.) |
| 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 | <p>Currently covered under Project 2007-401-00</p> <p>The strategies that were developed through the collaborative RM&E process in fall, 2009, are consistent with this action.</p> |

| Population | Description/Action | RPA Coverage Status and Recommendations |
|---------------------|--|---|
| | | <p>The AHSWG recommended this population as a candidate for trend analysis.</p> <p>Performance measures for abundance and productivity, would be:</p> <ul style="list-style-type: none"> • Pre-spawn mortality • Spawner abundance • Hatchery (and kelt) fraction • Recruit per spawner • Post release survival <p>For spatial structure and diversity:</p> <ul style="list-style-type: none"> • Adult spawner spatial distribution • Proportion of non-target hatchery spawners in the target population. • Genetic diversity • Life history characteristics (e.g., age structure, age at return, size at return, etc.) |
| 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. | <p>Current programs cover this action; PCSRF, Mitchell Act MER, SRFB, NOAA Biop contract for smolt trapping; 199900301, 200105300.</p> <p>The strategies that were developed through the collaborative RM&E process in fall, 2009, are consistent with this action.</p> <p>This population was not addressed within the AHSWG for trend analysis.</p> |

| Population | Description/Action | RPA Coverage Status and Recommendations |
|------------|--|--|
| | | <ul style="list-style-type: none"> • Post release survival • SAR <p>For <i>spatial structure and diversity</i>:</p> <ul style="list-style-type: none"> • Adult spawner spatial distribution • Proportion of non-target hatchery spawners in the target population. Genetic diversity • Life history characteristics (e.g., age structure, age at return, size at return, etc.) |
| | <p>Fund assessment of habitat potential, development of reintroduction strategies, and implementation of pilot supplementation projects in selected Lower Columbia River tributaries below Bonneville Dam.</p> | <p>Current programs cover this action; PCSRF, Mitchell Act MER, SRFB, NOAA Biop contract for smolt trapping; 199900301, 200105300.</p> <p>The strategies that were developed through the collaborative RM&E process in fall, 2009, are consistent with this action.</p> <p>This population was not addressed within the AHSWG for trend analysis.</p> <p>Performance measures for <i>abundance and productivity</i>, would be:</p> <ul style="list-style-type: none"> • Pre-spawn mortality • Adult escapement to tributary • Spawner abundance • Hatchery fraction • Recruit per spawner • Index of juvenile abundance • Juvenile emigrant abundance • Juvenile survival to first mainstem dam • Post release survival • SAR <p>For <i>spatial structure and diversity</i>:</p> <ul style="list-style-type: none"> • Adult spawner spatial distribution • Proportion of non-target hatchery spawners in the target population. • Genetic diversity • Life history characteristics |

| Population | Description/Action | RPA Coverage Status and Recommendations |
|------------|--------------------|--|
| | | (e.g., age structure, age at return, size at return, etc.) |

Below, we discuss in more detail the programs identified in Table 4 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. In the recommendations for RPA 50.5, additional information will be collected that will address VSP parameters and also assist in our understanding of whether A-run and B-run steelhead are separate spawning groups.
 - **Recommendation:** The workgroup recommends the implementation of RPA 50.5. That information obtained from RPA 50.5 will be used to inform the development of a trigger for future artificial propagation safety-net or conservation programs, or to identify populations for immediate safety-net or conservation programs.

2. Kelt reconditioning in the Upper Columbia – There are no work elements that address this RPA; however, there is a proposal by the Yakama Nation that has been reviewed 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 Winthrop National Fish Hatchery for the kelt program, which will fulfill this portion of the RPA. Support follow up review to ensure the Yakama Nation project adequately covers this portion of the RPA.
 - **Recommendation:** Evaluate the Yakama Nation proposal to determine if it adequately addresses this RPA.

3. 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 steelhead monitoring).
 - **Recommendation:** Before implementing the hatchery program, the workgroup recommends that baseline monitoring, especially Relative Reproductive Success (RRS), be implemented if it is not already occurring.

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).

- **RM&E projects - coverage assessment:** There are currently no work elements that appear to address this RPA for the Tucannon, Touchet, and Winthrop NFH steelhead programs. WDFW is evaluating means to implement the reform recommendations for the Tucannon and Touchet programs.

- Currently, there is no infrastructure in the Methow Basin to meet the HSRG PNI target, which will be done primarily by controlling pHOS. There is a weir on the Twisp River and currently supplementation is occurring upstream from the weir. There are also proposed modifications or rebuilding of a weir at the Winthrop NFH on the mainstem Methow River. However, these weirs

and control structures are high up in the basin and will not control enough of the spawning populations to make the PNI targets recommended by the HSRG. The USFWS is currently evaluating means to implement the reform recommendations at Winthrop NFH that would be designed to meet the HRT and HSRG targets.

- To determine the effects that reform actions have on recovery, the VSP parameters need to be monitored. However, the workgroup recognizes that monitoring the reform actions may require that we look at parameters other than the VSP parameters. In other words, secondary parameters may show improvements, which we assume would benefit one or more VSP parameters.
- This RPA addresses those populations identified within Table 6 of the FCRPS BiOp (summarized in Table 5).

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

| Population | Description/Action | RPA Coverage Status and Recommendations |
|------------------------|--|--|
| Lower Columbia Chinook | The COE will review the John Day Hatchery Mitigation Program | The workgroup recommends that when evaluating this program, the COE considers the recommendations of the AHSWG (Beasley et al. 2008). |
| Snake River Steelhead | Fund the Tucannon River steelhead supplementation program to transition to local broodstock using BMPs | <p>Currently, there is a gap for this RPA – see comments below table.</p> <p>The strategies that were developed through the collaborative RM&E process in fall, 2009, are consistent with this action, although it was not specifically mentioned.</p> <p>The AHSWG recommended this population as a candidate for trend analysis.</p> <p>Performance measures for abundance and productivity, would be:</p> <ul style="list-style-type: none"> • Pre-spawn mortality • Adult escapement to tributary • Spawner abundance • Hatchery fraction • Recruit per spawner • Index of juvenile abundance • Juvenile emigrant abundance • Juvenile survival to first mainstem dam • Post release survival • SAR |

| Population | Description/Action | RPA Coverage Status and Recommendations |
|---------------------------|---|--|
| | | <p>For spatial structure and diversity:</p> <ul style="list-style-type: none"> • Adult spawner spatial distribution • Stray rate • Genetic diversity • Life history characteristics (e.g., age structure, age at return, size at return, etc.) |
| Middle Columbia Steelhead | Fund the Touchet River steelhead supplementation program to transition to local broodstock using BMPs. | <p>Currently, there is a gap for this RPA – see comments below table.</p> <p>The strategies that were developed through the collaborative RM&E process in fall, 2009, are consistent with this action, although it was not specifically mentioned.</p> <p>The AHSWG recommended this population not be a candidate for trend analysis.</p> <p>Performance measures for abundance and productivity, would be:</p> <ul style="list-style-type: none"> • Pre-spawn mortality • Adult escapement to tributary • Spawner abundance • Hatchery fraction • Recruit per spawner • Index of juvenile abundance • Juvenile emigrant abundance • Juvenile survival to first mainstem dam • Post release survival • SAR <p>For spatial structure and diversity:</p> <ul style="list-style-type: none"> • Adult spawner spatial distribution • Stray rate • Genetic diversity • Life history characteristics (e.g., age structure, age at return, size at return, etc.) |
| Upper Columbia Steelhead | For the Winthrop NFH 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 | <p>Currently, there is a gap for this RPA and it is considered a high priority for immediate action – see comments below table.</p> <p>The strategies that were developed</p> |

| Population | Description/Action | RPA Coverage Status and Recommendations |
|------------|---|---|
| | <p>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.</p> | <p>through the collaborative RM&E process in fall, 2009, are consistent with this action, although it was not specifically mentioned.</p> <p>The AHSWG recommended this population as a candidate for trend analysis.</p> <p>Performance measures for abundance and productivity, would be:</p> <ul style="list-style-type: none"> • Pre-spawn mortality • Adult escapement to tributary • Spawner abundance • Hatchery fraction • Recruit per spawner • Index of juvenile abundance • Juvenile emigrant abundance • Juvenile survival to first mainstem dam • Post release survival • SAR <p>For spatial structure and diversity:</p> <ul style="list-style-type: none"> • Adult spawner spatial distribution • Stray rate • Genetic diversity • Life history characteristics (e.g., age structure, age at return, size at return, etc.) |

○ **Recommendation:** Implement BiOp critical hatchery effectiveness monitoring that is a component of the Columbia Basin Anadromous Fish Monitoring Strategy. Facilitate the formation of a regional workgroup process to implement and further refine regionally based hatchery effectiveness monitoring. This strategy will further inform the monitoring required in individual HGMPs and will help ensure the monitoring will be coordinated to address the regional hatchery effectiveness questions.

○ In the table above, the workgroup recommends performance measures that should be monitored to assess the effectiveness of the action. The HGMPs that are currently in development will refine the monitoring that needs to take place at each individual program, so the recommendations below should be considered interim.

- The workgroup recommends that all stakeholders (through the HCP and BiOp processes) convene to determine the best methods (and associated RM&E) to control pHOS for steelhead in the Methow Basin. Solutions will potentially benefit the development of local broodstocks too.
- In addition to development of local broodstock for all three programs, the Winthrop NFH will need to assist in monitoring whether hatchery origin spawners are being controlled (reduced) on the spawning grounds.
- Expansion of Project 199305600 will evaluate not only the hatchery reform actions identified for the Winthrop NFH, but some of the mechanisms that may be driving the effects of the action.

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:*** RRS studies are ongoing for spring/summer Chinook populations in the Upper Grande Ronde, Lostine River, and Catherine Creek; spring Chinook in the Wenatchee River; and steelhead in the Hood River. The feasibility study for Snake River fall Chinook is nearly complete. Therefore, there is no gap for this RPA.
- ***Recommendation:*** There are no recommendations for this RPA as long as the ongoing studies continue to be implemented.

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).

- ***RM&E projects - coverage assessment:*** The workgroup believes that monitoring associated with RPA 63.1 addresses the major components of RPA 64.2. Additional coverage is needed for other listed populations and other issues identified below by the Workgroup.
- ***Recommendation:*** The Workgroup recommends adding the Hood River steelhead program for coverage under this RPA.
- The workgroup recommends using additional BiOp and recovery plan VSP monitoring to assess stray rates and origin of hatchery fish to non-target areas.
- The workgroup recommends that after the analyses of data from implementation of RPA 63.1, further research may be needed to identify mechanisms by which “intervention” programs affect the recovery of listed populations (expansion of Project 199305600 may identify some of these mechanisms).

- Implement BiOp critical hatchery effectiveness monitoring that is a component of the Columbia Basin Anadromous Fish Monitoring Strategy. Facilitate the formation of a regional workgroup process to implement and further refine regionally based hatchery effectiveness monitoring. This strategy will further inform the monitoring required in individual HGMPs and will help ensure the monitoring will be coordinated to address the regional hatchery effectiveness questions.
- The workgroup recommends funding the ODFW Reproductive Success and Stray Impact project for Deschutes Eastside (Bakeoven-Buck Hollow) populations.

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 a gap for both Methow steelhead and Snake River fall Chinook.
 - WDFW will be supporting one portion of a RRS study for steelhead in the Methow Basin under project 201003300. This work will be complemented by the Douglas PUD steelhead RRS study.
- **Recommendation (HIGH PRIORITY):** For Snake River fall Chinook, see recommendation under RPA 65.1.
 - Douglas PUD is planning a steelhead RRS study in the Methow Basin. There will need to be an evaluation by NOAA FISHERIES of the study plans to determine if it adequately addresses RPA 64.3.

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 the lack of juvenile production estimates and ability to conduct RRS studies.
- **Recommendation (HIGH PRIORITY):** The workgroup recommends working with appropriate stakeholders to identify the intent of RPAs 64 and 65 in relationship to Snake River fall Chinook salmon and identify methods to meet the intent. Develop a targeted RFP based on this input.

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

- **RM&E projects - coverage assessment:** The workgroup believes that this RPA is closely related to RPAs 64.1, 64.3, and 65.1. Additional input by NOAA is needed to determine if the RPA is fully covered.
- **Recommendation:** Further discussions with NOAA are needed to evaluate this RPA.
 - One potential analysis would be to compare the productivity of Snake River fall Chinook (treatment) with the Deschutes population (potential reference).

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 will need to begin coordination with the AAs prior to the development of RFPs.
- **Recommendation:** The Workgroup offers no recommends for this RPA.

RM&E Coordination and Data Management Workgroup Assessments

The RM&E Coordination and Data Management Workgroup assessed the needs and coverage of Strategy 8 – Coordination and Data Management (RPAs 71 and 72), and Strategy 9 – Project Implementation and Compliance Monitoring (RPA 73). 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. Continue coordinated scientific approaches under AFEP and the F&W Program through independent scientific reviews.
- ***Recommendation:*** Continue to advance AA, NOAA, and NPCC 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. Explore ways to insure the Willamette and Columbia AFEP programs are compatible in information management, documentation, and research approaches. Increase coordination of fish marking for hatchery, habitat, and hydro performance tracking.

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. Some increased efficiencies and avoidance of duplication of effort may be realized with further coordination of the F&W program with other AA programs.
- ***Recommendation:*** The Action Agencies and NOAA should brief the ISRP and Council on the BiOp's Annual & Comprehensive Report. Enhanced coordination between the programs with regard to their different planning cycles, could result in increased efficiencies. Continue to advance the planning and coordination between the AFEP program and the Fish and Wildlife program to better meet the needs of the BiOp. Need to clearly identify BiOp priorities of the F&W Program, while recognizing the broader objectives of the program for non-listed populations and resident fish.

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, 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 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 and demonstration projects such as the ISEMP, PNAMP ISTM, Upper Columbia pilot, and CRITFC's Tribal Data Network Accord Project to demonstrate implementation of coordination and standardization tools. Ensure that these projects are consistent with PNAMP Data Management Leadership Team recommendations. Provide implementation and coordination support through a regional network of data management positions. Investigate additional pilot efforts to demonstrate approaches to improved data sharing and transparency.
- Complete the development of regional High Level Indicators (HLIs), associated metrics, and information mapping to help focus coordination needs and products. Continue to advance the data management and reporting components of the Columbia Basin Anadromous Salmonid Monitoring Strategy through ongoing collaboration with state and tribal fish management agencies. Implement regionally developed guidelines and business rules for Fish and Wildlife Program, BOR and AFEP RM&E projects through contract specifications.

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 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:** NED is no longer functioning, but PNAMP has assumed the advancement of NED objectives. 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 and review of the Aquatic Resource Schema (ARS) and similar approaches to ensure consistency with standard metrics identified in RPA 71.4. 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 data standards and metadata consistent with the ARS Schema across the Columbia Basin that support BiOp needs. Develop and implement a network of Data Support Staff and infrastructure to support the ARS Schema and data strategy guide in partnership with regional natural resource management entities and PNAMP. 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. Continue to advance the data management and reporting components of the Columbia Basin Anadromous Fish Monitoring Strategy through ongoing collaboration with state and tribal fish management agencies. In addition to advancing fish data exchange capabilities, advance these capabilities to areas of metadata, water quality and flow, a habitat environmental condition, project implementation tracking and other data exchanges as needed.

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. Continue to advance standard implementation metrics.

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 for the data support positions 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. NED is no longer functioning, but PNAMP has assumed the advancement of NED objectives.
- **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 COE 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. Investigate and develop capabilities for performing post-implementation (compliance) monitoring of habitat 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. COE is developing a multi-district review and spreadsheet to track RPA project level implementation. BOR is working to incorporate implementation and compliance information into the BPA PISCES system. AAs coordinate the annual reporting of this project level implementation to NOAA. Additional work on development of a regionally endorsed data dictionary for environmental resource action and project implementation metrics has been initiated.
- **Recommendation:** Develop and implement compatible 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. The AA will coordinate on reporting to ensure that all projects are appropriately counted and tracked.

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. BOR will be implementing the same metrics through PISCES. The COE multi-district tracking system will include applicable Katz et al compatible metrics.
- **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 A

RM&E RPA Actions and Associated Projects

Revised 6/23/10

| Action # | Sub-Action # | Project Name | Project Reference Number | Lead Agency | Project Information Internet Link |
|--|--------------|---|--------------------------|-------------|---|
| RPA 50 - Fish Population Status Monitoring: The Action Agencies will enhance existing fish population status monitoring performed 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 (see project tables in Attachment B.2.6-1). | | | | | |
| 50 | | PIT detection development | N/A | USACE | |
| 50 | | Adult fish counting at dams | O&M | USACE | |
| 50 | | Survival study methodologies | Sys03 | USACE | |
| RPA 50.1 - Implement and maintain CRB PIT-Tag Information System: Implement and maintain the Columbia River Basin passive integrated transponder (PIT)-Tag Information System. (Annually) | | | | | |
| 50 | 1 | Evaluate Umatilla Juvenile Salmonid Outmigration | 198902401 | BPA | http://www.cbfish.org/Project.mvc/Display/198902401 |
| 50 | 1 | Umatilla Hatchery Monitoring and Evaluation (M&E) | 199000500 | BPA | http://www.cbfish.org/Project.mvc/Display/199000500 |
| 50 | 1 | Columbia Basin Pit-Tag Information | 199008000 | BPA | http://www.cbfish.org/Project.mvc/Display/199008000 |
| 50 | 1 | Pit Tagging Wild Chinook | 199102800 | BPA | http://www.cbfish.org/Project.mvc/Display/199102800 |
| 50 | 1 | Comparative Survival Study (CSS) | 199602000 | BPA | http://www.cbfish.org/Project.mvc/Display/199602000 |
| 50 | 1 | Adult Pit Detector Installation | 200100300 | BPA | http://www.cbfish.org/Project.mvc/Display/200100300 |
| 50 | 1 | Upper Columbia Spring Chinook and Steelhead Juvenile and Adult Abundance, Productivity and Spatial Structure Monitoring | 201003400 | BPA | http://www.cbfish.org/Project.mvc/Display/201003400 |
| RPA 50.2 - Monitor adult returns at mainstem hydro dams: Monitor adult returns at mainstem hydroelectric dams using both visual counts and the PIT-tag detection system (see Hydrosystem section). (Annually) | | | | | |
| 50 | 2 | Survival Estimate for Passage through Snake and Columbia River Dams and Reservoirs | 199302900 | BPA | http://www.cbfish.org/Project.mvc/Display/199302900 |
| 50 | 2 | Adult Pit Detector Installation | 200100300 | BPA | http://www.cbfish.org/Project.mvc/Display/200100300 |
| 50 | 2 | Lower Granite Dam Adult Trap Operations | 200500200 | BPA | http://www.cbfish.org/Project.mvc/Display/200500200 |
| 50 | 2 | Upper Columbia Spring Chinook and Steelhead Juvenile and Adult Abundance, Productivity and Spatial Structure Monitoring | 201003400 | BPA | http://www.cbfish.org/Project.mvc/Display/201003400 |
| RPA 50.3 - Monitor juvenile fish migrations at mainstem hydro dams: Monitor juvenile fish migrations at mainstem hydroelectric dams using smolt monitoring and the PIT-tag detection system (see Hydrosystem section). (Annually) | | | | | |

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|----|---|---|-----------|-----|---|
| 50 | 3 | Smolt Monitoring by Non-Federal Entities | 198712700 | BPA | http://www.cbfish.org/Project.mvc/Display/198712700 |
| 50 | 3 | Evaluate Umatilla Juvenile Salmonid Outmigration | 198902401 | BPA | http://www.cbfish.org/Project.mvc/Display/198902401 |
| 50 | 3 | Pit Tagging Wild Chinook | 199102800 | BPA | http://www.cbfish.org/Project.mvc/Display/199102800 |
| 50 | 3 | Fish Passage Center | 199403300 | BPA | http://www.cbfish.org/Project.mvc/Display/199403300 |
| 50 | 3 | Comparative Survival Study (CSS) | 199602000 | BPA | http://www.cbfish.org/Project.mvc/Display/199602000 |
| 50 | 3 | Natural Production Management and Monitoring | 200831100 | BPA | http://www.cbfish.org/Project.mvc/Display/200831100 |
| 50 | 3 | Pittag Sr Sockeye-Uc Sp.Chnook | 200872400 | BPA | http://www.cbfish.org/Project.mvc/Display/200872400 |
| 50 | 3 | Project to provided VSP Estimates for Yakima Steelhead MPG | 201003000 | BPA | http://www.cbfish.org/Project.mvc/Display/201003000 |
| 50 | 3 | Upper Columbia Spring Chinook and Steelhead Juvenile and Adult Abundance, Productivity and Spatial Structure Monitoring | 201003400 | BPA | http://www.cbfish.org/Project.mvc/Display/201003400 |

RPA 50.4 - Fund pilot studies in Wenatchee/Methow/Entiat: 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).

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|----|---|--|-----------|-----|---|
| 50 | 4 | Coded Wire Tag-Pacific States Marine Fisheries Commission (PSMFC) | 198201301 | BPA | http://www.cbfish.org/Project.mvc/Display/198201301 |
| 50 | 4 | Smolt Monitoring by Non-Federal Entities | 198712700 | BPA | http://www.cbfish.org/Project.mvc/Display/198712700 |
| 50 | 4 | Hood River Production Monitoring and Evaluation (M&E)-Warm Springs | 198805303 | BPA | http://www.cbfish.org/Project.mvc/Display/198805303 |
| 50 | 4 | Statistical Support For Salmon | 198910700 | BPA | http://www.cbfish.org/Project.mvc/Display/198910700 |
| 50 | 4 | Idaho Natural Production Monitoring. Clearwater, Lochsa, Selway, SF Clearwater, Chamberlain, EF Salmon, Lemhi, Little Salmon, Lower MF Salmon, NF Salmon, Pahsimeroi, Panther Cr, Secesh, SF Salmon, Upper MF Salmon, Upper Salmon | 199107300 | BPA | http://www.cbfish.org/Project.mvc/Display/199107300 |
| 50 | 4 | Escapement and Productivity of Spring Chinook and Steelhead | 199801600 | BPA | http://www.cbfish.org/Project.mvc/Display/199801600 |
| 50 | 4 | Integrated Status and Effectiveness Monitoring Program (ISEMP) | 200301700 | BPA | http://www.cbfish.org/Project.mvc/Display/200301700 |

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|---|---|--|-----------|-----|---|
| 50 | 4 | Okanogan Basin Monitoring & Evaluation Program (OBMEP) | 200302200 | BPA | http://www.cbfish.org/Project.mvc/Display/200302200 |
| 50 | 4 | Monitor and Evaluate (M&E) Reproductive Success and Survival in Wenatchee River | 200303900 | BPA | http://www.cbfish.org/Project.mvc/Display/200303900 |
| 50 | 4 | Status and Trend Annual Reporting | 200900200 | BPA | http://www.cbfish.org/Project.mvc/Display/200900200 |
| 50 | 4 | Upper Columbia Spring Chinook and Steelhead Juvenile and Adult Abundance, Productivity and Spatial Structure Monitoring | 201003400 | BPA | http://www.cbfish.org/Project.mvc/Display/201003400 |
| RPA 50.5 - Provide additional status monitoring of SR B-Run Steelhead pops: 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) | | | | | |
| 50 | 5 | Coded Wire Tag-Pacific States Marine Fisheries Commission (PSMFC) | 198201301 | BPA | http://www.cbfish.org/Project.mvc/Display/198201301 |
| 50 | 5 | Nez Perce Tribal Hatchery Monitoring and Evaluation (M&E) | 198335003 | BPA | http://www.cbfish.org/Project.mvc/Display/198335003 |
| 50 | 5 | Salmon Studies in Idaho Rivers-Idaho Department of Fish and Game (IDFG) | 198909800 | BPA | http://www.cbfish.org/Project.mvc/Display/198909800 |
| 50 | 5 | Idaho Steelhead Monitoring and Evaluation (M&E) Studies | 199005500 | BPA | http://www.cbfish.org/Project.mvc/Display/199005500 |
| 50 | 5 | Pit Tagging Wild Chinook | 199102800 | BPA | http://www.cbfish.org/Project.mvc/Display/199102800 |
| 50 | 5 | Idaho Natural Production Monitoring. Clearwater, Lochsa, Selway, SF Clearwater, Chamberlain, EF Salmon, Lemhi, Little Salmon, Lower MF Salmon, NF Salmon, Pahsimeroi, Panther Cr, Secesh, SF Salmon, Upper MF Salmon, Upper Salmon | 199107300 | BPA | http://www.cbfish.org/Project.mvc/Display/199107300 |
| 50 | 5 | Comparative Survival Study (CSS) | 199602000 | BPA | http://www.cbfish.org/Project.mvc/Display/199602000 |
| 50 | 5 | Integrated Status and Effectiveness Monitoring Program (ISEMP) | 200301700 | BPA | http://www.cbfish.org/Project.mvc/Display/200301700 |
| 50 | 5 | Lower Granite Dam Adult Trap Operations | 200500200 | BPA | http://www.cbfish.org/Project.mvc/Display/200500200 |
| 50 | 5 | Distribution and Abundance Monitoring of Oncorhynchus mykiss within the Lower Clearwater Subbasin | 200723300 | BPA | http://www.cbfish.org/Project.mvc/Display/200723300 |
| 50 | 5 | Chinook and Steelhead Genotyping for Genetic Stock Identification (GSI) at Lower Granite Dam | 201002600 | BPA | http://www.cbfish.org/Project.mvc/Display/201002600 |

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|---|---|--|-----------|-----|---|
| 50 | 5 | Snake River Chinook and Steelhead Parental Based Tagging | 201003100 | BPA | http://www.cbfish.org/Project.mvc/Display/201003100 |
| 50 | 5 | Capital construction of permanent weir and PIT tag Array in Lolo Creek. One time cost. | 201003800 | BPA | http://www.cbfish.org/Project.mvc/Display/201003800 |
| RPA 50.6 - Review/modify existing fish pop status monitoring projects: 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 modifications in FY 2010) | | | | | |
| 50 | 6 | Coded Wire Tag-Pacific States Marine Fisheries Commission (PSMFC) | 198201301 | BPA | http://www.cbfish.org/Project.mvc/Display/198201301 |
| 50 | 6 | Coded Wire Tag-Oregon Department of Fish and Wildlife (ODFW) | 198201302 | BPA | http://www.cbfish.org/Project.mvc/Display/198201302 |
| 50 | 6 | Coded Wire Tag-US Fish and Wildlife Service (USFWS) | 198201303 | BPA | http://www.cbfish.org/Project.mvc/Display/198201303 |
| 50 | 6 | Coded Wire Tag-Washington Department of Fish and Wildlife (WDFW) | 198201304 | BPA | http://www.cbfish.org/Project.mvc/Display/198201304 |
| 50 | 6 | Nez Perce Tribal Hatchery Operations and Maintenance (O&M) | 198335000 | BPA | http://www.cbfish.org/Project.mvc/Display/198335000 |
| 50 | 6 | Nez Perce Tribal Hatchery Monitoring and Evaluation (M&E) | 198335003 | BPA | http://www.cbfish.org/Project.mvc/Display/198335003 |
| 50 | 6 | Blue Mountain Fish Habitat Improvement | 198402500 | BPA | http://www.cbfish.org/Project.mvc/Display/198402500 |
| 50 | 6 | Smolt Monitoring by Non-Federal Entities | 198712700 | BPA | http://www.cbfish.org/Project.mvc/Display/198712700 |
| 50 | 6 | Umatilla Fish Passage Operations | 198802200 | BPA | http://www.cbfish.org/Project.mvc/Display/198802200 |
| 50 | 6 | Hood River Production Monitoring and Evaluation (M&E)-Warm Springs | 198805303 | BPA | http://www.cbfish.org/Project.mvc/Display/198805303 |
| 50 | 6 | Hood River Production Monitor and Evaluation (M&E)-Oregon Department of Fish and Wildlife (ODFW) | 198805304 | BPA | http://www.cbfish.org/Project.mvc/Display/198805304 |
| 50 | 6 | Hood River Production Operations and Maintenance (O&M) and Powerdale | 198805308 | BPA | http://www.cbfish.org/Project.mvc/Display/198805308 |
| 50 | 6 | Evaluate Umatilla Juvenile Salmonid Outmigration | 198902401 | BPA | http://www.cbfish.org/Project.mvc/Display/198902401 |
| 50 | 6 | Salmon Studies in Idaho Rivers-Idaho Department of Fish and Game (IDFG) | 198909800 | BPA | http://www.cbfish.org/Project.mvc/Display/198909800 |
| 50 | 6 | Idaho Steelhead Monitoring and Evaluation (M&E) Studies | 199005500 | BPA | http://www.cbfish.org/Project.mvc/Display/199005500 |

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|----|---|--|-----------|-----|---|
| 50 | 6 | Idaho Natural Production Monitoring. Clearwater, Lochsa, Selway, SF Clearwater, Chamberlain, EF Salmon, Lemhi, Little Salmon, Lower MF Salmon, NF Salmon, Pahsimeroi, Panther Cr, Secesh, SF Salmon, Upper MF Salmon, Upper Salmon | 199107300 | BPA | http://www.cbfish.org/Project.mvc/Display/199107300 |
| 50 | 6 | Grand Ronde Early Life History of Spring Chinook and Steelhead | 199202604 | BPA | http://www.cbfish.org/Project.mvc/Display/199202604 |
| 50 | 6 | Yakima River Monitoring and Evaluation- Yakima/Klickitat Fisheries Project (YKFP) | 199506325 | BPA | http://www.cbfish.org/Project.mvc/Display/199506325 |
| 50 | 6 | Klickitat River Monitoring and Evaluation- Yakima/Klickitat Fisheries Project (YKFP) | 199506335 | BPA | http://www.cbfish.org/Project.mvc/Display/199506335 |
| 50 | 6 | Comparative Survival Study (CSS) | 199602000 | BPA | http://www.cbfish.org/Project.mvc/Display/199602000 |
| 50 | 6 | Yakama Reservation Watershed Project | 199603501 | BPA | http://www.cbfish.org/Project.mvc/Display/199603501 |
| 50 | 6 | Johnson Creek Artificial Propagation Enhancement | 199604300 | BPA | http://www.cbfish.org/Project.mvc/Display/199604300 |
| 50 | 6 | Imnaha River Smolt Monitoring | 199701501 | BPA | http://www.cbfish.org/Project.mvc/Display/199701501 |
| 50 | 6 | Chinook Salmon Adult Abundance Monitoring | 199703000 | BPA | http://www.cbfish.org/Project.mvc/Display/199703000 |
| 50 | 6 | Grande Ronde Supplementation Operations and Maintenance (O&M) and Montiring and Evaluation (M&E) on Lostine River | 199800702 | BPA | http://www.cbfish.org/Project.mvc/Display/199800702 |
| 50 | 6 | Grande Ronde Supplementation O&M on Catherine Creek/Upper Grande Ronde River | 199800703 | BPA | http://www.cbfish.org/Project.mvc/Display/199800703 |
| 50 | 6 | Spawning Distribution of Snake River Fall Chinook Salmon | 199801003 | BPA | http://www.cbfish.org/Project.mvc/Display/199801003 |
| 50 | 6 | Escapement and Productivity of Spring Chinook and Steelhead | 199801600 | BPA | http://www.cbfish.org/Project.mvc/Display/199801600 |
| 50 | 6 | Wind River Watershed | 199801900 | BPA | http://www.cbfish.org/Project.mvc/Display/199801900 |
| 50 | 6 | Walla Walla River Basin Monitoring and Evaluation (M&E) | 200003900 | BPA | http://www.cbfish.org/Project.mvc/Display/200003900 |
| 50 | 6 | Snake River Fall Chinook Salmon Life History Investigations | 200203200 | BPA | http://www.cbfish.org/Project.mvc/Display/200203200 |
| 50 | 6 | Asotin Creek Salmon Population Assessment | 200205300 | BPA | http://www.cbfish.org/Project.mvc/Display/200205300 |
| 50 | 6 | Integrated Status and Effectiveness Monitoring Program (ISEMP) | 200301700 | BPA | http://www.cbfish.org/Project.mvc/Display/200301700 |

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|----|---|--|-----------|-----|---|
| 50 | 6 | Okanogan Basin Monitoring & Evaluation Program (OBMEP) | 200302200 | BPA | http://www.cbfish.org/Project.mvc/Display/200302200 |
| 50 | 6 | Monitor and Evaluate (M&E) Reproductive Success and Survival in Wenatchee River | 200303900 | BPA | http://www.cbfish.org/Project.mvc/Display/200303900 |
| 50 | 6 | Evaluate the Relative Reproductive Success of Hatchery-Origin and Wild-Origin Steelhead Spawning Naturally in the Hood River | 200305400 | BPA | http://www.cbfish.org/Project.mvc/Display/200305400 |
| 50 | 6 | Grande Ronde Supplementation Monitoring and Evaluation (M&E) on Catherine Creek/Upper Grande Ronde River | 200708300 | BPA | http://www.cbfish.org/Project.mvc/Display/200708300 |
| 50 | 6 | Distribution and Abundance Monitoring of Oncorhynchus mykiss within the Lower Clearwater Subbasin | 200723300 | BPA | http://www.cbfish.org/Project.mvc/Display/200723300 |
| 50 | 6 | Oregon Plan Monitoring of Steelhead Status, Trend, and Habitat in the Grande Ronde River Subbasin | 200733700 | BPA | http://www.cbfish.org/Project.mvc/Display/200703700 |
| 50 | 6 | Oregon Plan Monitoring of Steelhead Status, Trend, and Habitat in the Grande Ronde River Subbasin | 200733700 | BPA | http://www.cbfish.org/Project.mvc/Display/200703700 |
| 50 | 6 | Spring Chinook Captive Propagation-Idaho | 200740300 | BPA | http://www.cbfish.org/Project.mvc/Display/200740300 |
| 50 | 6 | Spring Chinook Captive Propagation-Oregon | 200740400 | BPA | http://www.cbfish.org/Project.mvc/Display/200740400 |
| 50 | 6 | Deschutes fall chinook research | 200830600 | BPA | http://www.cbfish.org/Project.mvc/Display/200830600 |
| 50 | 6 | Natural Production Management and Monitoring | 200831100 | BPA | http://www.cbfish.org/Project.mvc/Display/200831100 |
| 50 | 6 | Implement a rotating panel sampling of small steelhead streams (tributary to Asotin, Tucannon and Snake) | 201002800 | BPA | http://www.cbfish.org/Project.mvc/Display/201002800 |
| 50 | 6 | Project to provided VSP Estimates for Yakima Steelhead MPG | 201003000 | BPA | http://www.cbfish.org/Project.mvc/Display/201003000 |
| 50 | 6 | Imnaha River steelhead status monitoring | 201003200 | BPA | http://www.cbfish.org/Project.mvc/Display/201003200 |
| 50 | 6 | Upper Columbia Spring Chinook and Steelhead Juvenile and Adult Abundance, Productivity and Spatial Structure Monitoring | 201003400 | BPA | http://www.cbfish.org/Project.mvc/Display/201003400 |
| 50 | 6 | Abundance, productivity and life history of Fifteenmile Creek Winter Steelhead | 201003500 | BPA | http://www.cbfish.org/Project.mvc/Display/201003500 |
| 50 | 6 | Toppenish Creek Steelhead Status & Trend Monitoring | 201003700 | BPA | http://www.cbfish.org/Project.mvc/Display/201003700 |
| 50 | 6 | Tucannon Expanded Pit Tagging | 201004200 | BPA | http://www.cbfish.org/Project.mvc/Display/201004200 |

RPA 50.7 - Fund marking of hatchery releases from AA funded facilities: 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)

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|----|---|--|-----------|-----|---|
| 50 | 7 | Coded Wire Tag-Pacific States Marine Fisheries Commission (PSMFC) | 198201301 | BPA | http://www.cbfish.org/Project.mvc/Display/198201301 |
| 50 | 7 | Coded Wire Tag-Oregon Department of Fish and Wildlife (ODFW) | 198201302 | BPA | http://www.cbfish.org/Project.mvc/Display/198201302 |
| 50 | 7 | Coded Wire Tag-US Fish and Wildlife Service (USFWS) | 198201303 | BPA | http://www.cbfish.org/Project.mvc/Display/198201303 |
| 50 | 7 | Coded Wire Tag-Washington Department of Fish and Wildlife (WDFW) | 198201304 | BPA | http://www.cbfish.org/Project.mvc/Display/198201304 |
| 50 | 7 | Nez Perce Tribal Hatchery Operations and Maintenance (O&M) | 198335000 | BPA | http://www.cbfish.org/Project.mvc/Display/198335000 |
| 50 | 7 | Nez Perce Tribal Hatchery Monitoring and Evaluation (M&E) | 198335003 | BPA | http://www.cbfish.org/Project.mvc/Display/198335003 |
| 50 | 7 | Smolt Monitoring by Non-Federal Entities | 198712700 | BPA | http://www.cbfish.org/Project.mvc/Display/198712700 |
| 50 | 7 | Hood River Production Monitoring and Evaluation (M&E)-Warm Springs | 198805303 | BPA | http://www.cbfish.org/Project.mvc/Display/198805303 |
| 50 | 7 | Hood River Production Monitor and Evaluation (M&E)-Oregon Department of Fish and Wildlife (ODFW) | 198805304 | BPA | http://www.cbfish.org/Project.mvc/Display/198805304 |
| 50 | 7 | Hood River Production Operations and Maintenance (O&M)-Warm Springs | 198805307 | BPA | http://www.cbfish.org/Project.mvc/Display/198805307 |
| 50 | 7 | Hood River Production Operations and Maintenance (O&M) and Powerdale | 198805308 | BPA | http://www.cbfish.org/Project.mvc/Display/198805308 |
| 50 | 7 | Salmon Studies in Idaho Rivers-Idaho Department of Fish and Game (IDFG) | 198909800 | BPA | http://www.cbfish.org/Project.mvc/Display/198909800 |
| 50 | 7 | Umatilla Hatchery Monitoring and Evaluation (M&E) | 199000500 | BPA | http://www.cbfish.org/Project.mvc/Display/199000500 |
| 50 | 7 | Idaho Steelhead Monitoring and Evaluation (M&E) Studies | 199005500 | BPA | http://www.cbfish.org/Project.mvc/Display/199005500 |
| 50 | 7 | Yakima River Monitoring and Evaluation-Yakima/Klickitat Fisheries Project (YKFP) | 199506325 | BPA | http://www.cbfish.org/Project.mvc/Display/199506325 |
| 50 | 7 | Klickitat River Monitoring and Evaluation-Yakima/Klickitat Fisheries Project (YKFP) | 199506335 | BPA | http://www.cbfish.org/Project.mvc/Display/199506335 |
| 50 | 7 | Comparative Survival Study (CSS) | 199602000 | BPA | http://www.cbfish.org/Project.mvc/Display/199602000 |
| 50 | 7 | Johnson Creek Artificial Propagation Enhancement | 199604300 | BPA | http://www.cbfish.org/Project.mvc/Display/199604300 |
| 50 | 7 | Imnaha River Smolt Monitoring | 199701501 | BPA | http://www.cbfish.org/Project.mvc/Display/199701501 |

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|--|---|---|-----------|-------|---|
| 50 | 7 | Grande Ronde Supplementation Operations and Maintenance (O&M) and Montiring and Evaluation (M&E) on Lostine River | 199800702 | BPA | http://www.cbfish.org/Project.mvc/Display/199800702 |
| 50 | 7 | Grande Ronde Supplementation O&M on Catherine Creek/Upper Grande Ronde River | 199800703 | BPA | http://www.cbfish.org/Project.mvc/Display/199800703 |
| 50 | 7 | Wind River Watershed | 199801900 | BPA | http://www.cbfish.org/Project.mvc/Display/199801900 |
| 50 | 7 | Grande Ronde Supplementation Monitoring and Evaluation (M&E) on Catherine Creek/Upper Grande Ronde River | 200708300 | BPA | http://www.cbfish.org/Project.mvc/Display/200708300 |
| 50 | 7 | Spring Chinook Captive Propagation-Oregon | 200740400 | BPA | http://www.cbfish.org/Project.mvc/Display/200740400 |
| 50 | 7 | Imnaha River steelhead status monitoring | 201003200 | BPA | http://www.cbfish.org/Project.mvc/Display/201003200 |
| RPA 50.8 - Report available information on population viability metrics: Report available information on population viability metrics in annual and comprehensive evaluation reports. (Initiate in FY 2008) | | | | | |
| 50 | 8 | No Project Funded | | | |
| RPA 51 - Collaboration Regarding Fish Population Status Monitoring: The Action Agencies will enhance existing fish populations status monitoring performed by fish management agencies through the following collaboration commitments: | | | | | |
| 51 | | PIT detection development | N/A | USACE | |
| RPA 51.1 - Synthesize fish pop metrics thru Regional Data Repositories: Support the coordination, data management, and annual synthesis of fish population metrics through Regional Data Repositories and reports. (Annually) | | | | | |
| 51 | 1 | Coded Wire Tag-Pacific States Marine Fisheries Commission (PSMFC) | 198201301 | BPA | http://www.cbfish.org/Project.mvc/Display/198201301 |
| 51 | 1 | Coded Wire Tag-Washington Department of Fish and Wildlife (WDFW) | 198201304 | BPA | http://www.cbfish.org/Project.mvc/Display/198201304 |
| 51 | 1 | StreamNet - Coordinated Information System (CIS)/ Northwest Environmental Database (NED) | 198810804 | BPA | http://www.cbfish.org/Project.mvc/Display/198810804 |
| 51 | 1 | Salmon Studies in Idaho Rivers-Idaho Department of Fish and Game (IDFG) | 198909800 | BPA | http://www.cbfish.org/Project.mvc/Display/198909800 |
| 51 | 1 | Fish Passage Center | 199403300 | BPA | http://www.cbfish.org/Project.mvc/Display/199403300 |
| 51 | 1 | Johnson Creek Artificial Propagation Enhancement | 199604300 | BPA | http://www.cbfish.org/Project.mvc/Display/199604300 |
| 51 | 1 | Chinook Salmon Adult Abundance Monitoring | 199703000 | BPA | http://www.cbfish.org/Project.mvc/Display/199703000 |
| 51 | 1 | Pacific Northwest Aquatic Monitoring Program (PNAMP) Coordination | 200400200 | BPA | http://www.cbfish.org/Project.mvc/Display/200400200 |

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| 51 | 1 | Streamnet Library | 200850500 | BPA | http://www.cbfish.org/Project.mvc/Display/200850500 |
| 51 | 1 | Nutrient Enhancement Project | 200860700 | BPA | http://www.cbfish.org/Project.mvc/Display/200860700 |

RPA 51.2 - Develop a regional strategy for status/trend monitoring: 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)

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| 51 | 2 | Pacific Northwest Aquatic Monitoring Program (PNAMP) Coordination | 200400200 | BPA | http://www.cbfish.org/Project.mvc/Display/200400200 |
| 51 | 2 | Regional Strategy-Status/Trend | 200873300 | BPA | http://www.cbfish.org/Project.mvc/Display/200873300 |

RPA 51.3 - Provide funding support/staff participation in regional forums: 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)

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| 51 | 3 | Coded Wire Tag-Pacific States Marine Fisheries Commission (PSMFC) | 198201301 | BPA | http://www.cbfish.org/Project.mvc/Display/198201301 |
| 51 | 3 | StreamNet - Coordinated Information System (CIS)/ Northwest Environmental Database (NED) | 198810804 | BPA | http://www.cbfish.org/Project.mvc/Display/198810804 |
| 51 | 3 | Fish Passage Center | 199403300 | BPA | http://www.cbfish.org/Project.mvc/Display/199403300 |
| 51 | 3 | Johnson Creek Artificial Propagation Enhancement | 199604300 | BPA | http://www.cbfish.org/Project.mvc/Display/199604300 |
| 51 | 3 | Pacific Northwest Aquatic Monitoring Program (PNAMP) Coordination | 200400200 | BPA | http://www.cbfish.org/Project.mvc/Display/200400200 |
| 51 | 3 | Pacific NW Aquatic Monitoring Program (PNAMP) Research, Monitoring and Evaluation (RM&E) Design and Protocols | 200721600 | BPA | http://www.cbfish.org/Project.mvc/Display/200721600 |
| 51 | 3 | Streamnet Library | 200850500 | BPA | http://www.cbfish.org/Project.mvc/Display/200850500 |

RPA 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:

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| 52 | | Snake River sockeye survival/transportation study | SYS05 | USACE | |
| 52 | | Adult fish counting at dams | O&M | USACE | |
| 52 | | Survival study methodologies | Sys03 | USACE | |
| 52 | | Passage survival testing | N/A | USACE | |
| 52 | | Performance verification monitoring | N/A | USACE | |
| 52 | | Post-construction passage survival testing | N/A | USACE | |
| 52 | | Performance verification monitoring | IHR02 | USACE | |

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| 52 | | Performance verification monitoring | LM08 | USACE | |
| 52 | | Performance verification monitoring | LGO05 | USACE | |
| 52 | | Snake River Fall Chinook system survival study | 149671 | USACE | |
| RPA 52.1 - Monitor/evaluate juvenile salmonid dam survival rates: Monitor and evaluate salmonid dam survival rates for a subset of FCRPS projects. | | | | | |
| 52 | 1 | Smolt Monitoring by Non-Federal Entities | 198712700 | BPA | http://www.cbfish.org/Project.mvc/Display/198712700 |
| 52 | 1 | Modeling and Evaluation Statistical Support for Life-Cycle Studies | 199105100 | BPA | http://www.cbfish.org/Project.mvc/Display/199105100 |
| 52 | 1 | Evaluate Delayed (Extra) Mortality Associated with Passage of Yearling Chinook Salmon through Snake River Dams | 200304100 | BPA | http://www.cbfish.org/Project.mvc/Display/200304100 |
| RPA 52.2 - Monitor and evaluate juvenile salmonid system survival: Monitor and evaluate juvenile salmonid in-river and system survival through transported fish relative to in-river fish (D-value) as needed. | | | | | |
| 52 | 2 | New Marking Monitoring Techniques | 198331900 | BPA | http://www.cbfish.org/Project.mvc/Display/198331900 |
| 52 | 2 | Smolt Monitoring by Non-Federal Entities | 198712700 | BPA | http://www.cbfish.org/Project.mvc/Display/198712700 |
| 52 | 2 | Salmon Studies in Idaho Rivers-Idaho Department of Fish and Game (IDFG) | 198909800 | BPA | http://www.cbfish.org/Project.mvc/Display/198909800 |
| 52 | 2 | Pit Tagging Wild Chinook | 199102800 | BPA | http://www.cbfish.org/Project.mvc/Display/199102800 |
| 52 | 2 | Survival Estimate for Passage through Snake and Columbia River Dams and Reservoirs | 199302900 | BPA | http://www.cbfish.org/Project.mvc/Display/199302900 |
| 52 | 2 | Comparative Survival Study (CSS) | 199602000 | BPA | http://www.cbfish.org/Project.mvc/Display/199602000 |
| 52 | 2 | Evaluate Delayed (Extra) Mortality Associated with Passage of Yearling Chinook Salmon through Snake River Dams | 200304100 | BPA | http://www.cbfish.org/Project.mvc/Display/200304100 |
| 52 | 2 | Pacific Ocean Survey Tracking (POST) | 200311400 | BPA | http://www.cbfish.org/Project.mvc/Display/200311400 |
| RPA 52.3 - Monitor and evaluate adult salmonid system survival: Monitor and evaluate adult salmonid system survival upstream through the FCRPS. | | | | | |
| 52 | 3 | Smolt Monitoring by Non-Federal Entities | 198712700 | BPA | http://www.cbfish.org/Project.mvc/Display/198712700 |
| 52 | 3 | Modeling and Evaluation Statistical Support for Life-Cycle Studies | 199105100 | BPA | http://www.cbfish.org/Project.mvc/Display/199105100 |
| 52 | 3 | Lower Granite Dam Adult Trap Operations | 200500200 | BPA | http://www.cbfish.org/Project.mvc/Display/200500200 |
| RPA 52.4 - Provide additional PIT-tag marking of UCR populations: 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. | | | | | |

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| 52 | 4 | Smolt Monitoring by Non-Federal Entities | 198712700 | BPA | http://www.cbfish.org/Project.mvc/Display/198712700 |
| 52 | 4 | Pittag Sr Sockeye-Uc Sp.Chnook | 200872400 | BPA | http://www.cbfish.org/Project.mvc/Display/200872400 |
| RPA 52.5 - Assess feasibility of PIT-tag marking of juvenile SR Sockeye: Assess the feasibility of PIT-tag marking of juvenile Snake River Sockeye Salmon for specific survival tracking of this ESU from the Stanley Basin to Lower Granite Dam and through the mainstem FCRPS projects. | | | | | |
| 52 | 5 | Smolt Monitoring by Non-Federal Entities | 198712700 | BPA | http://www.cbfish.org/Project.mvc/Display/198712700 |
| 52 | 5 | Pittag Sr Sockeye-Uc Sp.Chnook | 200872400 | BPA | http://www.cbfish.org/Project.mvc/Display/200872400 |
| RPA 52.6 - Develop action plan for conducting hydro status monitoring: 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 FY2009) | | | | | |
| 52 | 6 | Fish Passage Center | 199403300 | BPA | http://www.cbfish.org/Project.mvc/Display/199403300 |
| RPA 52.7 - Review relevant information to determine differential conversion rates: • □ 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. | | | | | |
| 52 | 7 | Smolt Monitoring by Non-Federal Entities | 198712700 | BPA | http://www.cbfish.org/Project.mvc/Display/198712700 |
| 52 | 7 | Okanogan Basin Monitoring & Evaluation Program (OBMEP) | 200302200 | BPA | http://www.cbfish.org/Project.mvc/Display/200302200 |
| 52 | 7 | Lower Granite Dam Adult Trap Operations | 200500200 | BPA | http://www.cbfish.org/Project.mvc/Display/200500200 |
| RPA 52.8 - Adult fish counting will continue at a minimum on the schedule presented: Monitoring adult passage counts is a cornerstone monitoring activity that must be performed on an annual basis. Adult fish counting is typically performed 16 hours per day, during daylight hours, by either video or visual counting methods, at all of the Corps projects that pass fish. Adult fish counting will continue at a minimum on the schedule presented in Table 8. | | | | | |
| 52 | 8 | No Action | | | |
| RPA 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: | | | | | |
| 53 | | North shore ladder exit (weirs) improvements | 138171 | USACE | |
| 53 | | Adult migration studies | 118618 | USACE | |

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|---|---|---|-----------|-------|---|
| 53 | | Estuary survival (post-FCRPS passage) | 135993 | USACE | |
| RPA 53.1 - Monitor/estimate abundance of smolts passing index dams: Monitor and estimate the abundance of smolts passing index dams. | | | | | |
| 53 | 1 | Smolt Monitoring by Non-Federal Entities | 198712700 | BPA | http://www.cbfish.org/Project.mvc/Display/198712700 |
| 53 | 1 | Research, monitoring, and evaluation of emerging issues and measures to recover the Snake River fall Chinook salmon ESU | 199102900 | BPA | http://www.cbfish.org/Project.mvc/Display/199102900 |
| 53 | 1 | Modeling and Evaluation Statistical Support for Life-Cycle Studies | 199105100 | BPA | http://www.cbfish.org/Project.mvc/Display/199105100 |
| 53 | 1 | Fish Passage Center | 199403300 | BPA | http://www.cbfish.org/Project.mvc/Display/199403300 |
| 53 | 1 | Smolt Monitoring Video Feasibility Project | 200850600 | BPA | http://www.cbfish.org/Project.mvc/Display/200850600 |
| RPA 53.2 - Monitor/describe migration timing of smolts at index dams: Monitor and describe the migration timing of smolts at index dams, identify potential problems, and evaluate implemented solutions. | | | | | |
| 53 | 2 | Smolt Monitoring by Non-Federal Entities | 198712700 | BPA | http://www.cbfish.org/Project.mvc/Display/198712700 |
| 53 | 2 | Salmon Studies in Idaho Rivers-Idaho Department of Fish and Game (IDFG) | 198909800 | BPA | http://www.cbfish.org/Project.mvc/Display/198909800 |
| 53 | 2 | Idaho Steelhead Monitoring and Evaluation (M&E) Studies | 199005500 | BPA | http://www.cbfish.org/Project.mvc/Display/199005500 |
| 53 | 2 | Pit Tagging Wild Chinook | 199102800 | BPA | http://www.cbfish.org/Project.mvc/Display/199102800 |
| 53 | 2 | Research, monitoring, and evaluation of emerging issues and measures to recover the Snake River fall Chinook salmon ESU | 199102900 | BPA | http://www.cbfish.org/Project.mvc/Display/199102900 |
| 53 | 2 | Modeling and Evaluation Statistical Support for Life-Cycle Studies | 199105100 | BPA | http://www.cbfish.org/Project.mvc/Display/199105100 |
| 53 | 2 | Fish Passage Center | 199403300 | BPA | http://www.cbfish.org/Project.mvc/Display/199403300 |
| 53 | 2 | Comparative Survival Study (CSS) | 199602000 | BPA | http://www.cbfish.org/Project.mvc/Display/199602000 |
| 53 | 2 | Gas Bubble Disease Monitoring | 199602100 | BPA | http://www.cbfish.org/Project.mvc/Display/199602100 |
| 53 | 2 | Evaluate Delayed (Extra) Mortality Associated with Passage of Yearling Chinook Salmon through Snake River Dams | 200304100 | BPA | http://www.cbfish.org/Project.mvc/Display/200304100 |
| 53 | 2 | Smolt Monitoring Video Feasibility Project | 200850600 | BPA | http://www.cbfish.org/Project.mvc/Display/200850600 |
| RPA 53.3 - Monitor/document condition of smolts at dams w/ JBS systems: 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. | | | | | |
| 53 | 3 | Smolt Monitoring by Non-Federal Entities | 198712700 | BPA | http://www.cbfish.org/Project.mvc/Display/198712700 |

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| 53 | 3 | Salmon Studies in Idaho Rivers-Idaho Department of Fish and Game (IDFG) | 198909800 | BPA | http://www.cbfish.org/Project.mvc/Display/198909800 |
| 53 | 3 | Idaho Steelhead Monitoring and Evaluation (M&E) Studies | 199005500 | BPA | http://www.cbfish.org/Project.mvc/Display/199005500 |
| 53 | 3 | Pit Tagging Wild Chinook | 199102800 | BPA | http://www.cbfish.org/Project.mvc/Display/199102800 |
| 53 | 3 | Fish Passage Center | 199403300 | BPA | http://www.cbfish.org/Project.mvc/Display/199403300 |
| 53 | 3 | Comparative Survival Study (CSS) | 199602000 | BPA | http://www.cbfish.org/Project.mvc/Display/199602000 |
| 53 | 3 | Evaluate Delayed (Extra) Mortality Associated with Passage of Yearling Chinook Salmon through Snake River Dams | 200304100 | BPA | http://www.cbfish.org/Project.mvc/Display/200304100 |
| 53 | 3 | Smolt Monitoring Video Feasibility Project | 200850600 | BPA | http://www.cbfish.org/Project.mvc/Display/200850600 |
| RPA 53.4 - Monitor/enumerate adult salmonids passing thru FCRPS fishways: Monitor and enumerate adult salmonids passing through fishways in the FCRPS, identify potential problems, and evaluate implemented solutions. | | | | | |
| 53 | 4 | Smolt Monitoring by Non-Federal Entities | 198712700 | BPA | http://www.cbfish.org/Project.mvc/Display/198712700 |
| RPA 53.5 - Evaluate operation of the BON PH2 corner collector: In addition to current operations (generally April 10 – August 31), 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. | | | | | |
| 53 | 5 | New Marking Monitoring Techniques | 198331900 | BPA | http://www.cbfish.org/Project.mvc/Display/198331900 |
| RPA 54 - Monitor and Evaluate Effects of Configuration and Operation Actions: The following will be conducted at specific projects for specific years as operations or configurations change, or new problems are identified. | | | | | |
| 54 | | Spillwall completion and testing | 122110 | USACE | |
| 54 | | Spillway weir reconfiguration | N/A | USACE | |
| 54 | | Kelt reconditioning planning/implementation | SYS06 | USACE | |
| 54 | | Avian deterrence at dams | N/A | USACE | |
| 54 | | Passage survival testing | N/A | USACE | |
| 54 | | Performance verification monitoring | N/A | USACE | |
| 54 | | Post-construction passage survival testing | N/A | USACE | |
| 54 | | Performance verification monitoring | IHR02 | USACE | |
| 54 | | Performance verification monitoring | LM08 | USACE | |
| 54 | | Performance verification monitoring | LGO05 | USACE | |
| 54 | | Snake River Fall Chinook system survival study | 149671 | USACE | |
| 54 | | Adult migration studies | 118618 | USACE | |
| 54 | | Estuary survival (post-FCRPS passage) | 135993 | USACE | |
| 54 | | Lower River BIOP performance testing | N/A | USACE | |

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| 54 | | Surface bypass biological studies - Mid-Columbia 2009 Analysis | 139436 | USACE | |
| 54 | | Surface bypass biological studies - data synthesis and multi-year analysis | 139436 | USACE | |
| 54 | | Surface bypass biological studies - gateway evaluation | 139346 | USACE | |
| 54 | | Transportation studies: juvenile and adult sockeye | O&M | USACE | |
| 54 | | Delayed mortality of juvenile salmonids - data synthesis and workshop | 107846 | USACE | |

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

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| 54 | 1 | New Marking Monitoring Techniques | 198331900 | BPA | http://www.cbfish.org/Project.mvc/Display/198331900 |
| 54 | 1 | Salmon Studies in Idaho Rivers-Idaho Department of Fish and Game (IDFG) | 198909800 | BPA | http://www.cbfish.org/Project.mvc/Display/198909800 |
| 54 | 1 | Idaho Steelhead Monitoring and Evaluation (M&E) Studies | 199005500 | BPA | http://www.cbfish.org/Project.mvc/Display/199005500 |
| 54 | 1 | Comparative Survival Study (CSS) | 199602000 | BPA | http://www.cbfish.org/Project.mvc/Display/199602000 |
| 54 | 1 | Evaluate Delayed (Extra) Mortality Associated with Passage of Yearling Chinook Salmon through Snake River Dams | 200304100 | BPA | http://www.cbfish.org/Project.mvc/Display/200304100 |

RPA 54.2 - Analyze effectiveness of traditional juvenile bypass systems: Monitor and evaluate the effects of environmental conditions affecting juvenile fish survival.

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| 54 | 2 | Survival Estimate for Passage through Snake and Columbia River Dams and Reservoirs | 199302900 | BPA | http://www.cbfish.org/Project.mvc/Display/199302900 |
| 54 | 2 | Fish Passage Center | 199403300 | BPA | http://www.cbfish.org/Project.mvc/Display/199403300 |

RPA 54.3 - Evaluate effectiveness of surface bypass structures: Monitor and evaluate the effectiveness of reducing predation toward improving juvenile fish survival.

RPA 54.4 - Evaluate effectiveness of turbine ops: Investigate, evaluate and deploy alternative technologies and methodologies for fish passage and the RM&E Action.

RPA 54.5 - Evaluate overall dam passage for modifications at projects: Determine if actions directed at benefiting juveniles have an unintended effect on migrating adults (e.g., certain spill operations).

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| 54 | 5 | Smolt Monitoring by Non-Federal Entities | 198712700 | BPA | http://www.cbfish.org/Project.mvc/Display/198712700 |
| 54 | 5 | Salmon Studies in Idaho Rivers-Idaho Department of Fish and Game (IDFG) | 198909800 | BPA | http://www.cbfish.org/Project.mvc/Display/198909800 |
| 54 | 5 | Idaho Steelhead Monitoring and Evaluation (M&E) Studies | 199005500 | BPA | http://www.cbfish.org/Project.mvc/Display/199005500 |
| 54 | 5 | Comparative Survival Study (CSS) | 199602000 | BPA | http://www.cbfish.org/Project.mvc/Display/199602000 |

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| 54 | 5 | Evaluate Delayed (Extra) Mortality Associated with Passage of Yearling Chinook Salmon through Snake River Dams | 200304100 | BPA | http://www.cbfish.org/Project.mvc/Display/200304100 |
| RPA 54.6 - Evaluate effectiveness of juvenile fish transport program: Install and maintain adult PIT-tag detectors in fish ladders at key dams in the FCRPS and evaluate adult survival (conversion rates). | | | | | |
| 54 | 6 | Smolt Monitoring by Non-Federal Entities | 198712700 | BPA | http://www.cbfish.org/Project.mvc/Display/198712700 |
| 54 | 6 | Salmon Studies in Idaho Rivers-Idaho Department of Fish and Game (IDFG) | 198909800 | BPA | http://www.cbfish.org/Project.mvc/Display/198909800 |
| 54 | 6 | Idaho Steelhead Monitoring and Evaluation (M&E) Studies | 199005500 | BPA | http://www.cbfish.org/Project.mvc/Display/199005500 |
| 54 | 6 | Pit Tagging Wild Chinook | 199102800 | BPA | http://www.cbfish.org/Project.mvc/Display/199102800 |
| 54 | 6 | Comparative Survival Study (CSS) | 199602000 | BPA | http://www.cbfish.org/Project.mvc/Display/199602000 |
| 54 | 6 | Evaluate Delayed (Extra) Mortality Associated with Passage of Yearling Chinook Salmon through Snake River Dams | 200304100 | BPA | http://www.cbfish.org/Project.mvc/Display/200304100 |
| RPA 54.7 - Evaluate environ. condition impact on juvenile fish survival: Monitor and evaluate the effects of fish ladder operations and configurations on adult passage rates. | | | | | |
| 54 | 7 | Smolt Monitoring by Non-Federal Entities | 198712700 | BPA | http://www.cbfish.org/Project.mvc/Display/198712700 |
| 54 | 7 | Salmon Studies in Idaho Rivers-Idaho Department of Fish and Game (IDFG) | 198909800 | BPA | http://www.cbfish.org/Project.mvc/Display/198909800 |
| 54 | 7 | Idaho Steelhead Monitoring and Evaluation (M&E) Studies | 199005500 | BPA | http://www.cbfish.org/Project.mvc/Display/199005500 |
| 54 | 7 | Pit Tagging Wild Chinook | 199102800 | BPA | http://www.cbfish.org/Project.mvc/Display/199102800 |
| 54 | 7 | Survival Estimate for Passage through Snake and Columbia River Dams and Reservoirs | 199302900 | BPA | http://www.cbfish.org/Project.mvc/Display/199302900 |
| 54 | 7 | Comparative Survival Study (CSS) | 199602000 | BPA | http://www.cbfish.org/Project.mvc/Display/199602000 |
| 54 | 7 | Evaluate Delayed (Extra) Mortality Associated with Passage of Yearling Chinook Salmon through Snake River Dams | 200304100 | BPA | http://www.cbfish.org/Project.mvc/Display/200304100 |
| RPA 54.8 - Evaluate impact of reducing predation to improve survival: 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 route for overwintering steelhead and kelts, implement if warranted. | | | | | |
| 54 | 8 | Salmon Studies in Idaho Rivers-Idaho Department of Fish and Game (IDFG) | 198909800 | BPA | http://www.cbfish.org/Project.mvc/Display/198909800 |
| 54 | 8 | Idaho Steelhead Monitoring and Evaluation (M&E) Studies | 199005500 | BPA | http://www.cbfish.org/Project.mvc/Display/199005500 |

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| 54 | 8 | Development of Systemwide Predator Control | 199007700 | BPA | http://www.cbfish.org/Project.mvc/Display/199007700 |
| 54 | 8 | Pit Tagging Wild Chinook | 199102800 | BPA | http://www.cbfish.org/Project.mvc/Display/199102800 |
| 54 | 8 | Comparative Survival Study (CSS) | 199602000 | BPA | http://www.cbfish.org/Project.mvc/Display/199602000 |
| 54 | 8 | Avian Predation on Juvenile Salmonids | 199702400 | BPA | http://www.cbfish.org/Project.mvc/Display/199702400 |
| 54 | 8 | Evaluate Delayed (Extra) Mortality Associated with Passage of Yearling Chinook Salmon through Snake River Dams | 200304100 | BPA | http://www.cbfish.org/Project.mvc/Display/200304100 |
| RPA 54.9 - Evaluate/deploy alternative methodologies for fish passage: Investigate surface-flow outlets during wintertime to provide safer fallback opportunity for over wintering steelhead (need will be determined by results of further research). | | | | | |
| 54 | 9 | New Marking Monitoring Techniques | 198331900 | BPA | http://www.cbfish.org/Project.mvc/Display/198331900 |
| 54 | 9 | Physical and Biological Testing of a Flow Velocity Enhancement System (FVES) | 200753500 | BPA | http://www.cbfish.org/Project.mvc/Display/200753500 |
| RPA 54.10 - Determine adult impacts of actions benefitting juveniles: Monitor and evaluate the effectiveness of traditional juvenile bypass systems and modifications to such, on smolt survival and condition. | | | | | |
| 54 | 10 | Salmon Studies in Idaho Rivers-Idaho Department of Fish and Game (IDFG) | 198909800 | BPA | http://www.cbfish.org/Project.mvc/Display/198909800 |
| 54 | 10 | Idaho Steelhead Monitoring and Evaluation (M&E) Studies | 199005500 | BPA | http://www.cbfish.org/Project.mvc/Display/199005500 |
| 54 | 10 | Pit Tagging Wild Chinook | 199102800 | BPA | http://www.cbfish.org/Project.mvc/Display/199102800 |
| 54 | 10 | Comparative Survival Study (CSS) | 199602000 | BPA | http://www.cbfish.org/Project.mvc/Display/199602000 |
| RPA 54.11 - Maintain adult PIT-tag detectors in fish ladders at key dams: Monitor and evaluate the effectiveness of surface bypass structures and modifications on smolt survival and condition. | | | | | |
| 54 | 11 | Adult Pit Detector Installation | 200100300 | BPA | http://www.cbfish.org/Project.mvc/Display/200100300 |
| RPA 54.12 - Monitor/evaluate effects of fish ladder ops and configuration: Monitor and evaluate the effectiveness of turbine operations and modifications on smolt survival and condition. | | | | | |
| 54 | 12 | Salmon Studies in Idaho Rivers-Idaho Department of Fish and Game (IDFG) | 198909800 | BPA | http://www.cbfish.org/Project.mvc/Display/198909800 |
| 54 | 12 | Idaho Steelhead Monitoring and Evaluation (M&E) Studies | 199005500 | BPA | http://www.cbfish.org/Project.mvc/Display/199005500 |
| 54 | 12 | Pit Tagging Wild Chinook | 199102800 | BPA | http://www.cbfish.org/Project.mvc/Display/199102800 |
| 54 | 12 | Comparative Survival Study (CSS) | 199602000 | BPA | http://www.cbfish.org/Project.mvc/Display/199602000 |

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| 54 | 12 | Evaluate Delayed (Extra) Mortality Associated with Passage of Yearling Chinook Salmon through Snake River Dams | 200304100 | BPA | http://www.cbfish.org/Project.mvc/Display/200304100 |
| RPA 54.13 - Evaluate ops of TDA sluiceway (Mar 1-Mar 31) & (Dec 1-Dec 15): Monitor and evaluate overall dam passage with respect to modifications at projects (including forebay delay and survival). | | | | | |
| 54 | 13 | New Marking Monitoring Techniques | 198331900 | BPA | http://www.cbfish.org/Project.mvc/Display/198331900 |
| 54 | 13 | Fish Passage Center | 199403300 | BPA | http://www.cbfish.org/Project.mvc/Display/199403300 |
| RPA 54.14 - Investigate surface-flow outlets during wintertime: Monitor and evaluate the effectiveness of the juvenile fish transportation program and modifications to operations. | | | | | |
| 54 | 14 | New Marking Monitoring Techniques | 198331900 | BPA | http://www.cbfish.org/Project.mvc/Display/198331900 |
| RPA 55 - Investigate Hydro Critical Uncertainties and Investigate New Technologies: The Action Agencies will fund selected research directed at resolving critical uncertainties that are pivotal in lifecycle model analyses. These specific actions include: | | | | | |
| 55 | | PIT detection development | N/A | USACE | |
| 55 | | Survival study methodologies | Sys03 | USACE | |
| 55 | | SNAKE RIVER FALL CHINOOK SYSTEM SURVIVAL STUDY | 149671 | USACE | |
| 55 | | Estuary survival (post-FCRPS passage) | 135993 | USACE | |
| 55 | | Lower River BIOP performance testing | N/A | USACE | |
| 55 | | Transportation studies: juvenile and adult sockeye | O&M | USACE | |
| 55 | | Delayed mortality of juvenile salmonids - data synthesis and workshop | 107846 | USACE | |
| RPA 55.1 - Investigate/quantify D-value due to transportation of smolts: 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) | | | | | |
| 55 | 1 | Smolt Monitoring by Non-Federal Entities | 198712700 | BPA | http://www.cbfish.org/Project.mvc/Display/198712700 |
| 55 | 1 | Salmon Studies in Idaho Rivers-Idaho Department of Fish and Game (IDFG) | 198909800 | BPA | http://www.cbfish.org/Project.mvc/Display/198909800 |
| 55 | 1 | Idaho Steelhead Monitoring and Evaluation (M&E) Studies | 199005500 | BPA | http://www.cbfish.org/Project.mvc/Display/199005500 |
| 55 | 1 | Pit Tagging Wild Chinook | 199102800 | BPA | http://www.cbfish.org/Project.mvc/Display/199102800 |
| 55 | 1 | Comparative Survival Study (CSS) | 199602000 | BPA | http://www.cbfish.org/Project.mvc/Display/199602000 |
| 55 | 1 | Evaluate Delayed (Extra) Mortality Associated with Passage of Yearling Chinook Salmon through Snake River Dams | 200304100 | BPA | http://www.cbfish.org/Project.mvc/Display/200304100 |
| 55 | 1 | Pacific Ocean Survey Tracking (POST) | 200311400 | BPA | http://www.cbfish.org/Project.mvc/Display/200311400 |

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| 55 | 1 | Lower Granite Dam Adult Trap Operations | 200500200 | BPA | http://www.cbfish.org/Project.mvc/Display/200500200 |
| 55 | 1 | Pittag Sr Sockeye-Uc Sp.Chnook | 200872400 | BPA | http://www.cbfish.org/Project.mvc/Display/200872400 |
| RPA 55.2 - Analyze post-BON mortality due to arrival timing/transport: Investigate the post-Bonneville mortality effect of changes in fish arrival timing and transportation to below Bonneville. (Initiate in FY 2007-2009) | | | | | |
| 55 | 2 | Smolt Monitoring by Non-Federal Entities | 198712700 | BPA | http://www.cbfish.org/Project.mvc/Display/198712700 |
| 55 | 2 | Salmon Studies in Idaho Rivers-Idaho Department of Fish and Game (IDFG) | 198909800 | BPA | http://www.cbfish.org/Project.mvc/Display/198909800 |
| 55 | 2 | Idaho Steelhead Monitoring and Evaluation (M&E) Studies | 199005500 | BPA | http://www.cbfish.org/Project.mvc/Display/199005500 |
| 55 | 2 | Pit Tagging Wild Chinook | 199102800 | BPA | http://www.cbfish.org/Project.mvc/Display/199102800 |
| 55 | 2 | Fish Passage Center | 199403300 | BPA | http://www.cbfish.org/Project.mvc/Display/199403300 |
| 55 | 2 | Comparative Survival Study (CSS) | 199602000 | BPA | http://www.cbfish.org/Project.mvc/Display/199602000 |
| 55 | 2 | Evaluate Delayed (Extra) Mortality Associated with Passage of Yearling Chinook Salmon through Snake River Dams | 200304100 | BPA | http://www.cbfish.org/Project.mvc/Display/200304100 |
| 55 | 2 | Pacific Ocean Survey Tracking (POST) | 200311400 | BPA | http://www.cbfish.org/Project.mvc/Display/200311400 |
| 55 | 2 | Lower Granite Dam Adult Trap Operations | 200500200 | BPA | http://www.cbfish.org/Project.mvc/Display/200500200 |
| 55 | 2 | Pittag Sr Sockeye-Uc Sp.Chnook | 200872400 | BPA | http://www.cbfish.org/Project.mvc/Display/200872400 |
| RPA 55.3 - Review RM&E approaches every other year w/ ISAB: 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) | | | | | |
| 55 | 3 | No Project Funded | | | |
| RPA 55.4 - Investigate key chars of SR Fall Chinook early life history: 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) | | | | | |
| 55 | 4 | New Marking Monitoring Techniques | 198331900 | BPA | http://www.cbfish.org/Project.mvc/Display/198331900 |
| 55 | 4 | Smolt Monitoring by Non-Federal Entities | 198712700 | BPA | http://www.cbfish.org/Project.mvc/Display/198712700 |
| 55 | 4 | Research, monitoring, and evaluation of emerging issues and measures to recover the Snake River fall Chinook salmon ESU | 199102900 | BPA | http://www.cbfish.org/Project.mvc/Display/199102900 |
| 55 | 4 | Snake River Fall Chinook Salmon Life History Investigations | 200203200 | BPA | http://www.cbfish.org/Project.mvc/Display/200203200 |

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| RPA 55.5 - Report adult passage experience impact on pre-spawning mortality: 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. | | | | | |
| 55 | 5 | New Marking Monitoring Techniques | 198331900 | BPA | http://www.cbfish.org/Project.mvc/Display/198331900 |
| 55 | 5 | Pittag Sr Sockeye-Uc Sp.Chnook | 200872400 | BPA | http://www.cbfish.org/Project.mvc/Display/200872400 |
| RPA 55.6 - Continue development of state-of-the-art turbine units: 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. | | | | | |
| RPA 55.7 - Investigate feasibility of spillway/turbine PIT-tag detector: Investigate feasibility of developing PIT-tag detectors for spillways and turbines. | | | | | |
| 55 | 7 | New Marking Monitoring Techniques | 198331900 | BPA | http://www.cbfish.org/Project.mvc/Display/198331900 |
| RPA 55.8 - Evaluate new tagging technologies: Evaluate new tagging technologies for use in improving the accuracy and assessing delayed or indirect hydro effects on juvenile or adult fish. | | | | | |
| 55 | 8 | New Marking Monitoring Techniques | 198331900 | BPA | http://www.cbfish.org/Project.mvc/Display/198331900 |
| 55 | 8 | Pacific Ocean Survey Tracking (POST) | 200311400 | BPA | http://www.cbfish.org/Project.mvc/Display/200311400 |
| RPA 55.9 - Assess feasibility of PIT-tag detectors in natal streams and tributaries: 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. | | | | | |
| 55 | 9 | New Marking Monitoring Techniques | 198331900 | BPA | http://www.cbfish.org/Project.mvc/Display/198331900 |
| RPA 56 - Monitor and Evaluate Tributary Habitat Conditions and Limiting Factors: The Action Agencies will: | | | | | |
| RPA 56.1 - Implement research in select areas of the pilot study basins: 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). | | | | | |
| 56 | 1 | Nez Perce Tribal Hatchery Monitoring and Evaluation (M&E) | 198335003 | BPA | http://www.cbfish.org/Project.mvc/Display/198335003 |
| 56 | 1 | John Day Habitat Enhancement | 198402100 | BPA | http://www.cbfish.org/Project.mvc/Display/198402100 |
| 56 | 1 | Blue Mountain Fish Habitat Improvement | 198402500 | BPA | http://www.cbfish.org/Project.mvc/Display/198402500 |
| 56 | 1 | Hood River Production Monitoring and Evaluation (M&E)-Warm Springs | 198805303 | BPA | http://www.cbfish.org/Project.mvc/Display/198805303 |

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| 56 | 1 | Hood River Production Monitor and Evaluation (M&E)-Oregon Department of Fish and Wildlife (ODFW) | 198805304 | BPA | http://www.cbfish.org/Project.mvc/Display/198805304 |
| 56 | 1 | Evaluate Umatilla Juvenile Salmonid Outmigration | 198902401 | BPA | http://www.cbfish.org/Project.mvc/Display/198902401 |
| 56 | 1 | Salmon Studies in Idaho Rivers-Idaho Department of Fish and Game (IDFG) | 198909800 | BPA | http://www.cbfish.org/Project.mvc/Display/198909800 |
| 56 | 1 | Idaho Steelhead Monitoring and Evaluation (M&E) Studies | 199005500 | BPA | http://www.cbfish.org/Project.mvc/Display/199005500 |
| 56 | 1 | Grand Ronde Early Life History of Spring Chinook and Steelhead | 199202604 | BPA | http://www.cbfish.org/Project.mvc/Display/199202604 |
| 56 | 1 | Asotin Creek Enhancement and Restoration | 199401805 | BPA | http://www.cbfish.org/Project.mvc/Display/199401805 |
| 56 | 1 | Tucannon Stream and Riparian Restoration | 199401806 | BPA | http://www.cbfish.org/Project.mvc/Display/199401806 |
| 56 | 1 | Trout Creek Operations and Maintenance (O&M) | 199404200 | BPA | http://www.cbfish.org/Project.mvc/Display/199404200 |
| 56 | 1 | Klickitat River Monitoring and Evaluation-Yakima/Klickitat Fisheries Project (YKFP) | 199506335 | BPA | http://www.cbfish.org/Project.mvc/Display/199506335 |
| 56 | 1 | Comparative Survival Study (CSS) | 199602000 | BPA | http://www.cbfish.org/Project.mvc/Display/199602000 |
| 56 | 1 | Yakama Reservation Watershed Project | 199603501 | BPA | http://www.cbfish.org/Project.mvc/Display/199603501 |
| 56 | 1 | Imnaha River Smolt Monitoring | 199701501 | BPA | http://www.cbfish.org/Project.mvc/Display/199701501 |
| 56 | 1 | Klickitat Watershed Enhancement | 199705600 | BPA | http://www.cbfish.org/Project.mvc/Display/199705600 |
| 56 | 1 | Spawning Distribution of Snake River Fall Chinook Salmon | 199801003 | BPA | http://www.cbfish.org/Project.mvc/Display/199801003 |
| 56 | 1 | Wind River Watershed | 199801900 | BPA | http://www.cbfish.org/Project.mvc/Display/199801900 |
| 56 | 1 | Walla Walla River Basin Monitoring and Evaluation (M&E) | 200003900 | BPA | http://www.cbfish.org/Project.mvc/Display/200003900 |
| 56 | 1 | Snake River Fall Chinook Salmon Life History Investigations | 200203200 | BPA | http://www.cbfish.org/Project.mvc/Display/200203200 |
| 56 | 1 | Yankee Fork Salmon River Restoration | 200205900 | BPA | http://www.cbfish.org/Project.mvc/Display/200205900 |
| 56 | 1 | Potlatch River Watershed Restoration | 200206100 | BPA | http://www.cbfish.org/Project.mvc/Display/200206100 |
| 56 | 1 | Lower Columbia River Estuary Ecosystem Monitoring | 200300700 | BPA | http://www.cbfish.org/Project.mvc/Display/200300700 |
| 56 | 1 | Historic Habitat Food Web Link | 200301000 | BPA | http://www.cbfish.org/Project.mvc/Display/200301000 |

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| 56 | 1 | Integrated Status and Effectiveness Monitoring Program (ISEMP) | 200301700 | BPA | http://www.cbfish.org/Project.mvc/Display/200301700 |
| 56 | 1 | Monitor and Evaluate (M&E) Reproductive Success and Survival in Wenatchee River | 200303900 | BPA | http://www.cbfish.org/Project.mvc/Display/200303900 |
| 56 | 1 | Grande Ronde Supplementation Monitoring and Evaluation (M&E) on Catherine Creek/Upper Grande Ronde River | 200708300 | BPA | http://www.cbfish.org/Project.mvc/Display/200708300 |
| 56 | 1 | East Fork of South Fork Salmon River Passage Restoration | 200712700 | BPA | http://www.cbfish.org/Project.mvc/Display/200712700 |
| 56 | 1 | Rock Creek Fish and Habitat Assessment | 200715600 | BPA | http://www.cbfish.org/Project.mvc/Display/200715600 |
| 56 | 1 | Distribution and Abundance Monitoring of Oncorhynchus mykiss within the Lower Clearwater Subbasin | 200723300 | BPA | http://www.cbfish.org/Project.mvc/Display/200723300 |
| 56 | 1 | Upper Columbia Nutrient Supplementation | 200847100 | BPA | http://www.cbfish.org/Project.mvc/Display/200847100 |
| 56 | 1 | Upper Columbia Habitat Restoration | 200900300 | BPA | http://www.cbfish.org/Project.mvc/Display/200900300 |
| 56 | 1 | Imnaha River steelhead status monitoring | 201003200 | BPA | http://www.cbfish.org/Project.mvc/Display/201003200 |
| 56 | 1 | Umatilla Basin IMW | 201005600 | BPA | http://www.cbfish.org/Project.mvc/Display/201005600 |
| 56 | 1 | Fish Pop Genetics | USBRIA142506A AIC4797 | USBR | Non Available |
| 56 | 1 | Methow Fish Production, Food Webs, | USBRIAw/USGS1 42508AA1C4887 | USBR | Non Available |
| 56 | 1 | Develop Effectiveness Monitoring Population Models | TBA | USBR | Non Available |
| 56 | 1 | Landscape Classification | USBRIAw/NOAA 142506AA1C4806 | USBR | Non Available |
| RPA 56.2 - Implement habitat status/trend monitoring as component of pilot studies: 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 project continue to provide a means of evaluating the effectiveness of tributary mitigation actions. | | | | | |
| 56 | 2 | John Day Habitat Enhancement | 198402100 | BPA | http://www.cbfish.org/Project.mvc/Display/198402100 |
| 56 | 2 | Blue Mountain Fish Habitat Improvement | 198402500 | BPA | http://www.cbfish.org/Project.mvc/Display/198402500 |
| 56 | 2 | Yankee Fork Salmon River Restoration | 200205900 | BPA | http://www.cbfish.org/Project.mvc/Display/200205900 |
| 56 | 2 | Historic Habitat Food Web Link | 200301000 | BPA | http://www.cbfish.org/Project.mvc/Display/200301000 |

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| 56 | 2 | Integrated Status and Effectiveness Monitoring Program (ISEMP) | 200301700 | BPA | http://www.cbfish.org/Project.mvc/Display/200301700 |
| 56 | 2 | Grande Ronde Supplementation Monitoring and Evaluation (M&E) on Catherine Creek/Upper Grande Ronde River | 200708300 | BPA | http://www.cbfish.org/Project.mvc/Display/200708300 |
| 56 | 2 | Upper Columbia Nutrient Supplementation | 200847100 | BPA | http://www.cbfish.org/Project.mvc/Display/200847100 |
| 56 | 2 | Upper Columbia Habitat Restoration | 200900300 | BPA | http://www.cbfish.org/Project.mvc/Display/200900300 |
| 56 | 2 | Upper Columbia Water Quality and Water Quantity Gauges | 201005100 | BPA | http://www.cbfish.org/Project.mvc/Display/201005100 |

RPA 56.3 - Develop strategy for habitat status/trend monitoring for ESA fish: 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)

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| 56 | 3 | Yakama Reservation Watershed Project | 199603501 | BPA | http://www.cbfish.org/Project.mvc/Display/199603501 |
| 56 | 3 | Snake River Fall Chinook Salmon Life History Investigations | 200203200 | BPA | http://www.cbfish.org/Project.mvc/Display/200203200 |
| 56 | 3 | Evaluate Stream Habitat- Nez Perce Tribe Watershed Monitoring and Evaluation (M&E) Plan. | 200206800 | BPA | http://www.cbfish.org/Project.mvc/Display/200206800 |
| 56 | 3 | Grays River Watershed assessment | 200301300 | BPA | http://www.cbfish.org/Project.mvc/Display/200301300 |
| 56 | 3 | Pacific Northwest Aquatic Monitoring Program (PNAMP) Coordination | 200400200 | BPA | http://www.cbfish.org/Project.mvc/Display/200400200 |
| 56 | 3 | Snake River Sockeye Captive Propagation | 200740200 | BPA | http://www.cbfish.org/Project.mvc/Display/200740200 |
| 56 | 3 | Project to provided VSP Estimates for Yakima Steelhead MPG | 201003000 | BPA | http://www.cbfish.org/Project.mvc/Display/201003000 |
| 56 | 3 | Toppenish Creek Steelhead Status & Trend Monitoring | 201003700 | BPA | http://www.cbfish.org/Project.mvc/Display/201003700 |
| 56 | 3 | Upper Columbia Water Quality and Water Quantity Gauges | 201005100 | BPA | http://www.cbfish.org/Project.mvc/Display/201005100 |
| 56 | 3 | Upper Grande Ronde and Catherine Creek IMW | 201005500 | BPA | http://www.cbfish.org/Project.mvc/Display/201005500 |

RPA 57 - Evaluate the Effectiveness of Tributary Habitat Actions: Evaluate the Effectiveness of Tributary Habitat Actions

RPA 57.1 - Entiat-Study ways to improve channel complexity & fish prod: 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).

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| 57 | 1 | Yankee Fork Salmon River Restoration | 200205900 | BPA | http://www.cbfish.org/Project.mvc/Display/200205900 |
| 57 | 1 | Integrated Status and Effectiveness Monitoring Program (ISEMP) | 200301700 | BPA | http://www.cbfish.org/Project.mvc/Display/200301700 |
| 57 | 1 | Upper Columbia Water Quality and Water Quantity Gauges | 201005100 | BPA | http://www.cbfish.org/Project.mvc/Display/201005100 |
| RPA 57.2 - Lehmi-Study reduce entrainment & provide better fish passage: 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). | | | | | |
| 57 | 2 | Water Entity - Water Transaction Program | 200201301 | BPA | http://www.cbfish.org/Project.mvc/Display/200201301 |
| 57 | 2 | Yankee Fork Salmon River Restoration | 200205900 | BPA | http://www.cbfish.org/Project.mvc/Display/200205900 |
| 57 | 2 | Historic Habitat Food Web Link | 200301000 | BPA | http://www.cbfish.org/Project.mvc/Display/200301000 |
| RPA 57.3 - Bridge Creek-Study treatments of channel incision: 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). | | | | | |
| 57 | 3 | Yankee Fork Salmon River Restoration | 200205900 | BPA | http://www.cbfish.org/Project.mvc/Display/200205900 |
| 57 | 3 | Lower Columbia River Estuary Ecosystem Monitoring | 200300700 | BPA | http://www.cbfish.org/Project.mvc/Display/200300700 |
| 57 | 3 | Integrated Status and Effectiveness Monitoring Program (ISEMP) | 200301700 | BPA | http://www.cbfish.org/Project.mvc/Display/200301700 |
| RPA 57.4 - Wenatchee/Methow/John Day-Habitat/fish productivity assessment: 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). | | | | | |
| 57 | 4 | John Day Habitat Enhancement | 198402100 | BPA | http://www.cbfish.org/Project.mvc/Display/198402100 |
| 57 | 4 | Blue Mountain Fish Habitat Improvement | 198402500 | BPA | http://www.cbfish.org/Project.mvc/Display/198402500 |
| 57 | 4 | Trout Creek Operations and Maintenance (O&M) | 199404200 | BPA | http://www.cbfish.org/Project.mvc/Display/199404200 |
| 57 | 4 | Mid-Columbia Reintroduction Feasibility Study | 199604000 | BPA | http://www.cbfish.org/Project.mvc/Display/199604000 |
| 57 | 4 | Water Entity - Water Transaction Program | 200201301 | BPA | http://www.cbfish.org/Project.mvc/Display/200201301 |
| 57 | 4 | Yankee Fork Salmon River Restoration | 200205900 | BPA | http://www.cbfish.org/Project.mvc/Display/200205900 |
| 57 | 4 | Integrated Status and Effectiveness Monitoring Program (ISEMP) | 200301700 | BPA | http://www.cbfish.org/Project.mvc/Display/200301700 |

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| 57 | 4 | Grande Ronde Supplementation Monitoring and Evaluation (M&E) on Catherine Creek/Upper Grande Ronde River | 200708300 | BPA | http://www.cbfish.org/Project.mvc/Display/200708300 |
| 57 | 4 | Upper Columbia Habitat Restoration | 200900300 | BPA | http://www.cbfish.org/Project.mvc/Display/200900300 |
| 57 | 4 | Methow Channel Restoration and Fish Productivity Response | USGSIA142508A A1C4887 | USBR | Non Availble |
| RPA 57.5 - Refine models relating habitat actions to ecosystem function: Action Agencies will convene a regional technical group to develop an initial set of relationships in FY 2008, 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 FY 2008) | | | | | |
| 57 | 5 | Wind River Watershed | 199801900 | BPA | http://www.cbfish.org/Project.mvc/Display/199801900 |
| 57 | 5 | Pacific Northwest Aquatic Monitoring Program (PNAMP) Coordination | 200400200 | BPA | http://www.cbfish.org/Project.mvc/Display/200400200 |
| 57 | 5 | Biomonitoring of Fish Habitat Enhancement | 200901400 | BPA | http://www.cbfish.org/Project.mvc/Display/200901400 |
| 57 | 5 | Landscape Influences on Stream Condition | NWFSCIA142506 AA1C4806 | USBR | Non Availble |
| RPA 58 - Monitor and Evaluate Fish Performance in the Estuary and Plume: The Action Agencies will monitor biological responses and/or environmental attributes, and report in the following areas: | | | | | |
| 58 | | Estuary survival (post-FCRPS passage) | 135993 | USACE | |
| 58 | | Estuary habitat studies - Contribution of tidal fluvial habitats in the Columbia River estuary to the recovery of diverse salmon ESUs | 123452 | USACE | |
| 58 | | Estuary habitat studies - Juvenile salmon ecology and restoration of tidal freshwater habitats | 123452 | USACE | |
| 58 | | Estuary habitat studies - Evaluation of life history diversity, habitat cConnectivity, and survival benefits associated with habitat restoration actions in the lower Columbia River and estuary | 123452 | USACE | |
| 58 | | Estuary habitat studies - Cumulative ecosystem response to habitat restoration projects in the lower Columbia River and estuary (final year) | 123452 | USACE | |
| RPA 58.1 - Evaluate smolt fitness in reaches from BON through estuary: 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) | | | | | |
| 58 | 1 | Pacific Ocean Survey Tracking (POST) | 200311400 | BPA | http://www.cbfish.org/Project.mvc/Display/200311400 |
| RPA 58.2 - Develop index & evaluate life history diversity of salmonid populations: 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) | | | | | |

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| 58 | 2 | Historic Habitat Food Web Link | 200301000 | BPA | http://www.cbfish.org/Project.mvc/Display/200301000 |
| 58 | 2 | Tidal Freshwater Monitoring | 200500100 | BPA | http://www.cbfish.org/Project.mvc/Display/200500100 |
| RPA 58.3 - Evaluate juvenile salmonid growth rates & prey resources: 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) | | | | | |
| 58 | 3 | Ocean Survival of Salmonids | 199801400 | BPA | http://www.cbfish.org/Project.mvc/Display/199801400 |
| 58 | 3 | Lower Columbia River Estuary Ecosystem Monitoring | 200300700 | BPA | http://www.cbfish.org/Project.mvc/Display/200300700 |
| 58 | 3 | Historic Habitat Food Web Link | 200301000 | BPA | http://www.cbfish.org/Project.mvc/Display/200301000 |
| 58 | 3 | Tidal Freshwater Monitoring | 200500100 | BPA | http://www.cbfish.org/Project.mvc/Display/200500100 |
| RPA 58.4 - Evaluate juvenile salmonid predators: 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) | | | | | |
| 58 | 4 | Ocean Survival of Salmonids | 199801400 | BPA | http://www.cbfish.org/Project.mvc/Display/199801400 |
| 58 | 4 | Lower Columbia River Estuary Ecosystem Monitoring | 200300700 | BPA | http://www.cbfish.org/Project.mvc/Display/200300700 |
| RPA 59 - Monitor and Evaluate Migration Characteristics and Estuary/Ocean Conditions: The Action Agencies will monitor and evaluate selected ecological attributes of the estuary, which include the following or equivalent: | | | | | |
| 59 | | Estuary habitat studies - Contribution of tidal fluvial habitats in the Columbia River estuary to the recovery of diverse salmon ESUs | 123452 | USACE | |
| 59 | | Estuary habitat studies - Juvenile salmon ecology and restoration of tidal freshwater habitats | 123452 | USACE | |
| 59 | | Estuary habitat studies - Evaluation of life history diversity, habitat connectivity, and survival benefits associated with habitat restoration actions in the lower Columbia River and estuary | 123452 | USACE | |
| 59 | | Estuary habitat studies - Cumulative ecosystem response to habitat restoration projects in the lower Columbia River and estuary (final year) | 123452 | USACE | |
| RPA 59.1 - Map estuary bathymetry and topography: Map bathymetry and topography of the estuary as needed for RM&E. (Initiate in FY 2007-2009 Projects) | | | | | |
| 59 | 1 | Lower Columbia River Estuary Ecosystem Monitoring | 200300700 | BPA | http://www.cbfish.org/Project.mvc/Display/200300700 |

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| 59 | 1 | Columbia River Estuary Habitat Restoration | 200301100 | BPA | http://www.cbfish.org/Project.mvc/Display/200301100 |
| 59 | 1 | Tidal Freshwater Monitoring | 200500100 | BPA | http://www.cbfish.org/Project.mvc/Display/200500100 |
| RPA 59.2 - Establish habitat classification system: Establish a hierarchical habitat classification system based on hydrogeomorphology, ground-truth it with vegetation cover monitoring data, and map existing habitats. (Initiate in FY 2007-2009 Projects) | | | | | |
| 59 | 2 | Lower Columbia River Estuary Ecosystem Monitoring | 200300700 | BPA | http://www.cbfish.org/Project.mvc/Display/200300700 |
| RPA 59.3 - Develop index of habitat connectivity: 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) | | | | | |
| RPA 59.4 - Evaluate migration through and use of shallow-water habitats: 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. (Initiate in FY 2007-2009 Projects, then annually) | | | | | |
| 59 | 4 | Lower Columbia River Estuary Ecosystem Monitoring | 200300700 | BPA | http://www.cbfish.org/Project.mvc/Display/200300700 |
| 59 | 4 | Historic Habitat Food Web Link | 200301000 | BPA | http://www.cbfish.org/Project.mvc/Display/200301000 |
| 59 | 4 | Tidal Freshwater Monitoring | 200500100 | BPA | http://www.cbfish.org/Project.mvc/Display/200500100 |
| RPA 59.5 - Monitor habitat conditions periodically: 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. (FY 2007-2009 Projects, then annually) | | | | | |
| 59 | 5 | Lower Columbia River Estuary Ecosystem Monitoring | 200300700 | BPA | http://www.cbfish.org/Project.mvc/Display/200300700 |
| 59 | 5 | Columbia River Estuary Habitat Restoration | 200301100 | BPA | http://www.cbfish.org/Project.mvc/Display/200301100 |
| 59 | 5 | Tidal Freshwater Monitoring | 200500100 | BPA | http://www.cbfish.org/Project.mvc/Display/200500100 |
| RPA 60 - Monitor and Evaluate Habitat Actions in the Estuary: The Action Agencies will monitor and evaluate the effects of a representative set of habitat projects in the estuary, as follows: | | | | | |
| 60 | | Estuary habitat studies - Evaluation of life history diversity, habitat connectivity, and survival benefits associated with habitat restoration actions in the lower Columbia River and estuary | 123452 | USACE | |
| 60 | | Estuary habitat studies - Action effectiveness research and monitoring of ecosystem restoration actions within the lower Columbia River and estuary | 123452 | USACE | |
| RPA 60.1 - Develop reference sites for typical habitats: 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) | | | | | |

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| 60 | 1 | Lower Columbia River Estuary Ecosystem Monitoring | 200300700 | BPA | http://www.cbfish.org/Project.mvc/Display/200300700 |
| 60 | 1 | Columbia River Estuary Habitat Restoration | 200301100 | BPA | http://www.cbfish.org/Project.mvc/Display/200301100 |
| 60 | 1 | Tidal Freshwater Monitoring | 200500100 | BPA | http://www.cbfish.org/Project.mvc/Display/200500100 |
| RPA 60.2 - Evaluate effects of individual habitat restoration actions: 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) | | | | | |
| 60 | 2 | Lower Columbia River Estuary Ecosystem Monitoring | 200300700 | BPA | http://www.cbfish.org/Project.mvc/Display/200300700 |
| 60 | 2 | Columbia River Estuary Habitat Restoration | 200301100 | BPA | http://www.cbfish.org/Project.mvc/Display/200301100 |
| 60 | 2 | Grays River Watershed Assessment | 200301300 | BPA | http://www.cbfish.org/Project.mvc/Display/200301300 |
| 60 | 2 | Tidal Freshwater Monitoring | 200500100 | BPA | http://www.cbfish.org/Project.mvc/Display/200500100 |
| 60 | 2 | Eelgrass Enhancement And Restoration | 200751300 | BPA | http://www.cbfish.org/Project.mvc/Display/200751300 |
| RPA 60.3 - Estimate cumulative effects of habitat restoration projects: 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. (Initiate in FY 2007-2009 Projects, annually review and modify as appropriate or until complete) | | | | | |
| 60 | 3 | Columbia River Estuary Habitat Restoration | 200301100 | BPA | http://www.cbfish.org/Project.mvc/Display/200301100 |
| RPA 61 - Investigate Estuary/Ocean Critical Uncertainties: The Action Agencies will fund selected research direct at resolving critical uncertainties that are pivotal in understanding estuary and ocean effects, which could include the following: | | | | | |
| 61 | | Estuary habitat studies - Contribution of tidal fluvial habitats in the Columbia River estuary to the recovery of diverse salmon ESUs | 123452 | USACE | |
| 61 | | Estuary habitat studies - Juvenile salmon ecology and restoration of tidal freshwater habitats | 123452 | USACE | |
| 61 | | Estuary habitat studies - Cumulative ecosystem response to habitat restoration projects in the lower Columbia River and estuary (final year) | 123452 | USACE | |
| RPA 61.1 - Define importance of tidal freshwater/estuary/plume/nearshore: 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. | | | | | |
| 61 | 1 | Ocean Survival of Salmonids | 199801400 | BPA | http://www.cbfish.org/Project.mvc/Display/199801400 |

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| 61 | 1 | Lower Columbia River Estuary Ecosystem Monitoring | 200300700 | BPA | http://www.cbfish.org/Project.mvc/Display/200300700 |
| 61 | 1 | Canada-USA Shelf Salmon Survival Study | 200300900 | BPA | http://www.cbfish.org/Project.mvc/Display/200300900 |
| 61 | 1 | Historic Habitat Food Web Link | 200301000 | BPA | http://www.cbfish.org/Project.mvc/Display/200301000 |
| 61 | 1 | Pacific Ocean Survey Tracking (POST) | 200311400 | BPA | http://www.cbfish.org/Project.mvc/Display/200311400 |
| 61 | 1 | Tidal Freshwater Monitoring | 200500100 | BPA | http://www.cbfish.org/Project.mvc/Display/200500100 |
| 61 | 1 | Impact of American Shad in the Columbia River | 200727500 | BPA | http://www.cbfish.org/Project.mvc/Display/200727500 |
| RPA 61.2 - Define migration/behavior affecting juvenile survival: Continue work to define the causal mechanisms and migration/behavior characteristics affecting survival of juvenile salmon during their first weeks in the ocean. | | | | | |
| 61 | 2 | Ocean Survival of Salmonids | 199801400 | BPA | http://www.cbfish.org/Project.mvc/Display/199801400 |
| 61 | 2 | Canada-USA Shelf Salmon Survival Study | 200300900 | BPA | http://www.cbfish.org/Project.mvc/Display/200300900 |
| 61 | 2 | Pacific Ocean Survey Tracking (POST) | 200311400 | BPA | http://www.cbfish.org/Project.mvc/Display/200311400 |
| RPA 61.3 - LCR-investigate early life history of salmon populations: Investigate the importance of early life history of salmon populations in tidal fresh water of the lower Columbia River. | | | | | |
| 61 | 3 | Lower Columbia River Estuary Ecosystem Monitoring | 200300700 | BPA | http://www.cbfish.org/Project.mvc/Display/200300700 |
| 61 | 3 | Historic Habitat Food Web Link | 200301000 | BPA | http://www.cbfish.org/Project.mvc/Display/200301000 |
| 61 | 3 | Columbia River Estuary Habitat Restoration | 200301100 | BPA | http://www.cbfish.org/Project.mvc/Display/200301100 |
| 61 | 3 | Tidal Freshwater Monitoring | 200500100 | BPA | http://www.cbfish.org/Project.mvc/Display/200500100 |
| RPA 61.4 - Develop hydrodynamic numerical model for estuary and plume: Continue development of a hydrodynamic numerical model for the estuary and plume to support critical uncertainties investigations. | | | | | |
| 61 | 4 | Ocean Survival of Salmonids | 199801400 | BPA | http://www.cbfish.org/Project.mvc/Display/199801400 |
| 61 | 4 | Historic Habitat Food Web Link | 200301000 | BPA | http://www.cbfish.org/Project.mvc/Display/200301000 |
| RPA 62 - Fund Selected Harvest Investigations: The Action Agencies will fund selected harvest investigations linked to FCRPS interests: | | | | | |
| RPA 62.1 - Evaluate feasibility of obtaining PIT-tag recoveries in Zone 6: 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) | | | | | |

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| 62 | 1 | Nez Perce Tribal Hatchery Monitoring and Evaluation (M&E) | 198335003 | BPA | http://www.cbfish.org/Project.mvc/Display/198335003 |
| 62 | 1 | Hood River Production Monitoring and Evaluation (M&E)-Warm Springs | 198805303 | BPA | http://www.cbfish.org/Project.mvc/Display/198805303 |
| 62 | 1 | Salmon Studies in Idaho Rivers-Idaho Department of Fish and Game (IDFG) | 198909800 | BPA | http://www.cbfish.org/Project.mvc/Display/198909800 |
| 62 | 1 | Johnson Creek Artificial Propagation Enhancement | 199604300 | BPA | http://www.cbfish.org/Project.mvc/Display/199604300 |
| 62 | 1 | Imnaha River Smolt Monitoring | 199701501 | BPA | http://www.cbfish.org/Project.mvc/Display/199701501 |
| 62 | 1 | Kelt Reconditioning and Reproductive Success Evaluation Research | 200740100 | BPA | http://www.cbfish.org/Project.mvc/Display/200740100 |
| 62 | 1 | Expanded Tribal Catch Sampling | 200850200 | BPA | http://www.cbfish.org/Project.mvc/Display/200850200 |
| 62 | 1 | Power Analysis Catch Sampling Rates | 200850800 | BPA | http://www.cbfish.org/Project.mvc/Display/200850800 |
| 62 | 1 | FCRPS Water Studies & Passage of Adult Salmon & Steelhead | 200890800 | BPA | http://www.cbfish.org/Project.mvc/Display/200890800 |
| 62 | 1 | Imnaha River steelhead status monitoring | 201003200 | BPA | http://www.cbfish.org/Project.mvc/Display/201003200 |
| RPA 62.2 - Evaluate methods to develop selective fishing methods/gear: Evaluate methods to develop or expand use of selective fishing methods and gear. (Initiate in FY 2007-2009 Projects) | | | | | |
| 62 | 2 | Select Area Fisheries Enhancement | 199306000 | BPA | http://www.cbfish.org/Project.mvc/Display/199306000 |
| 62 | 2 | Grande Ronde Supplementation Monitoring and Evaluation (M&E) on Catherine Creek/Upper Grande Ronde River | 200708300 | BPA | http://www.cbfish.org/Project.mvc/Display/200708300 |
| 62 | 2 | Evaluation of Live Capture Gear | 200724900 | BPA | http://www.cbfish.org/Project.mvc/Display/200724900 |
| 62 | 2 | Selective Gear Deployment | 200810500 | BPA | http://www.cbfish.org/Project.mvc/Display/200810500 |
| RPA 62.3 - Evaluate post-release mortality rates for selected fisheries: Evaluate post-release mortality rates for selected fisheries. (Initiate in FY 2007-2009 Projects) | | | | | |
| 62 | 3 | Selective Gear Deployment | 200810500 | BPA | http://www.cbfish.org/Project.mvc/Display/200810500 |
| 62 | 3 | FCRPS Water Studies & Passage of Adult Salmon & Steelhead | 200890800 | BPA | http://www.cbfish.org/Project.mvc/Display/200890800 |
| RPA 62.4 - Support coded-wire tagging and recovery: 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) | | | | | |
| 62 | 4 | Coded Wire Tag-Pacific States Marine Fisheries Commission (PSMFC) | 198201301 | BPA | http://www.cbfish.org/Project.mvc/Display/198201301 |

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| 62 | 4 | Coded Wire Tag-Oregon Department of Fish and Wildlife (ODFW) | 198201302 | BPA | http://www.cbfish.org/Project.mvc/Display/198201302 |
| 62 | 4 | Coded Wire Tag-US Fish and Wildlife Service (USFWS) | 198201303 | BPA | http://www.cbfish.org/Project.mvc/Display/198201303 |
| 62 | 4 | Coded Wire Tag-Washington Department of Fish and Wildlife (WDFW) | 198201304 | BPA | http://www.cbfish.org/Project.mvc/Display/198201304 |
| 62 | 4 | Nez Perce Tribal Hatchery Operations and Maintenance (O&M) | 198335000 | BPA | http://www.cbfish.org/Project.mvc/Display/198335000 |
| 62 | 4 | Nez Perce Tribal Hatchery Monitoring and Evaluation (M&E) | 198335003 | BPA | http://www.cbfish.org/Project.mvc/Display/198335003 |
| 62 | 4 | Hood River Production Monitoring and Evaluation (M&E)-Warm Springs | 198805303 | BPA | http://www.cbfish.org/Project.mvc/Display/198805303 |
| 62 | 4 | Hood River Production Operations and Maintenance (O&M)-Warm Springs | 198805307 | BPA | http://www.cbfish.org/Project.mvc/Display/198805307 |
| 62 | 4 | Umatilla Hatchery Monitoring and Evaluation (M&E) | 199000500 | BPA | http://www.cbfish.org/Project.mvc/Display/199000500 |
| 62 | 4 | Yakima River Monitoring and Evaluation-Yakima/Klickitat Fisheries Project (YKFP) | 199506325 | BPA | http://www.cbfish.org/Project.mvc/Display/199506325 |
| 62 | 4 | Imnaha River Smolt Monitoring | 199701501 | BPA | http://www.cbfish.org/Project.mvc/Display/199701501 |
| 62 | 4 | Nez Perce Harvest Monitoring on Snake and Clearwater Rivers | 200206000 | BPA | http://www.cbfish.org/Project.mvc/Display/200206000 |
| 62 | 4 | Selective Gear Deployment | 200810500 | BPA | http://www.cbfish.org/Project.mvc/Display/200810500 |
| 62 | 4 | FCRPS Water Studies & Passage of Adult Salmon & Steelhead | 200890800 | BPA | http://www.cbfish.org/Project.mvc/Display/200890800 |
| 62 | 4 | Imnaha River steelhead status monitoring | 201003200 | BPA | http://www.cbfish.org/Project.mvc/Display/201003200 |
| 62 | 4 | Lower Columbia – CWT Recovery Project | 201003600 | BPA | http://www.cbfish.org/Project.mvc/Display/201003600 |
| 62 | 4 | Tucannon Expanded Pit Tagging | 201004200 | BPA | http://www.cbfish.org/Project.mvc/Display/201004200 |
| 62 | 4 | Snake River steelhead annual run-reconstruction | 201004800 | BPA | http://www.cbfish.org/Project.mvc/Display/201004800 |
| RPA 62.5 - Investigate feasibility of genetic stock id techniques: Investigate the feasibility of genetic stock identification monitoring techniques. (Initiate in FY 2007-2009 Projects) | | | | | |
| 62 | 5 | Nez Perce Tribal Hatchery Operations and Maintenance (O&M) | 198335000 | BPA | http://www.cbfish.org/Project.mvc/Display/198335000 |
| 62 | 5 | Nez Perce Tribal Hatchery Monitoring and Evaluation (M&E) | 198335003 | BPA | http://www.cbfish.org/Project.mvc/Display/198335003 |

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| 62 | 5 | Hood River Production Monitor and Evaluation (M&E)-Oregon Department of Fish and Wildlife (ODFW) | 198805304 | BPA | http://www.cbfish.org/Project.mvc/Display/198805304 |
| 62 | 5 | Hood River Production Operations and Maintenance (O&M)-Warm Springs | 198805307 | BPA | http://www.cbfish.org/Project.mvc/Display/198805307 |
| 62 | 5 | Genetic Monitoring and Evaluation (M&E) Program for Salmon and Steelhead | 198909600 | BPA | http://www.cbfish.org/Project.mvc/Display/198909600 |
| 62 | 5 | Salmon Studies in Idaho Rivers-Idaho Department of Fish and Game (IDFG) | 198909800 | BPA | http://www.cbfish.org/Project.mvc/Display/198909800 |
| 62 | 5 | Idaho Steelhead Monitoring and Evaluation (M&E) Studies | 199005500 | BPA | http://www.cbfish.org/Project.mvc/Display/199005500 |
| 62 | 5 | Yakima River Monitoring and Evaluation-Yakima/Klickitat Fisheries Project (YKFP) | 199506325 | BPA | http://www.cbfish.org/Project.mvc/Display/199506325 |
| 62 | 5 | Klickitat River Monitoring and Evaluation-Yakima/Klickitat Fisheries Project (YKFP) | 199506335 | BPA | http://www.cbfish.org/Project.mvc/Display/199506335 |
| 62 | 5 | Johnson Creek Artificial Propagation Enhancement | 199604300 | BPA | http://www.cbfish.org/Project.mvc/Display/199604300 |
| 62 | 5 | Imnaha River Smolt Monitoring | 199701501 | BPA | http://www.cbfish.org/Project.mvc/Display/199701501 |
| 62 | 5 | Chinook Salmon Adult Abundance Monitoring | 199703000 | BPA | http://www.cbfish.org/Project.mvc/Display/199703000 |
| 62 | 5 | Grande Ronde Supplementation Operations and Maintenance (O&M) and Montiring and Evaluation (M&E) on Lostine River | 199800702 | BPA | http://www.cbfish.org/Project.mvc/Display/199800702 |
| 62 | 5 | Escapement and Productivity of Spring Chinook and Steelhead | 199801600 | BPA | http://www.cbfish.org/Project.mvc/Display/199801600 |
| 62 | 5 | Salmonid Progeny Markers | 200203000 | BPA | http://www.cbfish.org/Project.mvc/Display/200203000 |
| 62 | 5 | Asotin Creek Salmon Population Assessment | 200205300 | BPA | http://www.cbfish.org/Project.mvc/Display/200205300 |
| 62 | 5 | Monitor and Evaluate (M&E) Reproductive Success and Survival in Wenatchee River | 200303900 | BPA | http://www.cbfish.org/Project.mvc/Display/200303900 |
| 62 | 5 | Evaluate the Reproductive Success of Wild and Hatchery Steelhead in Natural and Hatchery Environments | 200305000 | BPA | http://www.cbfish.org/Project.mvc/Display/200305000 |
| 62 | 5 | Evaluate the Relative Reproductive Success of Hatchery-Origin and Wild-Origin Steelhead Spawning Naturally in the Hood River | 200305400 | BPA | http://www.cbfish.org/Project.mvc/Display/200305400 |
| 62 | 5 | Evaluate the Relative Reproductive Success of Wild and Hatchery Origin Snake River Fall Chinook Spawners Upstream of Lower Granite Dam | 200306000 | BPA | http://www.cbfish.org/Project.mvc/Display/200306000 |

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| 62 | 5 | Natural Reproductive Success and Demographic Effects of Hatchery-Origin Steelhead in Abernathy Creek, Washington | 200306300 | BPA | http://www.cbfish.org/Project.mvc/Display/200306300 |
| 62 | 5 | Spring Chinook Captive Propagation-Oregon | 200740400 | BPA | http://www.cbfish.org/Project.mvc/Display/200740400 |
| 62 | 5 | White River supplementation | 200831000 | BPA | http://www.cbfish.org/Project.mvc/Display/200831000 |
| 62 | 5 | Natural Production Management and Monitoring | 200831100 | BPA | http://www.cbfish.org/Project.mvc/Display/200831100 |
| 62 | 5 | Genetic Assessment of Columbia River Stocks | 200890700 | BPA | http://www.cbfish.org/Project.mvc/Display/200890700 |
| 62 | 5 | Chinook and Steelhead Genotyping for Genetic Stock Identification (GSI) at Lower Granite Dam | 201002600 | BPA | http://www.cbfish.org/Project.mvc/Display/201002600 |
| 62 | 5 | Project to provided VSP Estimates for Yakima Steelhead MPG | 201003000 | BPA | http://www.cbfish.org/Project.mvc/Display/201003000 |
| 62 | 5 | Snake River Chinook and Steelhead Parental Based Tagging | 201003100 | BPA | http://www.cbfish.org/Project.mvc/Display/201003100 |
| 62 | 5 | Imnaha River steelhead status monitoring | 201003200 | BPA | http://www.cbfish.org/Project.mvc/Display/201003200 |
| 62 | 5 | Snake River steelhead annual run-reconstruction | 201004800 | BPA | http://www.cbfish.org/Project.mvc/Display/201004800 |

RPA 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. These actions include:

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| 63 | | John Day mitigation evaluation (Ringold Springs) | 122434 | USACE | |
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RPA 63.1 - Determine effect of safety-net & conservation hatchery programs: 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)

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| 63 | 1 | Nez Perce Tribal Hatchery Monitoring and Evaluation (M&E) | 198335003 | BPA | http://www.cbfish.org/Project.mvc/Display/198335003 |
| 63 | 1 | Genetic Monitoring and Evaluation (M&E) Program for Salmon and Steelhead | 198909600 | BPA | http://www.cbfish.org/Project.mvc/Display/198909600 |
| 63 | 1 | Salmon Studies in Idaho Rivers-Idaho Department of Fish and Game (IDFG) | 198909800 | BPA | http://www.cbfish.org/Project.mvc/Display/198909800 |
| 63 | 1 | Grand Ronde Early Life History of Spring Chinook and Steelhead | 199202604 | BPA | http://www.cbfish.org/Project.mvc/Display/199202604 |
| 63 | 1 | Johnson Creek Artificial Propagation Enhancement | 199604300 | BPA | http://www.cbfish.org/Project.mvc/Display/199604300 |
| 63 | 1 | Chinook Salmon Adult Abundance Monitoring | 199703000 | BPA | http://www.cbfish.org/Project.mvc/Display/199703000 |

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| 63 | 1 | Grande Ronde Supplementation Operations and Maintenance (O&M) and Montiring and Evaluation (M&E) on Lostine River | 199800702 | BPA | http://www.cbfish.org/Project.mvc/Display/199800702 |
| 63 | 1 | Grande Ronde Supplementation O&M on Catherine Creek/Upper Grande Ronde River | 199800703 | BPA | http://www.cbfish.org/Project.mvc/Display/199800703 |
| 63 | 1 | Grande Ronde Spring Chinook on Lostine/Catherine Creek/ Upper Grande Ronde Rivers | 199800704 | BPA | http://www.cbfish.org/Project.mvc/Display/199800704 |
| 63 | 1 | Escapement and Productivity of Spring Chinook and Steelhead | 199801600 | BPA | http://www.cbfish.org/Project.mvc/Display/199801600 |
| 63 | 1 | Reintroduction of Chum in Duncan Creek | 200105300 | BPA | http://www.cbfish.org/Project.mvc/Display/200105300 |
| 63 | 1 | Grande Ronde Supplementation Monitoring and Evaluation (M&E) on Catherine Creek/Upper Grande Ronde River | 200708300 | BPA | http://www.cbfish.org/Project.mvc/Display/200708300 |
| 63 | 1 | Northeast Oregon Hatchery Monitoring and Evaluations Implemenation | 200713200 | BPA | http://www.cbfish.org/Project.mvc/Display/200713200 |
| 63 | 1 | Snake River Sockeye Captive Propagation | 200740200 | BPA | http://www.cbfish.org/Project.mvc/Display/200740200 |
| 63 | 1 | Spring Chinook Captive Propagation-Idaho | 200740300 | BPA | http://www.cbfish.org/Project.mvc/Display/200740300 |
| 63 | 1 | Spring Chinook Captive Propagation-Oregon | 200740400 | BPA | http://www.cbfish.org/Project.mvc/Display/200740400 |
| 63 | 1 | Development of an Integrated strategy for Chum Salmon Restoration in the tributaries below Bonneville Dam | 200871000 | BPA | http://www.cbfish.org/Project.mvc/Display/200871000 |
| 63 | 1 | Project to provided VSP Estimates for Yakima Steelhead MPG | 201003000 | BPA | http://www.cbfish.org/Project.mvc/Display/201003000 |
| 63 | 1 | Imnaha River steelhead status monitoring | 201003200 | BPA | http://www.cbfish.org/Project.mvc/Display/201003200 |
| 63 | 1 | Tucannon Expanded Pit Tagging | 201004200 | BPA | http://www.cbfish.org/Project.mvc/Display/201004200 |
| 63 | 1 | Snake River steelhead annual run-reconstruction | 201004800 | BPA | http://www.cbfish.org/Project.mvc/Display/201004800 |
| 63 | 1 | B-run steelhead supplementation effectiveness research | 201005700 | BPA | http://www.cbfish.org/Project.mvc/Display/201005700 |
| 63 | 1 | Tucannon Spring Chinook PIT tagging. | 201006000 | BPA | http://www.cbfish.org/Project.mvc/Display/201006000 |
| RPA 63.2 - Determine effect of implemented hatchery reform actions: Determine the effect that implemented hatchery reform actions have on the recovery of targeted salmon and steelhead populations. (Initiate in FY 2007-2009 Projects) | | | | | |
| 63 | 2 | Grand Ronde Early Life History of Spring Chinook and Steelhead | 199202604 | BPA | http://www.cbfish.org/Project.mvc/Display/199202604 |

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| 63 | 2 | Advance Hatchery Reform Research | 199305600 | BPA | http://www.cbfish.org/Project.mvc/Display/199305600 |
| 63 | 2 | Tucannon Expanded Pit Tagging | 201004200 | BPA | http://www.cbfish.org/Project.mvc/Display/201004200 |
| 63 | 2 | Evaluation of the Touchet endemic program | 201004900 | BPA | http://www.cbfish.org/Project.mvc/Display/201004900 |
| 63 | 2 | Evaluation of the Tucannon endemic program | 201005000 | BPA | http://www.cbfish.org/Project.mvc/Display/201005000 |

RPA 64 - Investigate Hatchery Critical Uncertainties: The Action Agencies will continue to fund selected research directed at resolving artificial propagation critical uncertainties:

RPA 64.1 - Estimate relative reproductive success (RSS) of hatchery fish: 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)

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| 64 | 1 | Nez Perce Tribal Hatchery Monitoring and Evaluation (M&E) | 198335003 | BPA | http://www.cbfish.org/Project.mvc/Display/198335003 |
| 64 | 1 | Hood River Production Monitoring and Evaluation (M&E)-Warm Springs | 198805303 | BPA | http://www.cbfish.org/Project.mvc/Display/198805303 |
| 64 | 1 | Hood River Production Monitor and Evaluation (M&E)-Oregon Department of Fish and Wildlife (ODFW) | 198805304 | BPA | http://www.cbfish.org/Project.mvc/Display/198805304 |
| 64 | 1 | Hood River Production Operations and Maintenance (O&M)-Warm Springs | 198805307 | BPA | http://www.cbfish.org/Project.mvc/Display/198805307 |
| 64 | 1 | Hood River Production Operations and Maintenance (O&M) and Powerdale | 198805308 | BPA | http://www.cbfish.org/Project.mvc/Display/198805308 |
| 64 | 1 | Genetic Monitoring and Evaluation (M&E) Program for Salmon and Steelhead | 198909600 | BPA | http://www.cbfish.org/Project.mvc/Display/198909600 |
| 64 | 1 | Grand Ronde Early Life History of Spring Chinook and Steelhead | 199202604 | BPA | http://www.cbfish.org/Project.mvc/Display/199202604 |
| 64 | 1 | Grande Ronde Supplementation Operations and Maintenance (O&M) and Monitoring and Evaluation (M&E) on Lostine River | 199800702 | BPA | http://www.cbfish.org/Project.mvc/Display/199800702 |
| 64 | 1 | Grande Ronde Supplementation O&M on Catherine Creek/Upper Grande Ronde River | 199800703 | BPA | http://www.cbfish.org/Project.mvc/Display/199800703 |
| 64 | 1 | Grande Ronde Spring Chinook on Lostine/Catherine Creek/ Upper Grande Ronde Rivers | 199800704 | BPA | http://www.cbfish.org/Project.mvc/Display/199800704 |
| 64 | 1 | Monitor and Evaluate (M&E) Reproductive Success and Survival in Wenatchee River | 200303900 | BPA | http://www.cbfish.org/Project.mvc/Display/200303900 |

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| 64 | 1 | Evaluate the Relative Reproductive Success of Hatchery-Origin and Wild-Origin Steelhead Spawning Naturally in the Hood River | 200305400 | BPA | http://www.cbfish.org/Project.mvc/Display/200305400 |
| 64 | 1 | Evaluate the Relative Reproductive Success of Wild and Hatchery Origin Snake River Fall Chinook Spawners Upstream of Lower Granite Dam | 200306000 | BPA | http://www.cbfish.org/Project.mvc/Display/200306000 |
| 64 | 1 | Grande Ronde Supplementation Monitoring and Evaluation (M&E) on Catherine Creek/Upper Grande Ronde River | 200708300 | BPA | http://www.cbfish.org/Project.mvc/Display/200708300 |
| 64 | 1 | Study Reproductive Success of Hatchery and Natural Origin Steelhead in the Methow | 201003300 | BPA | http://www.cbfish.org/Project.mvc/Display/201003300 |
| RPA 64.2 - Determine if artificial production contributes to recovery: Determine if properly designed intervention programs using artificial production make a net positive contribution to recovery of listed populations. (Initiate in FY 2007-2009) | | | | | |
| 64 | 2 | Nez Perce Tribal Hatchery Operations and Maintenance (O&M) | 198335000 | BPA | http://www.cbfish.org/Project.mvc/Display/198335000 |
| 64 | 2 | Nez Perce Tribal Hatchery Monitoring and Evaluation (M&E) | 198335003 | BPA | http://www.cbfish.org/Project.mvc/Display/198335003 |
| 64 | 2 | Umatilla Hatchery Satellite Fac O&M | 198343500 | BPA | http://www.cbfish.org/Project.mvc/Display/198343500 |
| 64 | 2 | Northeast Oregon Hatchery Master Plan | 198805301 | BPA | http://www.cbfish.org/Project.mvc/Display/198805301 |
| 64 | 2 | Hood River Production Monitoring and Evaluation (M&E)-Warm Springs | 198805303 | BPA | http://www.cbfish.org/Project.mvc/Display/198805303 |
| 64 | 2 | Hood River Production Monitor and Evaluation (M&E)-Oregon Department of Fish and Wildlife (ODFW) | 198805304 | BPA | http://www.cbfish.org/Project.mvc/Display/198805304 |
| 64 | 2 | Hood River Production Operations and Maintenance (O&M)-Warm Springs | 198805307 | BPA | http://www.cbfish.org/Project.mvc/Display/198805307 |
| 64 | 2 | Hood River Production Operations and Maintenance (O&M) and Powerdale | 198805308 | BPA | http://www.cbfish.org/Project.mvc/Display/198805308 |
| 64 | 2 | Genetic Monitoring and Evaluation (M&E) Program for Salmon and Steelhead | 198909600 | BPA | http://www.cbfish.org/Project.mvc/Display/198909600 |
| 64 | 2 | Salmon Studies in Idaho Rivers-Idaho Department of Fish and Game (IDFG) | 198909800 | BPA | http://www.cbfish.org/Project.mvc/Display/198909800 |
| 64 | 2 | Umatilla Hatchery Monitoring and Evaluation (M&E) | 199000500 | BPA | http://www.cbfish.org/Project.mvc/Display/199000500 |
| 64 | 2 | Umatilla Basin Natural Production Monitoring and Evaluation (M&E) | 199000501 | BPA | http://www.cbfish.org/Project.mvc/Display/199000501 |
| 64 | 2 | Grand Ronde Early Life History of Spring Chinook and Steelhead | 199202604 | BPA | http://www.cbfish.org/Project.mvc/Display/199202604 |

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| 64 | 2 | Yakima River Monitoring and Evaluation-Yakima/Klickitat Fisheries Project (YKFP) | 199506325 | BPA | http://www.cbfish.org/Project.mvc/Display/199506325 |
| 64 | 2 | Johnson Creek Artificial Propagation Enhancement | 199604300 | BPA | http://www.cbfish.org/Project.mvc/Display/199604300 |
| 64 | 2 | Imnaha River Smolt Monitoring | 199701501 | BPA | http://www.cbfish.org/Project.mvc/Display/199701501 |
| 64 | 2 | Chinook Salmon Adult Abundance Monitoring | 199703000 | BPA | http://www.cbfish.org/Project.mvc/Display/199703000 |
| 64 | 2 | Grande Ronde Supplementation Operations and Maintenance (O&M) and Montiring and Evaluation (M&E) on Lostine River | 199800702 | BPA | http://www.cbfish.org/Project.mvc/Display/199800702 |
| 64 | 2 | Grande Ronde Supplementation O&M on Catherine Creek/Upper Grande Ronde River | 199800703 | BPA | http://www.cbfish.org/Project.mvc/Display/199800703 |
| 64 | 2 | Grande Ronde Spring Chinook on Lostine/Catherine Creek/ Upper Grande Ronde Rivers | 199800704 | BPA | http://www.cbfish.org/Project.mvc/Display/199800704 |
| 64 | 2 | Spawning Distribution of Snake River Fall Chinook Salmon | 199801003 | BPA | http://www.cbfish.org/Project.mvc/Display/199801003 |
| 64 | 2 | Monitor and Evaluate (M&E) Performance of Juvenile Snake River Fall Chinook Salmon from Fall Chinook Acclimation Project | 199801004 | BPA | http://www.cbfish.org/Project.mvc/Display/199801004 |
| 64 | 2 | Tucannon River Spring Chinook Captive Brood | 200001900 | BPA | http://www.cbfish.org/Project.mvc/Display/200001900 |
| 64 | 2 | Salmonid Progeny Markers | 200203000 | BPA | http://www.cbfish.org/Project.mvc/Display/200203000 |
| 64 | 2 | Growth Modulation in Salmon Supplementation | 200203100 | BPA | http://www.cbfish.org/Project.mvc/Display/200203100 |
| 64 | 2 | Monitor and Evaluate (M&E) Reproductive Success and Survival in Wenatchee River | 200303900 | BPA | http://www.cbfish.org/Project.mvc/Display/200303900 |
| 64 | 2 | Evaluate the Reproductive Success of Wild and Hatchery Steelhead in Natural and Hatchery Environments | 200305000 | BPA | http://www.cbfish.org/Project.mvc/Display/200305000 |
| 64 | 2 | Evaluate the Relative Reproductive Success of Hatchery-Origin and Wild-Origin Steelhead Spawning Naturally in the Hood River | 200305400 | BPA | http://www.cbfish.org/Project.mvc/Display/200305400 |
| 64 | 2 | Evaluate the Relative Reproductive Success of Wild and Hatchery Origin Snake River Fall Chinook Spawners Upstream of Lower Granite Dam | 200306000 | BPA | http://www.cbfish.org/Project.mvc/Display/200306000 |
| 64 | 2 | Natural Reproductive Success and Demographic Effects of Hatchery-Origin Steelhead in Abernathy Creek, Washington | 200306300 | BPA | http://www.cbfish.org/Project.mvc/Display/200306300 |

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| 64 | 2 | Grande Ronde Supplementation Monitoring and Evaluation (M&E) on Catherine Creek/Upper Grande Ronde River | 200708300 | BPA | http://www.cbfish.org/Project.mvc/Display/200708300 |
| 64 | 2 | Investigation of Relative Reproductive Success of Stray Hatchery & Wild Steelhead & Influence of Hatchery Strays on Natural Productivity in Deschutes | 200729900 | BPA | http://www.cbfish.org/Project.mvc/Display/200729900 |
| 64 | 2 | Kelt Reconditioning and Reproductive Success Evaluation Research | 200740100 | BPA | http://www.cbfish.org/Project.mvc/Display/200740100 |
| 64 | 2 | Snake River Sockeye Captive Propagation | 200740200 | BPA | http://www.cbfish.org/Project.mvc/Display/200740200 |
| 64 | 2 | Spring Chinook Captive Propagation-Idaho | 200740300 | BPA | http://www.cbfish.org/Project.mvc/Display/200740300 |
| 64 | 2 | Spring Chinook Captive Propagation-Oregon | 200740400 | BPA | http://www.cbfish.org/Project.mvc/Display/200740400 |
| 64 | 2 | White River supplementation | 200831000 | BPA | http://www.cbfish.org/Project.mvc/Display/200831000 |
| 64 | 2 | Natural Production Management and Monitoring | 200831100 | BPA | http://www.cbfish.org/Project.mvc/Display/200831100 |
| 64 | 2 | Steelhead Kelt Reconditioning | 200845800 | BPA | http://www.cbfish.org/Project.mvc/Display/200845800 |
| 64 | 2 | Expand Multispecies Acclimation Wenatchee/Methow | 200900100 | BPA | http://www.cbfish.org/Project.mvc/Display/200900100 |
| 64 | 2 | Imnaha River steelhead status monitoring | 201003200 | BPA | http://www.cbfish.org/Project.mvc/Display/201003200 |
| 64 | 2 | Study Reproductive Success of Hatchery and Natural Origin Steelhead in the Methow | 201003300 | BPA | http://www.cbfish.org/Project.mvc/Display/201003300 |
| 64 | 2 | Tucannon Expanded Pit Tagging | 201004200 | BPA | http://www.cbfish.org/Project.mvc/Display/201004200 |

RPA 64.3 - Fund new RSS study for ESA-listed steelhead in Methow River: 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)

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| 64 | 3 | Nez Perce Tribal Hatchery Monitoring and Evaluation (M&E) | 198335003 | BPA | http://www.cbfish.org/Project.mvc/Display/198335003 |
| 64 | 3 | Evaluate the Relative Reproductive Success of Wild and Hatchery Origin Snake River Fall Chinook Spawners Upstream of Lower Granite Dam | 200306000 | BPA | http://www.cbfish.org/Project.mvc/Display/200306000 |
| 64 | 3 | Kelt Reconditioning and Reproductive Success Evaluation Research | 200740100 | BPA | http://www.cbfish.org/Project.mvc/Display/200740100 |

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| 64 | 3 | Study Reproductive Success of Hatchery and Natural Origin Steelhead in the Methow | 201003300 | BPA | http://www.cbfish.org/Project.mvc/Display/201003300 |
| RPA 65 - Investigate Hatchery Critical Uncertainties (Redux): The Action Agencies will fund research directed at resolving critical uncertainties: | | | | | |
| RPA 65.1 - Compare hatchery-origin vs. natural-origin of SR fall Chinook: 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. | | | | | |
| 65 | 1 | Research, monitoring, and evaluation of emerging issues and measures to recover the Snake River fall Chinook salmon ESU | 199102900 | BPA | http://www.cbfish.org/Project.mvc/Display/199102900 |
| 65 | 1 | Spawning Distribution of Snake River Fall Chinook Salmon | 199801003 | BPA | http://www.cbfish.org/Project.mvc/Display/199801003 |
| 65 | 1 | Monitor and Evaluate (M&E) Performance of Juvenile Snake River Fall Chinook Salmon from Fall Chinook Acclimation Project | 199801004 | BPA | http://www.cbfish.org/Project.mvc/Display/199801004 |
| 65 | 1 | Evaluate the Relative Reproductive Success of Wild and Hatchery Origin Snake River Fall Chinook Spawners Upstream of Lower Granite Dam | 200306000 | BPA | http://www.cbfish.org/Project.mvc/Display/200306000 |
| 65 | 1 | Fish Pop Genetics | USBRIA142506A AIC4797 | USBR | Non Available |
| RPA 65.2 - Estimate fall Chinook hatchery program effects on productivity: Estimate fall Chinook hatchery program effects on the productivity of the fall Chinook salmon ESU. | | | | | |
| 65 | 2 | Research, monitoring, and evaluation of emerging issues and measures to recover the Snake River fall Chinook salmon ESU | 199102900 | BPA | http://www.cbfish.org/Project.mvc/Display/199102900 |
| 65 | 2 | Spawning Distribution of Snake River Fall Chinook Salmon | 199801003 | BPA | http://www.cbfish.org/Project.mvc/Display/199801003 |
| 65 | 2 | Monitor and Evaluate (M&E) Performance of Juvenile Snake River Fall Chinook Salmon from Fall Chinook Acclimation Project | 199801004 | BPA | http://www.cbfish.org/Project.mvc/Display/199801004 |
| 65 | 2 | Evaluate the Relative Reproductive Success of Wild and Hatchery Origin Snake River Fall Chinook Spawners Upstream of Lower Granite Dam | 200306000 | BPA | http://www.cbfish.org/Project.mvc/Display/200306000 |
| RPA 65.3 - Provide a NOAA approved research plan/study design: 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. | | | | | |

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| 65 | 3 | Research, monitoring, and evaluation of emerging issues and measures to recover the Snake River fall Chinook salmon ESU | 199102900 | BPA | http://www.cbfish.org/Project.mvc/Display/199102900 |
| RPA 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. | | | | | |
| 66 | | Estuary avian predation: terns and cormorants | 122681 | USACE | |
| 66 | | Estuary avian PIT tag recovery | 107844 | USACE | |
| 66 | | Avian Predation on Juvenile Salmonids | 199702400 | BPA | http://www.cbfish.org/Project.mvc/Display/199702400 |
| RPA 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. | | | | | |
| 67 | | Estuary avian predation: terns and cormorants | 122681 | USACE | |
| 67 | | Estuary avian PIT tag recovery | 107844 | USACE | |
| 67 | | Avian Predation on Juvenile Salmonids | 199702400 | BPA | http://www.cbfish.org/Project.mvc/Display/199702400 |
| RPA 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 predations rates, if warranted. | | | | | |
| 68 | | Avian Predation on Juvenile Salmonids | 199702400 | BPA | http://www.cbfish.org/Project.mvc/Display/199702400 |
| 68 | | Inland avian predation | 120121 | USACE | |
| RPA 69 - Monitoring Related to Marine Mammal Predation: The Action Agencies will: | | | | | |
| 69 | | Pinniped mangement and monitoring | O&M | USACE | |
| RPA 69.1 - Estimate overall sea lion abundance immediately below BON: Estimate overall sea lion abundance immediately below Bonneville Dam. (Initiate in FY 2007-2009 Projects) | | | | | |
| 69 | 1 | Sea Lion Non-Lethal Hazing and Monitoring | 200800400 | BPA | http://www.cbfish.org/Project.mvc/Display/200800400 |
| RPA 69.2 - Monitor sea lion predation attempts & estimate predation rates: Monitor the spatial and temporal distribution of sea lion predation attempts and estimate predation rates. (Initiate in FY 2007-2009 Projects) | | | | | |
| 69 | 2 | Sea Lion Non-Lethal Hazing and Monitoring | 200800400 | BPA | http://www.cbfish.org/Project.mvc/Display/200800400 |
| RPA 69.3 - Monitor the effectiveness of deterrent actions: Monitor the effectiveness of deterrent actions (e.g., exclusion gates, acoustics, harassment and other measures) and their timing of application on spring runs of anadromous fish passing Bonneville Dam. (Initiate in FY 2007-2009 Projects) | | | | | |

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| 69 | 3 | Sea Lion Non-Lethal Hazing and Monitoring | 200800400 | BPA | http://www.cbfish.org/Project.mvc/Display/200800400 |
| RPA 70 - Monitoring Related to Piscivorous (Fish) Predation: The Action Agencies will: | | | | | |
| RPA 70.1 - Estimate benefits of sustained removals of pikeminnow: Continue to update and estimate the cumulative benefits of sustained removals of northern pikeminnow since 1990. (Initiate in FY 2007-2009 Projects) | | | | | |
| 70 | 1 | Development of Systemwide Predator Control | 199007700 | BPA | http://www.cbfish.org/Project.mvc/Display/199007700 |
| RPA 70.2 - Evaluate if inter & intra compensation is occurring: Continue to evaluate if inter and intra compensation is occurring. (Initiate in FY 2007-2009 Projects) | | | | | |
| 70 | 2 | Development of Systemwide Predator Control | 199007700 | BPA | http://www.cbfish.org/Project.mvc/Display/199007700 |
| RPA 70.3 - Evaluate impact of program incentive increase on predation: Evaluate the benefit of additional removals and resultant increase in exploitation rate's affect on reduction in predator mortality since the 2004 program incentive increase. (Initiate in FY 2007-2009 Projects) | | | | | |
| 70 | 3 | Development of Systemwide Predator Control | 199007700 | BPA | http://www.cbfish.org/Project.mvc/Display/199007700 |
| RPA 70.4 - Develop study plan to reduce non-indigenous piscivorous predation: Develop a study plan to review, evaluate, and develop strategies to reduce non-indigenous piscivorous predation. (Initiate in FY 2007-2009 Projects) | | | | | |
| 70 | 4 | Research Non-Indigenous Actions | 200871900 | BPA | http://www.cbfish.org/Project.mvc/Display/200871900 |
| RPA 71 - Coordination: 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: Organizing and supporting the Corps AFEP. | | | | | |
| 71 | 1 | No projects implemented for coordination | | | |
| RPA 71.2 - Support/participate in Council project plan/review efforts: Supporting and participating in the Council's Columbia River Basin Fish and Wildlife Program project planning and review efforts. | | | | | |
| 71 | 2 | No projects implemented for coordination | | | |

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

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| 71 | 3 | Fish Passage Center | 199403300 | BPA | http://www.cbfish.org/Project.mvc/Display/199403300 |
| 71 | 3 | Johnson Creek Artificial Propagation Enhancement | 199604300 | BPA | http://www.cbfish.org/Project.mvc/Display/199604300 |
| 71 | 3 | Pacific Northwest Aquatic Monitoring Program (PNAMP) Coordination | 200400200 | BPA | http://www.cbfish.org/Project.mvc/Display/200400200 |
| 71 | 3 | Pacific NW Aquatic Monitoring Program (PNAMP) Research, Monitoring and Evaluation (RM&E) Design and Protocols | 200721600 | BPA | http://www.cbfish.org/Project.mvc/Display/200721600 |
| 71 | 3 | Pacific Northwest Aquatic Monitoring Program (PNAMP) Coordination | 1425-09-AA-IC-4930 | USBR | Non Available |

RPA 71.4 - Develop standard metrics; BMPs; and data sharing and reporting tools: 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.

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| 71 | 4 | Coded Wire Tag-Pacific States Marine Fisheries Commission (PSMFC) | 198201301 | BPA | http://www.cbfish.org/Project.mvc/Display/198201301 |
| 71 | 4 | StreamNet - Coordinated Information System (CIS)/ Northwest Environmental Database (NED) | 198810804 | BPA | http://www.cbfish.org/Project.mvc/Display/198810804 |
| 71 | 4 | Fish Passage Center | 199403300 | BPA | http://www.cbfish.org/Project.mvc/Display/199403300 |
| 71 | 4 | Lower Columbia River Estuary Ecosystem Monitoring | 200300700 | BPA | http://www.cbfish.org/Project.mvc/Display/200300700 |
| 71 | 4 | Integrated Status and Effectiveness Monitoring Program (ISEMP) | 200301700 | BPA | http://www.cbfish.org/Project.mvc/Display/200301700 |
| 71 | 4 | Okanogan Basin Monitoring & Evaluation Program (OBMEP) | 200302200 | BPA | http://www.cbfish.org/Project.mvc/Display/200302200 |
| 71 | 4 | Habitat and Biodiversity Information System for Columbia River Basin | 200307200 | BPA | http://www.cbfish.org/Project.mvc/Display/200307200 |
| 71 | 4 | Pacific Northwest Aquatic Monitoring Program (PNAMP) Coordination | 200400200 | BPA | http://www.cbfish.org/Project.mvc/Display/200400200 |
| 71 | 4 | Spring Chinook Captive Propagation-Idaho | 200740300 | BPA | http://www.cbfish.org/Project.mvc/Display/200740300 |
| 71 | 4 | Streamnet Library | 200850500 | BPA | http://www.cbfish.org/Project.mvc/Display/200850500 |
| 71 | 4 | Pacific Northwest Aquatic Monitoring Program (PNAMP) Coordination | 1425-09-AA-IC-4930 | USBR | Non Available |

RPA 71.5 - Coordinate further development & implementation of RM&E: 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.

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| 71 | 5 | Integrated Status and Effectiveness Monitoring Program (ISEMP) | 200301700 | BPA | http://www.cbfish.org/Project.mvc/Display/200301700 |
| 71 | 5 | Habitat and Biodiversity Information System for Columbia River Basin | 200307200 | BPA | http://www.cbfish.org/Project.mvc/Display/200307200 |

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| 71 | 5 | Pacific Northwest Aquatic Monitoring Program (PNAMP) Coordination | 200400200 | BPA | http://www.cbfish.org/Project.mvc/Display/200400200 |
| 71 | 5 | Tidal Freshwater Monitoring | 200500100 | BPA | http://www.cbfish.org/Project.mvc/Display/200500100 |
| 71 | 5 | Pacific Northwest Aquatic Monitoring Program (PNAMP) Coordination | 1425-09-AA-IC-4930 | USBR | Non Available |

RPA 71.6 - Coordinate implementation w/ other regional collaboration processes: 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.

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| 71 | 6 | Habitat and Biodiversity Information System for Columbia River Basin | 200307200 | BPA | http://www.cbfish.org/Project.mvc/Display/200307200 |
| 71 | 6 | Pacific Northwest Aquatic Monitoring Program (PNAMP) Coordination | 200400200 | BPA | http://www.cbfish.org/Project.mvc/Display/200400200 |
| 71 | 6 | Pacific Northwest Aquatic Monitoring Program (PNAMP) Coordination | 1425-09-AA-IC-4930 | USBR | Non Available |

RPA 72 - Data Management: 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. Actions include:

RPA 72.1 - Participate in & jointly fund regional coordination forums: 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)

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| 72 | 1 | Coded Wire Tag-Pacific States Marine Fisheries Commission (PSMFC) | 198201301 | BPA | http://www.cbfish.org/Project.mvc/Display/198201301 |
| 72 | 1 | StreamNet - Coordinated Information System (CIS)/ Northwest Environmental Database (NED) | 198810804 | BPA | http://www.cbfish.org/Project.mvc/Display/198810804 |
| 72 | 1 | Implement Wy - Kan - Ush - Mi Wa - Kis | 199803100 | BPA | http://www.cbfish.org/Project.mvc/Display/199803100 |
| 72 | 1 | Integrated Status and Effectiveness Monitoring Program (ISEMP) | 200301700 | BPA | http://www.cbfish.org/Project.mvc/Display/200301700 |
| 72 | 1 | Pacific Northwest Aquatic Monitoring Program (PNAMP) Coordination | 200400200 | BPA | http://www.cbfish.org/Project.mvc/Display/200400200 |
| 72 | 1 | Tidal Freshwater Monitoring | 200500100 | BPA | http://www.cbfish.org/Project.mvc/Display/200500100 |
| 72 | 1 | Streamnet Library | 200850500 | BPA | http://www.cbfish.org/Project.mvc/Display/200850500 |
| 72 | 1 | Regional Data Management Support and Coordination | 200872700 | BPA | http://www.cbfish.org/Project.mvc/Display/200872700 |
| 72 | 1 | Pacific Northwest Aquatic Monitoring Program (PNAMP) Coordination | 1425-09-AA-IC-4930 | USBR | Non Available |

RPA 72.2 - Fund data system components to support info mgmt needs of H's: 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)

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|----|---|--|--------------------|------|---|
| 72 | 2 | StreamNet - Coordinated Information System (CIS)/ Northwest Environmental Database (NED) | 198810804 | BPA | http://www.cbfish.org/Project.mvc/Display/198810804 |
| 72 | 2 | Data Access in Real Time (DART) | 199601900 | BPA | http://www.cbfish.org/Project.mvc/Display/199601900 |
| 72 | 2 | Regional Data Management Support and Coordination | 200872700 | BPA | http://www.cbfish.org/Project.mvc/Display/200872700 |
| 72 | 2 | Pacific Northwest Aquatic Monitoring Program (PNAMP) Coordination | 1425-09-AA-IC-4930 | USBR | Non Available |

RPA 72.3 - Participate in regional coordination and collaboration efforts: 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)

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|----|---|--|--------------------|------|---|
| 72 | 3 | Coded Wire Tag-Pacific States Marine Fisheries Commission (PSMFC) | 198201301 | BPA | http://www.cbfish.org/Project.mvc/Display/198201301 |
| 72 | 3 | StreamNet - Coordinated Information System (CIS)/ Northwest Environmental Database (NED) | 198810804 | BPA | http://www.cbfish.org/Project.mvc/Display/198810804 |
| 72 | 3 | Implement Wy - Kan - Ush - Mi Wa - Kis | 199803100 | BPA | http://www.cbfish.org/Project.mvc/Display/199803100 |
| 72 | 3 | Pacific Northwest Aquatic Monitoring Program (PNAMP) Coordination | 200400200 | BPA | http://www.cbfish.org/Project.mvc/Display/200400200 |
| 72 | 3 | Streamnet Library | 200850500 | BPA | http://www.cbfish.org/Project.mvc/Display/200850500 |
| 72 | 2 | Methow Data Management Support | TBA | USBR | Non Available |
| 72 | 3 | Pacific Northwest Aquatic Monitoring Program (PNAMP) Coordination | 1425-09-AA-IC-4930 | USBR | Non Available |

RPA 73 - Implementation and Compliance Monitoring: The Action Agencies will:

RPA 73.1 - Monitor implementation of projects thru standard procedures & requirements: 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.

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| 73 | 1 | No projects funded for this RPA | | | |
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RPA 73.2 - Maintain project & action level details for planning/reporting: 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.

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| 73 | 2 | No projects funded for this RPA | | | |
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RPA 73.3 - Maintain comprehensive habitat project tracking system: 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)

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| 73 | 3 | No projects funded for this RPA | | | |
| CONSERVATION MEASURES | | | | | |
| <p>CONSERVATION MEASURE 1 - This section discusses NOAA Fisheries’ obligation to develop conservation recommendations under Section 7(a)(1) of the ESA, which states in part: All other Federal agencies shall, in consultation with and with the assistance of the Secretary, utilize their authorities in furtherance of the purposes of this Act by carrying out programs for the conservation of endangered species and threatened species listed pursuant to section 4 of this Act.</p> | | | | | |
| 1 | | No projects funded for this Conservation Measure | | | |
| <p>CONSERVATION MEASURE 2 - NOAA Fisheries recommends that Reclamation, on its own and in coordination with state and Tribal water management entities, identify opportunities and implement actions to conserve water and to ensure that a substantial portion of such conserved water accrues to streamflow to benefit listed species. Water conservation efforts have the potential to benefit both out of stream water users and flowrelated tributary and mainstem habitat conditions. Reclamation is uniquely qualified and specifically authorized to pursue such opportunities.</p> | | | | | |
| 2 | | No projects funded for this Conservation Measure | | | |
| <p>CONSERVATION MEASURE 3 - NOAA Fisheries recommends that the Action Agencies participate in regional efforts to develop a Zebra Mussel Rapid Response Plan. In the event that the zebra mussel or other species of Dreissena genus are detected in the Columbia River basin, the Corps, Reclamation, and Bonneville should participate and provide support to implement the response plan. Zebra mussels infestations have the potential to substantially affect fish protection system performance and could become a major impediment to salmon recovery. Proactive efforts (e.g., public education) and rapid response to their occurrence are essential to minimizing this potential.</p> | | | | | |
| 3 | | No projects funded for this Conservation Measure | | | |
| <p>CONSERVATION MEASURE 4 - The Corps should study the potential for reducing flood control specified storage reservoir drafting during below average water years. Specified drafting in according with current Corps flood control criteria can result in excessive attenuation of flows during below average water years in a manner that may reduce salmon and steelhead survival. Further, such forced drafts can reduce system flexibility, thereby affecting other water uses (e.g., power production). Current operations often result in lateseason drafts that are both difficult to achieve and adverse to subsequent fish survival by attenuating discharge during the peak of the juvenile emigration. For example, under current operational constraints it is sometimes difficult to achieve the end-of-April target elevation at Lake Roosevelt without exceeding the maximum 1-foot per day drawdown rate, even while the risk of subsequent downstream flooding is very low. The intent of this recommendation is to encourage detailed consideration of the potential for modifying flood control operations in a manner that avoids any increased risk of substantial flood damage while avoiding excessive spring flow attenuation in below average water ye</p> | | | | | |
| 4 | | No projects funded for this Conservation Measure | | | |

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| CONSERVATION MEASURE 5 - The Corps should work through the FPOM to make hourly individual turbine unit and spill bay operation data available on its website (a secure, password protected site, if necessary), in real time during the juvenile migration season. This data would provide assurances to fish managers that operation criteria specified in the Fish Passage Plan (e.g., unit operation, priorities, and spill patterns), as well as agreed-on special project operations for research or in response to in-season management issues are being implemented. | | | | |
| 5 | | No projects funded for this Conservation Measure | | |
| CONSERVATION MEASURE 6 - The Corps should modify the Bonneville Dam adult trap to provide greater and more efficient adult collection capability, and to reduce handling stress of adult salmonids during collections. | | | | |
| 6 | | No projects funded for this Conservation Measure | | |
| CONSERVATION MEASURE 7 - Coordinate with NOAA Fisheries and other regional parties to investigate the feasibility of running individual operating turbine unit(s) at mainstem dams to adjust powerhouse flows to improve adult or juvenile fish passage and/or survival. If found to be feasible, implement operations when fish passage or survival will be improved. | | | | |
| 7 | | No projects funded for this Conservation Measure | | |
| CONSERVATION MEASURE 8 - Coordinate with NOAA Fisheries and other interested regional parties to design and implement research (in appropriately selected locations) to evaluate the use of nutrient supplementation as a means to increase the productivity and survival of certain interior basin steelhead or Chinook salmon populations. Studies should target priority populations with low productivity where known areas of reduced nutrient availability exist and studies can be implemented consistent with federal, state, and local regulatory requirements. | | | | |
| 8 | | Upper Columbia Nutrient Supplementation | 200847100 | BPA http://www.cbfish.org/Project.mvc/Display/200847100 |