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Pacific Northwest National Laboratory
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Facilitation of the Estuary/Ocean Subgroup for Federal Research, Monitoring, and Evaluation, FY09 Annual Report

Final Report

GE Johnson

October 2009

Pacific Northwest NATIONAL LABORATORY

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Pacific Northwest National Laboratory
Richland, Washington 99352

Preface

The Estuary/Ocean Subgroup (EOS) is part of the research, monitoring, and evaluation (RME) effort that the Action Agencies (Bonneville Power Administration, U.S. Army Corps of Engineers, U.S. Bureau of Reclamation) developed in response to obligations arising from the Endangered Species Act as applied to operation of the Federal Columbia River Power System (FCRPS). The goal of the EOS project is to facilitate activities of the estuary/ocean RME subgroup as it coordinates design and implementation of federal RME in the lower Columbia River and estuary. The EOS is one of multiple work groups in the federal research, monitoring, and evaluation (RME) effort developed in response to responsibilities arising from the Endangered Species Act as a result of operation of the FCRPS. The EOS is tasked by NOAA Fisheries and the Action Agencies to design and coordinate implementation of the federal RME plan for the lower Columbia River and estuary, including the plume. Initiated in 2002, the EOS is composed of members from:

- Bonneville Power Administration (BPA);
- Lower Columbia River Estuary Partnership (Estuary Partnership);
- National Oceanic and Atmospheric Administration National Marine Fisheries Service (NOAA Fisheries);
- PNNL's Marine Sciences Laboratory;
- U.S. Army Corps of Engineers (USACE);
- Other agencies as necessary.

The Bonneville Power Administration contracted with the Pacific Northwest National Laboratory (PNNL) to coordinate and facilitate the Estuary/Ocean Subgroup (EOS) (Contract No. 26934, release 19). This annual report is a FY09 deliverable for the project titled Facilitation of the Estuary/Ocean Subgroup (BPA Project No. 2002-077-00 and PNNL Project No. 55786). For more information about the Estuary/Ocean Subgroup, please contact Gary Johnson (503-417-7567).

Acknowledgments

Important contributions to the EOS during fiscal year 2009 were made by Blaine Ebberts (Portland District, USACE); Russell Scranton and Cathy Tortorici (NOAA Fisheries); Anne Creason, Jim Geiselman, and Tracey Yerxa (BPA); and Catherine Corbett and Krista Jones (Estuary Partnership). Assistance from the following PNNL staff is much appreciated: PNNL, Heida Diefenderfer, Susan Ennor, Erin Nave, Mike Parker, Jan Slater, and Ron Thom.

Acronyms and Abbreviations

AER	action effectiveness research
BiOp	Biological Opinion
BPA	Bonneville Power Administration
CRE	Columbia River estuary
CREC	Columbia River Estuary Conference
CREDDP	Columbia River Estuary Data Development Program
CREST	Columbia River Estuary Study Taskforce
EOS	Estuary/Ocean Subgroup
EP	Estuary Partnership
ERME	estuary research, monitoring, and evaluation
FCRPS	Federal Columbia River Power System
F&W	Fish and Wildlife
FY08	fiscal year 2008
GIS	geographic information system
ISAB	Independent Scientific Advisory Board
ISEMP	Integrated Status and Effectiveness Monitoring Program
ISRP	Independent Scientific Review Panel
NED	Northwest Environmental Data network
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPCC	Northwest Power and Conservation Council
PER	Paulsen Environmental Research
PNAMP	Pacific Northwest Aquatic Monitoring Partnership
PNNL	Pacific Northwest National Laboratory
RME	research, monitoring, and evaluation
RPA	Reasonable and Prudent Alternative
USACE	U.S. Army Corps of Engineers
WE	work element (Pisces)
WRDA	Water Resources Development Act

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None

1.0 Introduction

This document is the annual report for fiscal year 2009 (FY09) for the project called Facilitation of the Estuary/Ocean Subgroup (EOS). The EOS is part of the research, monitoring, and evaluation (RME) effort developed by the Action Agencies (Bonneville Power Administration [BPA], U.S. Army Corps of Engineers [Corps or USACE], U.S. Bureau of Reclamation) in response to obligations arising from the Endangered Species Act as a result of operation of the Federal Columbia River Power System (FCRPS). For the purposes of this report, the Columbia River estuary includes mainstem waters from Bonneville Dam down through the lower river and estuary into the river's plume in the ocean (Figure 1).

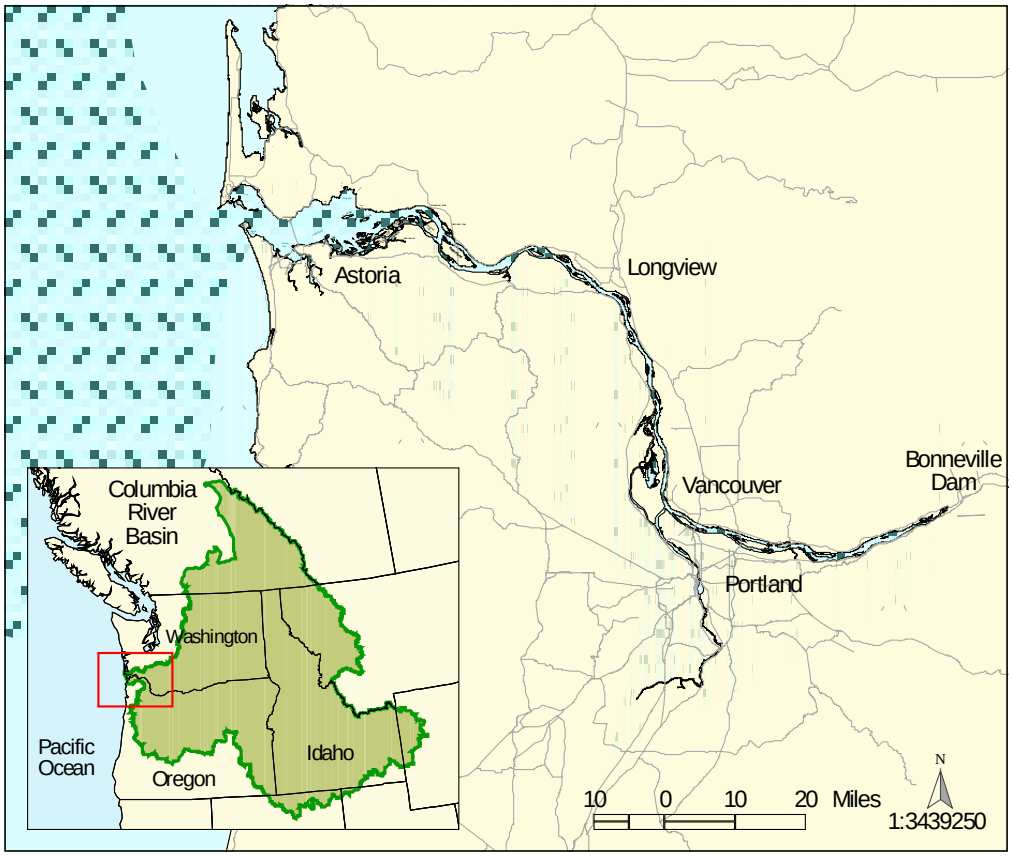

Figure 1. The Location of the Columbia River Estuary. The estuary includes mainstem, tidally-influenced waters from Bonneville Dam down through the lower river and estuary into the river's plume in the ocean.

The goal of the EOS project is to facilitate meetings and work products of the Estuary/Ocean Subgroup as it coordinates implementation of the Estuary RME Program with the Pacific Northwest Aquatic Monitoring Partnership (PNAMP), the Northwest Power and Conservation Council's (NPCC's) Fish and Wildlife Program, federal RME parties, and other federal and non-federal entities conducting RME in the estuary. During 2002 through 2008, the EOS worked to design the federal RME program for the estuary/ocean (Johnson et al. 2008).

1.1 Project Objectives

The EOS project had the following objectives for FY09, designated by work element (WE) codes from BPA's Pisces project tracking system as of October 1, 2008:

- Manage and Administer Projects (WE 119) -- Manage and administer the project according to BPA's "Work Element/Milestone" based project management and reporting system (Pisces).
- Produce Annual Report (WE 132) -- Produce an annual report of project activities, including under separate cover a pilot synthesis report of estuary/ocean RME as part of adaptive management at the program level.
- Produce Plan (WE 174) -- Revise the Estuary RME Program document (dated January 2008) as required by the Action Agencies as new information becomes available concerning RME in the Columbia River estuary.
- Produce Status Report (WE 185) -- Produce quarterly status reports and upload them to Pisces.
- Watershed Coordination (WE 191) -- Much of the scope of work for Project No. 2002-077-00 is coordination of RME activities in the lower Columbia River, estuary, and ocean, as follows:

    a) Estuary/Ocean Subgroup for Federal RME – Continue to facilitate the EOS in its mission to implement the Estuary RME Program and respond to requirements of the Action Agencies regarding RME.

    b) Expert Regional Technical Group for Survival Benefits of Habitat Restoration – Aid the Action Agencies to establish this technical group and facilitate periodic meetings to assess the survival benefits from habitat restoration.

    c) Estuary RME Coordination– Work with the Action Agencies, the Estuary Partnership, and others to convene annual estuary RME meetings of researchers and managers to present new data, exchange information, evaluate the conduct of the estuary RME program, and provide input to a pilot synthesis report for estuary/ocean RME.

    d) Estuary Restoration Prioritization Strategy – Attend and contribute to meetings of a new Action Agency work group intended to develop a new strategy to restoration project prioritization and selection.

    e) PNAMP Estuary Workgroup – Participate in workgroup meetings and assist in the development of coordinated estuary planning and monitoring approaches within PNAMP.

1.2 Background

The function of the Columbia River estuary[1] in the life history of threatened and endangered salmonids is more than simply serving as a corridor for passage between the tributaries and the Pacific Ocean. The estuary provides habitat for multiple life history stages of salmon and steelhead, ranging from the rearing and feeding of fry, fingerlings, and smolts to the passage upstream of adults (Bottom et

[1] The Columbia River estuary is defined as the tidally influenced portion of the river from Bonneville Dam to the plume. This is consistent with Bottom et al. (2005) and the Lower Columbia River Estuary Program (1999). Lower Columbia River tributaries are not part of the estuary RME study area.

al. 2005). Use of estuary habitats by juvenile salmonids varies by species and life history stage (Rich 1920). Generally, the closer the natal stream is to the estuary and the smaller the juvenile migrant, the more likely it is that juveniles will use estuarine habitats as feeding, rearing, and refuge areas, i.e., as more than just a migration corridor (Dawley et al. 1986). Information on salmon biology and ecology in the Columbia River estuary can be found in reports by Bottom et al. (1984, 2005); Dawley et al. (1985a,b, 1986); Kirn et al. (1986); Ledgerwood et al. (1991); McCabe et al. (1983, 1986); McConnell et al. (1983); and Reimers and Loeffel (1967).

In recognition of the estuary's importance to salmon population viability, the 2008 Biological Opinion (BiOp) on operation of the FCRPS called for the restoration of estuarine habitat as a pivotal action to avoid jeopardizing the continued existence of listed salmonid populations (NOAA Fisheries 2008), as well as comprehensive research, monitoring, and evaluation for listed salmon. As a result of the 2000 BiOp on FCRPS operations, the Action Agencies and NOAA Fisheries established a process to develop a basin-wide plan to guide RME efforts for the tributaries, hydrosystem, and estuary/ocean. The process involves a Policy Oversight Group and six technical subgroups: Status Monitoring, Effectiveness Research, Hydrosystem, Hatchery/Harvest, Data Management, and Estuary/Ocean. In FY09, federal RME efforts focused on implementing the RME provisions in the 2008 BiOp.

Overall in FY09, much of the work on the EOS project specifically concerned the estuary/ocean portion of a basin-wide "gap" assessment of federal RME projects and their scope relative to BiOp RME requirements. The EOS project also worked a significant amount of time on the Expert Regional Technical Group. The other coordination activities listed in the previous section were attended to at a lesser degree than the two main work topics. Activities and accomplishments for the EOS project during FY09 are documented in this annual report. Previous annual reports were submitted for FY05, FY06, FY07, and FY08 (Johnson 2005, Johnson 2006, Johnson and Diefenderfer 2007, Johnson and Diefenderfer 2008a, respectively).

1.3 Study Area

A number of publications provide descriptive information about the Columbia River estuary:

- the *Salmon at River's End* report by Bottom et al. (2005)
- Fresh et al.'s (2005) *Role of the Estuary in the Recovery of Columbia River Basin Salmon and Steelhead*
- the *Biological Assessment for the Columbia River Channel Improvements Project* by the U.S. Army Corps of Engineers (2001)
- the RPA Action 158 action plan by Berquam et al. (2003) and the RPA Action 159 habitat restoration report by Johnson et al. (2003)
- the NPCC's sub-basin plan for the estuary (Lower Columbia River Estuary Partnership and Lower Columbia Fish Recovery Board 2004a; 2004b).

Important earlier compendiums include the following:

- *The Columbia River Estuary and Adjacent Ocean Waters* by Pruter and Alverson (1972)

- "Columbia River Estuary" in *Changes in Fluxes in Estuaries: Implications from Science to Management* by Dyer and Orth (1994)
- *Columbia River: Estuarine System* by Small (1990), which contains reviews of earlier work supported by the Columbia River Estuary Data Development Program (CREDDP) on physical and biological processes (CREDDP 1984a, 1984b).

1.4 Report Contents and Organization

The following sections of this FY09 annual report for the EOS project describe project activities, summarize accomplishments, and provide recommendations for FY09. The sections on activities and accomplishments are organized by the work elements listed previously under project objectives (Section 1.1). Appendix A contains the running meeting notes for the federal RME gap assessment that the EOS undertook for the estuary/ocean during FY09.

2.0 Project Activities

EOS project activities during FY09 included project management, annual report, status reports, and coordination efforts; as described in the following sections for each work element.

2.1 Project Management (WE119)

The project was managed according to procedures and principles set forth in PNNL's Standard Business and Management System. As requested by BPA, PNNL developed and submitted the FY10 scope of work and budget for Project 2002-077-00 to BPA via Pisces in August 2009.

2.2 Annual Report (WE 132)

This document fulfills the annual report objective. In addition during FY09, a draft outline for a synthesis report of estuary/ocean RME activities was developed by some EOS members. This outline is documented below because it could serve future BiOp reporting purposes, e.g., the 2013 Comprehensive Report.

The Estuary/Ocean Subgroup (EOS) for federal research, monitoring, and evaluation (RME) proposed the idea for a synthesis report on RME in the lower Columbia River and estuary (LCRE) in the estuary/ocean RME plan (Johnson et al. 2008). Recently, the EOS assessed the coverage of estuary/ocean Reasonable and Prudent Alternatives (RPAs) in the 2008 Biological Opinion (BiOp) (NMFS 2008). One of the main findings was an overarching need for synthesis of the collective information on many RPAs. These "roll-ups" will be relevant to BiOp reporting requirements.

The purpose of the estuary RME synthesis report will be to summarize, synthesize, and evaluate existing literature and new findings in the context of the major management questions and the RPAs for estuary/ocean RME (#58-61). The expected outcome is a document that succinctly describes and applies scientific results to management issues. The intended audience is Action Agency policy/decision-makers. Report preparation will be a logical role and responsibility of the EOS and, as such, will be developed within the EOS as part of the federal process for BiOp RME. Peer-review by researchers, independent scientists, and some intended recipients will be an integral part of report preparation. The report will be a key part of the adaptive management process for habitat restoration in the LCRE, as well as providing management context on ocean conditions. To be developed progressively over a period of three years, the report will culminate in 2012 with a submittal to the Action Agencies for use in the 2013 BiOp Comprehensive Report. A draft outline for the estuary/ocean RME synthesis report follows.

Title: Synthesis of Federal Research, Monitoring, and Evaluation in the Lower Columbia River Estuary and Ocean

Chapter 1 – Introduction (*why, when, where*)
- Purpose
- Background
- Study Area
- Contents

Chapter 2 – Management Needs (*what the RME work is intended to address, i.e., the drivers for the research and monitoring, include the key hypotheses used to support recovery actions*)

- Introduction
- Federal Estuary Program Goal and Objectives
- Key federal management questions and hypotheses (*link to BiOp ERME)*
- Federal RME Objectives (*link to ERME Program document*)

Chapter 3 – Research and Monitoring (*describe what's been done and is being done to address RPAs and management needs*)

- Introduction
- Federal Agencies, Programs, and Funding Processes (*Corps, BPA, through EP, other*)
- Categories: Status & Trends, Action Effectiveness, Uncertainties Research (*organize by RPA#*)
- Performance Indicators and Monitored Attributes (*link to ERME Program document and the hypotheses*)
- Project Descriptions (*objectives, methods [briefly], and types of data; see EOS 2009 running mtg notes*)
- Gap Analysis (*relative to the RME Program document and ERME Proposed Action; see EOS 2009 running mtg notes*)
- Summary

Chapter 4 – Synthesis of Major Findings (*tie all agency/program RME results together*)

- Introduction
- Major Findings (*include published and unpublished results to the extent possible*)
- Synthesis

Chapter 5 –Application and Assessment (*what are the policy implications? where are the gaps, i.e., how well is the RME meeting management needs*?)

- Introduction
- Implications of RME Findings (*for federal habitat restoration project design and program development & management*)
- Evaluation of Information Dissemination/Sharing/Management
- Adaptive Management Needs (*summary of how RME findings in the report should affect federal estuary program and project actions*)

Chapter 6 – Conclusions and Recommendations

Chapter 7 – References

2.3 Estuary RME Plan (WE 174)

No revisions to the Estuary/Ocean RME Plan (Johnson et al. 2008) were required in FY09.

2.4 Status Reports (WE 185)

Status reports on Project 2002-077-00 were submitted quarterly by PNNL to BPA during FY09. The status reports contained information on whether progress was satisfactory or not by milestone for each work element.

2.5 Coordination (WE 191)

The bulk of the work on the EOS project falls under the coordination work element. The material that follows is organized by the topics listed under the coordination objective in Section 1.1.

2.5.1 EOS Meetings

During FY09, the EOS (also called the Estuary RME Workgroup [ERMEW] in FY09), met formally 17 times. Meeting notes are contained in Appendix A.

2.5.2 ERTG

Expert Regional Technical Group for Survival Benefits of Habitat Restoration was established by the Action Agencies. During FY09, two meetings were facilitated to assess the survival benefits from habitat restoration – July 30 and August 26, 2009.

2.5.3 Estuary RME Coordination

Work with the Action Agencies, the Estuary Partnership, and others continued on a future meeting of researchers and managers to present new data, exchange information, evaluate the conduct of the estuary RME program, and provide input to a pilot synthesis report for estuary/ocean RME.

2.5.4 Estuary Restoration Prioritization Strategy

Attendance and contributions were made at one meetings of a new Action Agency work group intended to develop a new strategy to restoration project prioritization and selection.

2.5.5 PNAMP Estuary Workgroup

The PNAMP Estuary Workgroup has waned. Work did occur to coordinate with PNAMP's Integrated Status and Trends Monitoring project.

3.0 Accomplishments and Recommendations

During FY09, EOS accomplishments for BPA Project 2002-077-00 were as follows:

- Continued facilitation and coordination of the EOS as it worked to implement the federal ERME Program and provide input to the broader federal RME effort.
- Helped plan the Northwest Power and Conservation Council's Science-to-Policy Exchange for the Estuary. This event was held September 9-10, 2009 in Astoria, Oregon.
- Performed the estuary/ocean RME analysis for the federal RME efforts. The estuary/ocean RME RPAs were deciphered, RME projects inventoried, and gaps in coverage identified.
- Significant contributions from estuary/ocean RME during 2008 were listed for the Action Agencies 2008 Annual Progress Report.
- The ERTG was initiated.

Project work in FY10 will include facilitation of the EOS, assessing the expert regional technical group on survival benefits of habitat restoration, and helping with strategic planning for restoration. In addition to the usual project management, annual report, and status report, the following activities, are planned for FY10 under Project 2002-077-00.

141 Produce Other Report

Produce an initial version of the estuary/ocean RME synthesis report as part of adaptive management at the program level. This report was recommended during the review of BiOp RMW implementation conducted during FY09.

191 Watershed Coordination

As described above, much of the scope of work for Project No. 2002-077-00 is coordination of RME activities in the lower Columbia River, estuary, and ocean. This coordination effort includes the following topics:

- Estuary/Ocean Subgroup for Federal RME – Continue to facilitate the EOS in its mission to implement the Estuary RME Program.
- Expert Regional Technical Group – Aid the Action Agencies as they continue the ERTG's work to assess survival benefits to juvenile salmon from habitat restoration in the lower Columbia River and estuary. Convene and coordinate with subcontractors who will be members of the RPA 37 Expert Group.
- Estuary RME Coordination– Work with the Action Agencies, the Estuary Partnership, and others to convene annual estuary RME meetings of researchers and managers to present new data, exchange information, evaluate the conduct of the estuary RME program. Also, lead the steering committee for the 2010 Columbia River Estuary Conference in Astoria.
- PNAMP Integrated Status and Trends Monitoring – Participate in workgroup meetings and assist in the development of coordinated estuary planning and monitoring approaches within PNAMP.

- Steering Committee for Estuary Restoration Strategy – Attend and contribute to meetings of a new Action Agency work group intended to develop a new strategy to restoration project prioritization and selection.

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Appendix A

AA/NOAA/NPCC BiOp RME -- Estuary/Ocean Workgroup Running Meeting Notes

A.1 New Updates

Last updated: July 29, 2009 GEJ (503 417 7567)

1. Meeting notes for July 27, 2009 plus input from the Corps on June 2.
2. Revised RPA coverage report sent to the region as part of the Grand RME Gap Assessment compiled by Geiselman.

A.2 Workgroup Tasks and Schedule

(from Strategy Statement issued by Geiselman, 10/21/08, updated 11/24/08, 12/31/08, 1/15/09)

✓ means task completed.

1. ✓Review Management Questions (and associated decisions) and RPAs for monitoring and research requirements (January 16). [[see Attachment 5]]
    a. ✓Each workgroup review key management questions identified in the AA's BA under strategy areas that are associated with their group.
    b. ✓Review applicable RPAs and clarify/document any expectations regarding information needs and compliance requirements.
2. ✓Review and further develop RM&E Work Plan for documentation of expectations, information needs, and identification of subtasks, task leads, and milestones. (February 1)
    a. ✓For each RPA, complete the cells in the RM&E Work Plan (spreadsheet) to document expectations, information needs, associated subtasks (including coordination needs), responsible staff leads, and milestones for completion.
3. ✓Assess coverage of RPA actions and information needs and areas that may be reduced through critical, project specific reviews (Gap and Excess Assessment) (March 1).
    a. ✓Identify all RM&E projects currently being implemented or planned by the AAs, develop key summary information in spreadsheets, and parse projects to applicable workgroups (based on metric information from PISCES and AFEP 1 page reviews). [[see Attachment 6]]
    b. ✓Critically review each project. JG email 2/13/09 -- Here are the Steps for conducting Task 3 b for Fish and Wildlife Program Projects - using the Project Evaluation sheet sent out Feb 12 (Table for Workgroups 2-11-09.xls). [[see Attachment 6]]
        i. ✓For each project that you are reviewing, for each contract or contracts associated with that project, you need to review the Work Element (WE) Description (Column L) and associated Deliverable Specification (Column S).

ii. ✓ID/verify RPA(s) associated with the WE in Column M, highlight in yellow ones that you do not agree with or add new ones highlighted in red, place your initials next to any proposed deletions (yellow) or additions (red).

iii. ✓Determine what parts of the WE description and deliverable specification do not address the needs or objectives of RPA(s). (Highlight parts that do not address needs or objectives in yellow).

iv. ✓Identify potential project improvements that could improve the support for specific RPA needs (note there will be another opportunity for this in the overall RPA gap assessment later in step 3c), or provide any other comment relevant to either the entire project or the specific WE that you feel should be documented or noted. Enter this information into WE-specific and/or Project-specific comment columns (U or V) and place your initials by all comments.

v. ✓ID the types of tags if any that are used in the WE in column T.

vi. ✓Identify any other WGs that you think need to review this WE (that are not already included in Column F) by adding the standard workgroup name to Column F and highlighting it in red.

c. ✓After all projects have been reviewed, assess overall coverage of each RM&E RPA and F&W Program RM&E Objective and document any gaps in expected information needs, coverage or compliance. (From Peven email 3/18/09, Gaps analysis steps (2).doc.) [[see Attachment 7]]

Standard Questions for 3c.

A. Is the RPA or F&W Program objective being satisfied by the suite of projects? Create table that has components from 1-4 in it

A1. Identify what is needed (components) for each RPA

A1a. Review tables (of what is required to fulfill each RPA (perhaps combine with variables that need to be monitored))

A1b. Add detail if needed

A2. Identify any non-contracted tasks that need to be completed associated with the RPA (like development of an implementation plan that combines various components)

A3. Review suite of projects assigned to a RPA to determine if all of the components of the RPA are satisfied (this will be a qualitative assessment – particular components, like variables, will not be compared)

A4. Document the remaining gap and list components that are currently not being met.

B. How should the gap be filled?

B1. Identify how and who should fill the gap: RFP; Expansion or modification of existing project scope; Coordination and or cost sharing with other (non AA).

C. Identify projects or parts of projects that could be eliminated and still meet the RPA or F&W Program objective

C1. Identify projects or parts of projects that are in excess of what is needed to meet the RPA or F&W Program objective

C1a. High level review

C1b. Look for redundant activities or tasks

C1c. Look for projects or work elements that have no RPA assigned to them: Is it RM&E related? Is it innovative and could assist in our understanding of other elements that address a RPA? Is it funded through the Fish Accords?

D. Are there projects that possess unique attributes that warrant its funding, even though certain aspects may overlap other projects that apply to the RPA, Fish Accords or F&W Program objective?

4. ✓Recommendations for changes to existing projects and/or needs for additional projects that would address any RM&E gaps (April 1). [[see Attachment 7]]
    a. Based on project critical reviews, any identified gaps in RM&E, and cost information on RM&E placeholders and RM&E close-outs, develop recommendations for project modifications and targeted requests for proposals.
    b. Recommendations should balance needs within existing RM&E budgets.
5. ✓Develop targeted requests for proposals as needed (May 1).
6. Review proposals and make recommendations to proposed work relative to RM&E gaps. (July 1).
7. Support annual and 3-yr comprehensive performance reports (June 1).
8. Support RM&E implementation plans on a 3-year cycle (October 1).

Planning Group:

1. Provide workgroup guidance and oversight of tasks and products (ongoing).
2. Coordinate and inform agency executives on progress and issues (ongoing).
3. Report and coordinate progress with Federal Caucus, RIOG, NPCC, AFEP, NWEIS, PNAMP, Accord Parties, and other regional RM&E forums (ongoing).

A.3 Estuary/Ocean Workgroup -- Meeting Notes

Meeting 11/13/08

A workgroup meeting was held at PNNL Portland and attended by Ebberts, Johnson, and Yerxa. The purpose was to kick-off planning for the 2009 estuary/ocean workgroup, as assigned by Geiselman et al. during the conference call on 10/30/08 for grand federal RME for the FCRPS BiOp.

The composition of the workgroup was discussed. It was decided that the membership listed above would provide a good start and that others could be invited as necessary in the future. *Action Item*: Johnson to call Tortorici about participating. [Completed -- Tortorici will participate.]

The workgroup objectives and tasks outlined in the RME Strategy Statement were examined. There was general concurrence with them. *Action Item*: Johnson to assemble a package (this document) of the workgroup objectives and tasks and pertinent material from the 2007 BA and the 2008 BiOp.

Along with the Strategy Statement, Geiselman provided a workbook containing spreadsheets on the "work plan" and project lists (BPA_FW_StatusSheetv33_display.xls). *Action Item*: Yerxa to check with Geiselman to confirm this is the most recent version of the workbook. [Completed] *Action Item*: Johnson to extract the data on the estuary/ocean. [Completed -- Thakker did it.]

The gap assessment will require definition of what constitutes "coverage" and what does not. This will be a workgroup decision. The reasoning behind specific coverage determinations will be documented.

This effort to implement BiOp RME for the estuary/ocean will provide an opportunity to apply on a regional estuary-wide basis the adaptive management program developed by the Corps.

The workgroup is commencing to work on the tasks. The next meeting will be 12/1/08, 1300-1500 h, at PNNL Portland. The agenda will include: 1) review the estuary/ocean management questions and RPA actions; 2) work on the work plan; 3) plan for the gap assessment.

Meeting 12/1/08

A workgroup meeting was held at PNNL Portland and attended by Marci Foster (BPA), Johnson, Jim Ruff (NPCC), Yerxa, and Tortorici (phone). The purpose was to respond to Jim Geiselman's request of 11/19/08 for a review and listing of outstanding issues of interpretation of the 2008 BiOp RPAs -- "*…. identify any outstanding issues or potential areas of disagreement regarding interpretation of RPA compliance requirements and make sure we have a BPA position on these issues articulated and coordinated with COE and BOR ASAP…please review "brainstorm" your groups relevant RPAs for any such issues that you believe we may run into with NOAA in our AA/NOAA/NPCC RM&E Implementation workgroup process and either flag them with an e-mail or stop by my office to discuss.*"

The workgroup examined the estuary/ocean RPA actions one by one, as follows (the issues below incorporate comments from Ebberts obtained after the meeting):

RPA 36 – Estuary Habitat Actions 2007-2009. OK

RPA 37 -- Estuary Habitat Actions 2010-2018.

ISSUE – The appropriate reporting metrics for habitat projects need to be defined.

ISSUE – The approach to estimate biological benefits needs to be clarified.

ISSUE – In the 2nd and 3rd bullets, define the habitat metrics.

ISSUE – In the 4th bullet, need to clarify why we'd use the method in the BA if we have quantitative estimates of survival benefits.

ISSUE – In the 5th bullet, "replacement" really means "additional." NMFS agrees with this interpretation.

RPA 38 – Pile Program.

ISSUE – Metrics for the Pile Program are not established. Such metrics will be needed as inputs to Pisces to quantify progress for the Pile Program.

ISSUE – Need to clarify whether Pile Program implementation will continue through 2018 even if survival benefits are not being realized.

RPA 58 – Fish Performance.

ISSUE 1– Some of the estuary/ocean actions overlap with actions under the hydro' and predation RPAs that are being covered by those respective workgroups. The Action Agencies and NMFS agreed that the estuary/ocean workgroup would defer to the hydro and predation workgroups for the overlapping actions, but that we will keep each other informed.

ISSUE 2– In the 1st and 3rd bullets, need to clarify if they are meant to refer to the same fish, i.e., smolts or juvenile salmonids.

ISSUE 3– Need to clarify what "representative" means. Same for "completion."

RPA 59 – Migration Characteristics.

ISSUE – What is intended for the content of the annual progress report? Who reports what for when and where?

RPA 60 – Action Effectiveness Research. OK.

RPA 61 – Critical Uncertainties Research. OK.

Ruff presented a memorandum (Attachment 3) on estuary/ocean management questions in the F&WL Program that may be outside the scope of the 2008 BiOp RPA actions. The workgroup agreed to cross-check the F&WL Program management questions against the Action Agencies' management questions for estuary/ocean RME when we do the gap assessment for project coverage of the RPAs.

Next meeting TBD. The purpose will be to review and further develop the RME workplan for the estuary/ocean (Workgroup Task #2). Yerxa will ask Thakker to send the workgroup the latest version of the workplan. [Completed.]

Meeting 12/17/08

The meeting was postponed due to snow.

Meeting 1/15/09

A workgroup meeting was held at PNNL Portland and attended by Blaine Ebberts (CENWP), Marci Foster, Jim Geiselman, Nilay Thakker, and Tracey Yerxa (BPA), Gary Johnson (PNNL), and Cathy Tortorici (NOAA). The purpose was to continue work on Task 1(review the management questions and RPA actions for estuary/ocean RME) and start work on Task 2 (develop the work plan) and Task 3 (gap assessment).

<u>Updates</u>

The running meeting notes and attachments was introduced. The intent is to include all relevant materials for the workgroup in one location (file).

Johnson will post ERMEW materials and inquire about passwords and permissions for ERMEW members on the website the Action Agencies have instituted for the Implementation Website for the AA/NOAA/NPCC RM&E workgroups.

Workgroup efforts could get intense as the Action Agencies will be rolling-up workgroup products into implementation plans, progress reports and comprehensive evaluations to be submitted to NOAA as required in the BiOp.

To perform the workgroup tasks, the ERMEW will use content from the Estuary/Ocean RME document (released January 2008) as much as possible. In addition, results form estuary RME should help implement adaptive management for estuary ecosystem restoration.

<u>Task 1 – Review Management Questions and RPAs</u>

The management questions for the estuary/ocean are contained in Attachment 2. There was no actual need to review them to identify issues because they will not be changed.

The ERMEW spent time discussing issues of RPA interpretation and clarification identified at the ERMEW meeting 12/1/08. The results of these discussions will be incorporated into the work plan (Attachment 5). In fact, the first field under Task 1 Review is called Interpretation/Issues.

The first issue concerned overlap among workgroups, e.g, hydrosystem effects that manifest themselves in the estuary and ocean are covered by the Hydrosystem Workgroup. We will need

to have good communication between the Hydrosystem and Predation workgroups because their RME efforts include actions in the estuary. We will coordinate on projects and RPAs that overlap among workgroups.

The ERMEW review is concerned about the estuary RME RPAs (58-61), not the habitat RPAs (36-38). Any issues of interpretation of RPA 36-38 will be addressed separate from the RME RPAs.

The issue of "representativeness" will be addressed during the project review (Task 3).

The issue of "completeness" will be addressed during the interaction between the Action Agencies and NOAA at the reporting steps in BiOp adaptive management. One definition of complete is whether or not the commitments in the Biological Assessment and subsequent Implementation Plans have been met. Also, best professional judgment will be used to assess how well the RPA action has been covered and whether or not useful and appropriate information has been obtained.

Task 2 – Develop a Work Plan

In a recent development, the workplan (an Excel spreadsheet) that was distributed for the meeting will not be appropriate for use by the ERMEW because it is designed for internal BPA needs. Instead, Thakker provided a new spreadsheet for the work plan. It's basically a "tool to accumulate information" about activities and concerns. The new work plan is organized by RPA actions and subactions (the bullets under each RPA). The ERMEW is free to modify this as necessary for the purposes of estuary/ocean RME. (See Attachment 5.)

Task 3 – Gap Assessment

A cross-walk between the RPAs and existing projects was undertaken by BPA. The ERMEW will make use of this product in Task 3.

The universe of projects includes those funded by BPA and the Corps. Also, projects funded by others that specifically address estuary/ocean RPAs will be noted.

Eventually there'll be a database of the projects and RPAs that can be queried to generate reports for managers.

Next Meetings

January 20 (0715-0900 h) and January 26 (1300-1600 h).

Meeting 1/20/09

A workgroup meeting was held at PNNL Portland and attended by Blaine Ebberts (CENWP), Tracey Yerxa (BPA), and Gary Johnson (PNNL). The purpose was to continue work on Tasks 1 and 2 developing the workplan for estuary/ocean RME implementation.

Johnson introduced the new template to obtain information from the workgroup in order to populate the workplan. Since the last meeting, He cut and pasted information from the Estuary/Ocean RME document (released January 2008) into the workplan template. We'll cite this material or put it in a different font color to differentiate it from material generated by the workgroup. The template's fields are a combination of the Thakker spreadsheet and content in the Geiselman task descriptions. The workplan is Attachment 5 in these notes.

Regarding RPAs 36-38 (Estuary Habitat), Ebberts and Yerxa agreed that the ERMEW should incorporate them into the workgroup's efforts because, even though they are habitat- and not

RME-related, that RME eventually will be applied to them. Therefore, RPAs 36-38 will be incorporated into Attachment 5.

The meeting adjourned and we watched the inauguration.

There was a conference call later in the day with Geiselman and the workgroup leads to discuss Task 3, the gap assessment. A new spreadsheet to collect information on the projects (Task 3a) was offered. Fields in this sheet were incorporated into the estuary project template (Attachment 6). The estuary/ocean workgroup will collect information using the RPA and project templates (Attachments 5 and 6, respectively). In the end, Johnson will place the material in whatever form is required.

Next meeting: January 26, 2009, 1300-1600 at PNNL Portland.

Meeting 1/26/09

A workgroup meeting was held at PNNL Portland and attended by Blaine Ebberts (CENWP), Marcy Foster and Tracey Yerxa (BPA), Jim Ruff (NPCC), and Gary Johnson (PNNL). The purpose was to finish work on Task 1 and continue work on Task 2 for estuary/ocean federal RME implementation.

Task 1 – We filled in missing information in the section for task 1 in the workplan template (Attachment 5). Outstanding issues, e.g., "completeness", will be resolved during the project review (Task 3) or the processes for the Progress and Comprehensive Evaluation reports.

Task 2 – We completed RPA 58 and worked through RPA 59.1 to 59.4, before adjourning. The results of the community writing effort are in Attachment 5.

Action Item: Johnson to work on adding material for Task 2 before the next meeting. This material shall be highlighted in yellow to differentiate it.

Next meeting: February 2, 2009, 1300-1600 h at PNNL Portland.

Meeting 2/2/09

A workgroup meeting was held at PNNL Portland and attended by Blaine Ebberts (CENWP), Marcy Foster, Jim Geiselman, and Tracey Yerxa (BPA), Jim Ruff (NPCC), Russell Scranton (NOAA), and Gary Johnson (PNNL). The purpose was to finish work on Task 2 (RPA requirements) and to prepare for work on Task 3 (gap assessment) for estuary/ocean federal RME implementation. Here're a few highlights; the bulk of the meting was documented by real-time editing of Attachment 5

The Northwest Environmental Data network (NED) has been replaced by the RME Data Management and Coordination Workgroup. Data management is in RPA 72.

The Shiraz model is being used by the Tributary Habitat workgroup for status and trends monitoring. For more information about Shiraz, copy and paste these links into your browser.

> http://www.prism.washington.edu/stories/factSheet.jsp?title=SHIRAZ%20Model
>
> http://www.ingentaconnect.com/content/nrc/cjfas/2006/00000063/00000007/art00016?crawler=true

It appears to be time for another cross-check with the Tributary Habitat Workgroup. Johnson will inquire about Hillman's availability for a future ERMEW meeting.

Geiselman reviewed the assignment for Task 3, Gap Assessment. Much of the project specific data will be downloaded from Pisces by Fisher and distributed to the respective workgroups. We'll fit the half-dozen or so Corps' projects into this template (see Attachment 6). The BPA and Corps projects will be our priority. The material in Task 3 will be used to support any recommendations for project improvements and gap coverage.

Next meeting: 2/23/09, 1300-1600 h, PNNL Portland.

Meeting 2/23/09

A workgroup meeting was held at PNNL Portland and attended by Blaine Ebberts (CENWP), Jim Geiselman (phone) and Tracey Yerxa (BPA), Jim Ruff (NPCC), and Gary Johnson (PNNL). The purpose was to finish work on Task 3a (project list) and 3b (gap assessment) for estuary/ocean federal RME implementation. Here're a few highlights; the bulk of the meting was documented by real-time editing of Attachments 6 and 7.

The group decided to keep completed projects in the assessment if they provided information pertinent to an RPA.

We assessed level of coverage of an RPA by a project according to a three-level scale: none, some, and essentially full (see Attachment 7).

Johnson will work with Geiselman, Fisher, and Thacker to upload the results of the ERMEW work to the BPA spreadsheet once the tasks are complete at the end of March.

Ebberts or Johnson to provide information on Crims, JBH, and Tenasillahe.

Project 2007-401-00 lead is not the Estuary/ocean group.

Next meeting: TBD, but we'll probably need at least three meetings in March to finish Task 1-4 by the April due date.

Next Meeting: 3/19/09.

Meeting 3/18/09

A workgroup meeting was held at PNNL Portland and attended by Blaine Ebberts (CENWP), Jim Geiselman (BPA), Jim Ruff (NPCC), and Gary Johnson (PNNL). Cathy Tortorici (NMFS) was on the phone. The purpose was to continue work on Task 3b (gap assessment) for estuary/ocean federal RME implementation. Here're a few highlights; the bulk of the meting was documented by real-time editing of Attachment 6.

Projects E22 through E27 are relevant to estuary RME, but are funded for other purposes under the purview of other agencies, not the AA. Therefore, we will include them in the list, but will not review them or suggest improvements.

AFEP projects are funded by the Corps using Congressional appropriations for the Columbia River Fish Mitigation (CRFM) program. Estuary/ocean RME includes projects with formal AFEP study codes, such as EST-02-P-01 for the Acoustic Telemetry Study. It also includes other projects funded with CRFM monies under Corps authorities, such as Crims Island Monitoring. For thoroughness, we will track all RME projects in the estuary/ocean funded with CRFM monies.

Task 3 calls for suggestions for "improvements" to the project. The group discussed the definition of improvements. Improvements should be limited to scope deficiencies relative to the particular RPAs being addressed and issues of cost-effectiveness and statistical robustness. Any

suggestions for improvements will need to be coordinated with the researchers. In general, improvements should help address the issue of survival benefits.

Johnson will compile a package of PDFs of recent and available reports for the estuary/ocean RME projects.

The ocean projects needs to be reviewed collectively in an integrated fashion, asking how do they relate to each other?

Many of the BPA projects will be reviewed during the Council's categorical RME review for the 2010+ planning process.

We need to be cognizant of the following potential issue – the information from the Pisces download that we're using for work element descriptions and deliverable may be out of date if the researchers have new and different objectives planned for the future.

We will continue to ask: How will management decisions be affected by the data? How will the data be applied to help management decision-making?

Meeting 3/19/09

A workgroup meeting was held at PNNL Portland and attended by Blaine Ebberts (CENWP), Tracey Yerxa (BPA), Jim Ruff (NPCC), and Gary Johnson (PNNL). Cathy Tortorici (NMFS) and Jim Geiselman (BPA) were on the phone. The purpose was to continue work on Task 3b (gap assessment) for estuary/ocean federal RME implementation. Here're a few highlights; the bulk of the meting was documented by real-time editing of Attachments 6 and 7.

Based on communication with the Hydro Workgroup, Johnson will prepare a table of the main BPA and Corps projects (E1-E15) for review by work element/objective. Currently we're doing the Task 3 review at the project level.

The workgroup discussed the need for two levels of RPA coverage. We decided to keep two levels for now knowing that we can always convert to one level at a later date if necessary. We also clarified the definitions (Attachment 7):

●	= full coverage; directly applies to the RPA
●	= partial coverage; provides information that could be useful to the RPA

The AA will have to contend with the issue of coordination and roll-up of multiple projects covering a given RPA Subaction. During the current ERMEW review, we'll identify redundancies and areas for coordination to improve cost-effectiveness.

We will include only the estuary/ocean RPAs (58-61) when we do the coverage assessment. Other groups will identify non-estuary RPAs that may be applicable.

We need to press for the ecological applications of tagging studies.

The Corps and BPA agreed to meet to discuss the Cumulative Effects Study and the Adaptive Management Plan for Habitat Restoration in the Columbia River estuary.

Next Meeting: TBD.

Meeting 3/26/09

A workgroup meeting at PNNL Portland was attended by Jim Ruff (NPCC) and Gary Johnson (PNNL). Jim Geiselman (BPA) was on the phone briefly to report on the grand RME process (see below). The purpose of the meeting was to continue work on Task 3b (gap assessment) for

estuary/ocean federal RME implementation. We worked from the 3/20/09 version of the running meeting notes.

To facilitate comparison and integration of projects, we reordered the projects in Attachment 6 into groupings according to: Status and Trends, Action Effectiveness, or Critical Uncertainties. This necessitated a new numbering system.

We deleted RPA coverage for the projects that are funded for purposes other than the 2008 BiOp. The RPA is non-applicable because the Action Agencies are not funding this work to fulfill the BiOp.

Tortorici informed the group that the Department of Justice has asked the NWFSC to list research priorities for the estuary/ocean. The ERMEW should be apprised of the list when it becomes available.

Ruff mentioned that we'll still need to review coverage of the estuary/ocean elements in the Council's F&W Program – Johnson and Ruff to do this offline, then report results to the group.

Geiselman reported on the 3/25/09 meeting of RME Workgroup leads. Schedules are slipping some. The AA's RME Steering Committee will be meeting to finalize a revised schedule. Still need to have recommendations for RFP solicitations, if any, by May 1. An outline for the overall gap assessment is being developed. Eventually we will be including Fish Accords projects in our coverage assessment.

Johnson suggested the following classes for RPA coverage (modified by GEJ 4/2/09):

- Class A = Complete, the RPA is fully covered and met by past and existing projects; discontinue work related to this RPA.
- Class B = Ongoing, the RPA is fully covered by existing work; continue work related to this RPA.
- Class C = Ongoing, the RPA is partially covered by existing work; continue work related to this RPA and add new work elements.
- Class D = Ongoing, the RPA is partially covered by existing work; continue work related to this RPA and initiate an RFP.
- Class F = Nothing, the RPA is not being covered by any project; initiate an RFP.

The group discussed a process to document differing opinions of members on RPA coverage by particular projects. A matrix for rankings (direct, indirect, none) by individual was discussed; at the next meeting, the entire group will decide how to handle this issue.

Next Meeting: 3/31/09, 0900-1200 h @ PNNL Portland.

Meeting 3/31/09

A workgroup meeting was convened at PNNL Portland and attended by Jim Ruff (NPCC), Gary Johnson (PNNL), Anne Creason (BPA), and Cathy Tortorici (NMFS). The purpose of the meeting was to continue work on Task 3b (gap assessment) for estuary/ocean federal RME implementation. We worked from the 3/27/09 version of the running meeting notes.

Other workgroups, such as Hydro and Hatchery, are ascribing RPAs for each work element within a project. The ERMEW, however, is working at the project-level. **Johnson** will add WE-level data, if necessary, when the ERMEW results are rolled-up into the Grand RME workplan.

In Task 3c, we'll be assessing how well a suite of projects pertaining to an RPA cover it. How much coverage is enough? The groups will discuss this when Task 3c is finalized, hopefully at our next meeting.

The assessment of the level of coverage by a project to a particular RPA has three levels: 1) full coverage, directly applies to the RPA; 2) partial coverage, provides information that is useful to the RPA; 3) not applicable. The group clarified the first level to be coverage of all elements of the RPA. For example, assume an RPA says determine migration pathways in the estuary and plume. If a project fully covered the plume but did not address the estuary, then it would get a partial coverage. Before, we were giving these full coverage grades.

Johnson to contact Giorgi to cross-check which estuary/ocean projects the Hydro group reviewed.

Some projects have application outside the estuary/ocean RME RPAs (58-61). We're trying to make notes to this effect in the comment field.

The work element material for the BPA projects was the most recent content in Pisces when the download occurred (Feb 2009). However, the scopes of work for some projects may be changing in the near future as new contracts are emplaced. Thus, the issue is performing the project review using old information. There's not much we can do about this now other than to keep the issue in mind.

This work would be a lot easier if the work elements and objectives included the RPA subaction. Something for BPA and the Corps to consider requiring.

Next steps: update Attachment 7 and assess gaps RPA by RPA.

Next meeting: first full week of April.

Meeting 4/7/09

This workgroup meeting at PNNL Portland was attended by Gary Johnson (PNNL), Tracey Yerxa (BPA), and Cathy Tortorici (NMFS; by phone). The purpose of the meeting was to continue work on Task 3b (gap assessment) for estuary/ocean federal RME implementation. We worked from the 4/2/09 version of the running meeting notes.

Johnson reported meeting with Leonard and Ruff (NPCC) to identify the F&WP objectives that particular projects pertain to. This information will be added to the project templates in Attachment 6.

To finalize Task 3, the ERMEW members will need to review the content in Attachments 6 and 7 and make an assessment in RPA coverage.

Meeting 4/22/09

A workgroup meeting was convened at PNNL Portland and attended by Gary Johnson (PNNL) and Tracey Yerxa (BPA). We continued to work on Task 3b (gap assessment) using the 4/2/09 version of Attachment 7, the gap assessment.

Because of their complexity, a few projects will require a more thorough review than is possible in the timeframe for Task 3. As part of determining the scope of work during the contracting process, the respective action agencies will consider convening special, focused review meetings for these projects, which might include CUR2 (POST) and STM1 (Ecosystem Monitoring).

Johnson updated Attachment with grades and comments on RPA coverage provided in emails from Ruff, Tortorici, and Yerxa. We examined the results RPA subaction by RPA subaction and updated Attachment 7. Several points were raised:

- If a project addresses an RPA subaction, do we need to make a distinction in the gap assessment between full coverage and partial? Decision – keep the distinction for now.

●	= full coverage; directly applies to the RPA
●	= partial coverage; provides information that could be useful to the RPA

- If so, do we have to have at least one project per RPA subaction that provides full coverage? Decision – not necessarily, but discuss with full ERMEW.
- For BiOp reporting, we will need to synthesize across multiple projects and roll-up the information for each RPA. What do we know and not know? The ERMEW could play a role here.

Meeting 4/23/09

Gary Johnson (PNNL), Anne Creason (BPA), and Cathy Tortorici (NMFS) met at PNNL Portland to continue work on Task 3b (gap assessment). We worked from the 4/2/09 version of Attachment 7, updated during the ERMEW meeting on 4/22/09.

Because the "Grades" connote levels performance, they will not be appropriate when the ERMEW's work on Tasks 1-3 is submitted to the Grand RME Policy Group on May 1. It's our understanding that Giorgi and Geiselman are working on a universal template for all work groups to use. Johnson will transfer the ERMEW's work products into this template.

As on 4/22/09, the members present at the meeting examined the results RPA subaction by RPA subaction and updated Attachment 7. Several points were raised:

- A single project addressing an RPA subaction may be problematic. Will need to closely assess coverage in these cases (RPA 58.1, 59.2, and 59.3).
- Does each RPA subaction need at least one project that provides "full coverage"? (The same point was made on 4/22/09.) Maybe not because a) some RPAs by their very nature would be difficult for one project to cover fully (e.g., 60.2 Site-Specific Action Effectiveness Research), and b) a collection of projects each addressing an aspect of an RPA subaction when taken as a whole could provide full coverage (e.g., RPA 61.1 Ecological Importance).
- Each RPA subaction needs a roll-up; the roll-up function is generally absent. Perhaps a "lead" project in each RPA, such as a project that provides "full' coverage, and/or an overall synthesis effort could serve this need.
- Tortorici's assumed in her scores that, for an RPA to have full coverage (Score 1 or 3), there had to be an existing project doing roll-up.
- BiOp reporting will need to be a true synthesis and integration of information, not simply a summary of findings.

Johnson will contact Ebberts to get the Corps' input. Johnson will write-up the scores and comments in a narrative at the end of Attachment 7 and submit them to the ERMEW for review before delivering the material to the Grand RME Policy Group on May 1. Next meeting – TBD.

Meeting 6/1/09

Gary Johnson, Jim Ruff, and Cathy Tortorici met at PNNL Portland and Geiselman and Yerxa participated by phone to reach consensus on coverage for all RPA 58-61 subactions and finalize the Task 3 gap assessment. We worked from the 5/7/09 version of the running meeting notes and the draft gap report contained in Attachment 7 of the notes.

Geiselman provided an update on grand RME. He's compiling input from all workgroups into a Compehensive RME Gap Assessment document. The information will be presented at a meeting of the AA/NOAA managers on 6/3/09. The ERMEW will need to identify high priority gaps that require fast-tracking through the funding process, i.e., BiOp time-critical work. This pertains to BPA projects; Corps projects are already on track within the 2010 AFEP planning process.

The group discussed the RPA subactions that did not have consensus from previous meetings: 58.3, 59.4, 61.1, and 61.3. Through the spirit of compromise, we reached consensus among the ERMEW members present. Because the Corps representative was not able to attend the meeting, the consensus reached does not necessarily reflect the Corps' position. Johnson will show the Corps the new language in the gap assessments for the four subactions in question and see if it meets their approval. The revised gap assessment (included in Attachment 7 of the running meeting notes) will be submitted to Geiselman on 6/2/09.

The group reviewed and commented on a draft presentation prepared by Johnson for the AA/NOAA RME review meeting on 6/3/09.

On 6/2/09, Ebberts provided input for the Corps on the new language in the gap assessments (58.3, 59.4, 61.1, 61.3). He added caveats to the gap assessments for 58.3 and 59.4; the language the ERMEW decided upon on 6/1/09 was not changed. The estuary/ocean gap report in Attachment 7 includes these changes. This report was submitted to Geiselman and is included in the Grand RME Gap Assessment draft report that Geiselman submitted for regional review on 6/3/09.

Meeting 7/29/09

Creason, Ebberts, Johnson, Ruff, Tortorici, and Yerxa met at PNNL Portland. Geiselman participated by phone. Phil Trask was also present as there was an RPA 37 Steering Committee meeting immediately after the ERMEW meeting. Per Geiselman's instructions in an email to workgroup leads on 7/2/09, we identified any redundancies among estuary/ocean RME projects, assessed the cross-walk with NPCC F&W Program objectives, and reviewed the estuary/ocean RPAs for "high priorities." We also discussed the synthesis report, the Implementation Plan, Estuary/Ocean RME Coordination Meeting and next steps for the ERMEW.

Federal RME Update. Geiselman provided an update on grand RME. Collaboration work with the fisheries agencies and tribes is ongoing for various aspects of federal RME; this collaboration work does not include the estuary/ocean at this time. The NPCC has been briefed on the federal RME effort and the RME gap assessment. The NPCC categorical review for RME within the F&W Program is scheduled for October 2009. This will entail review of sponsor reports (i.e., researcher's project accomplishments and future plans) by the ISRP and others. The federal RME gap assessment will be used to inform the NPCC's categorical review for RME. Geiselman also mentioned that Giorgi is leading an effort to review PIT and other tagging requirements for federal RME. ***Action Item***: Based on the PIT information in Attachment 6 (Project Review) of the Running Meeting Notes, Johnson to inform Giorgi of PIT tagging needs for the estuary.

Yerxa noted that the Cowlitz Tribe desires to become more involved in estuary RME activities. ***Action Item***: Yerxa to send Johnson the contact information for tribal staff and provide guidance on which meetings will be applicable to them.

Redundancies. A perceived redundancy exists between the POST project (BPA 2003-114-00) and the Post-FCRPS Survival Study (EST-P-0201) and the other smolt survival studies conducted by the Corps at JDA, TDA, and BON. The Corps' survival studies use the Juvenile Salmon Acoustic Telemetry technology and state-of-the-art experimental designs to estimate survival for yearling and subyearling Chinook salmon and steelhead at JDA, TDA, BON, and in the lower river and estuary. POST uses Vemco technology to estimate travel times and detection rates in the Eastern Pacific Ocean. More education is needed for regional managers to understand the distinctions between these two technologies. No other redundancies were noted.

F&W Program Objectives. The estuary/ocean RME RPAs and associated projects correspond to specific NPCC F&W Program objectives. Ruff, Leonard, and Johnson performed this cross-walk earlier. It is documented in Attachment 4 of the Running Meeting Notes.

The following high priority needs were identified: RPA 59.1 bathymetry and topography mapping, RPA 59.2 estuary habitat classification system, and the overall roll-up/synthesis report.

Synthesis Report. Yerxa said the plan is to develop the synthesis report through the EOS as part of the contract with PNNL. The report with mature in successive annual stages as information becomes available. The intent is to inform the Comprehensive Report for the BiOp due in 2013. The RME synthesis work should be part of the Implementation Plan due this winter. Furthermore, if timing allows, drafts of the synthesis may be used to inform the Implementation Plan.

Implementation Plan. Yerxa and Ebberts will lead coordination between BPA and the Corps on estuary/ocean aspects of the Implementation Plan (IP). The intent is to include adaptive management as part of the IP. The Corps' Adaptive Management Plan for Estuary Habitat Restoration will be applicable here.

RME Coordination Meeting. Planning for the Estuary/Ocean RME Coordination Meeting is underway. The ERMEW will perform the steering committee function. Participants need to be the actual researchers, not their managers or supervisors. The meeting should occur this fall. The format should include open, free-flowing questions/answers and discussion. This will not be a conference. The Corps and BPA will co-host the meeting. ***Action Item***: Johnson to revise the previous description statement for the Coordination Meeting and send to Yerxa and Ebberts for review.

Next Steps. Next steps and meetings are to be determined.

A.4 Attachment 1 -- BiOp, Fish Accords, and F&W Program, RM&E Implementation Strategy (from Geiselman 12/2/08)

Goals:

1. Confirm and communicate our vision for future RME priorities and expenditures.
2. Optimize the cost-effective implementation of BiOp, Fish Accords and other F&W Program RM&E necessary to meet legal commitments, address PS, and inform adaptive management decisions within existing budget constraints.

3. Coordinate and refine the RM&E vision with other regional partners, including AAs/NOAA; Fish Accord parties; NPCC; Federal Caucus; RIOG.

Tactical Steps:

1. Develop Teams and Workgroups
    a. Develop and staff a BPA RM&E Team specific to BPA strategic issues and review (ongoing).
    b. Develop and staff a NPCC/BPA F&W Program RM&E Review Team (ongoing).
    c. Develop and staff an AA/NOAA/NPCC BiOp RM&E Planning Group and a set of strategy-specific Workgroups (ongoing).
2. Confirm the Vision
    a. Confirm our vision for RME as identified in our BA and BiOp, taking into account the Fish Accord commitments, Non-BiOp RM&E needs within the F&W Program and AFEP, and likely recovery plan priorities (Fall 2008).
    b. Confirm our understanding of management questions/decisions, performance standards/targets, RPAs and associated information needs, advancing and refining the common federal agency vision of RME (Fall 2008).
3. Coordinate and Refine
    a. Coordinate closely with the F&W Program and AFEP RM&E Review Processes, the RIOG forum, the Federal Caucus, Fish Accord partners PNAMP, NWEIS, and regional recovery plans (ongoing).
    b. As a result of this coordination, advance the common regional RME vision to the extent possible, and set priorities accordingly (ongoing).
4. Adapt Existing Programs to the Vision
    a. Critically assess all existing RM&E projects and new proposals for relative priority and value to management questions/RPAs (Winter 2009).
    b. Identify project modifications, close-outs, and gaps requiring targeted solicitations (Spring 2009).
    c. Develop information strategies and monitoring designs where needed (ongoing).
    d. Develop and coordinate RM&E Annual and Comprehensive Progress Reports and Implementation Plans (ongoing).

RME Teams and Workgroups:

Element	**BPA RM&E Team**	**BPA/NPCC RM&E Review Team**	**AA/NOAA/NPCC BiOp RM&E Workgroups**
Workgroup Objectives	Review and confirm a BiOp/F&W Program RM&E vision. Provide BPA support to the AA/NOAA/NPCC RM&E Workgroups and the NPCC/BPA RM&E Review Team	Insure that F&W Program projects have high value and capability to meet legal commitments and support management decision information needs.	Confirm BiOp RM&E and Performance Reporting RPA requirements. Ensure that BiOp RM&E RPAs are being implemented successfully and that information will be available to answer key management

Element	BPA RM&E Team	BPA/NPCC RM&E Review Team	AA/NOAA/NPCC BiOp RM&E Workgroups
	process. Insure RM&E projects follow data collection and data management standards, provide expected deliverables and are implemented on schedule. Insure BPA BiOp and Accord RM&E commitments are satisfied.	Obtain ISRP review as needed. Recommend changes and close-out of F&W Program RM&E project work that has little or no value to F&W Program management information needs. Facilitate targeted requests for proposals as needed.	questions, inform adaptive management, and demonstrate accountability relative to performance requirements. Oversee BiOp RM&E Annual Progress Reporting, Comprehensive Assessments, and Implementation Plans.
Members and/or Leads	Estuary/Ocean: Yerxa, Johnson, Ebberts	Lynn Palensky, Tony Grover, Jim Geiselman, Jeff Allen, Kerry Berg, Bettin,Scott, Chris Furey, Kathy Fisher, Mark Fritsch, Jeff Gislason, Stacy Horton, Nancy Leonard, Erik Merrill, Jim Ruff, John Skidmore, Karl Weist, Tracy Yerxa.	Estuary RM&E Workgroup (Coordinated w/ EOS and RIOG Habitat): Co-Leads: Tracey Yerxa, Gary Johnson; Participants: COE NWD (to be determined), Blaine Ebberts, Cathy Tortorici, Heida Diefenderfer; Marci Foster, Jim Geiselman, Jim Ruff, Russell Scranton, Nilay Thakkar.
Primary Tasks	Review and confirm a BiOp/F&W Program RM&E vision documented through a high level paper. Further develop RM&E Work Plan for non-BiOp information needs and Accord commitments. Identify potential changes to existing projects and/or needs for additional projects that would address any non-BiOp RM&E gaps.	Identify F&W Program management questions, RM&E objectives, and information needs. Request project sponsor information and ISRP reviews. Assess coverage of Non-BiOp information needs and work that may be reduced through critical, project specific reviews (Gap and Excess Assessment).	Review Management Questions (and associated decisions) and RPAs for monitoring and research requirements. Review and further develop RM&E Work Plan by further identification of subtasks, milestones, and associated agency projects. Assess coverage of RPA actions and information needs and areas that may be reduced through critical, project specific reviews (Gap and Excess Assessment).

Element	BPA RM&E Team	BPA/NPCC RM&E Review Team	AA/NOAA/NPCC BiOp RM&E Workgroups
	Develop or review targeted requests for proposals as needed for non-BiOp information needs in collaboration with the NPCC. Develop F&W Program RM&E project evaluation criteria in coordination with NPCC staff and AA/NOAA workgroups. Evaluate all F&W Program projects with evaluation criteria and assess compliance to data collection and data management standards. Recommend mod's to projects and/or project close-outs. Manage Workplan and insure F&W Program RM&E projects are implemented as expected. Develop BPA RM&E components of Annual and Comprehensive Reports and Implementation Plans.	Identify potential changes to existing Non-BiOp projects and/or needs for additional projects that would address any RM&E gaps. Implement targeted solicitations and facilitate BPA and NPPC decision process.	Identify potential changes to existing projects and/or needs for additional projects that would address any RM&E gaps. Develop or review targeted requests for proposals as needed. Support annual and 3-yr comprehensive performance reports. Support RM&E implementation plans on a 3-year cycle.

A.5 Attachment 2 -- Excerpts from the 2007 BA

(from p.B.2.6-11)

B.2.6.4 RM&E Strategy 4—Estuary and Ocean RM&E

• Funding Source(s): BPA – direct funding; Corps appropriations through Section 536 of the Water Resources Development Act of 1999 and Columbia River Fish Mitigation Program

• Rationale: Evaluating the effectiveness of habitat actions that are being implemented as offsite mitigation for dam effects is a central feature of the FCRPS ESA responsibilities.

• What's New: Several new actions

Management Questions: The estuary/ocean RM&E presented in this appendix draws on the *Plan for Research, Monitoring and Evaluation of Salmon in the Columbia River Estuary* (Estuary/Ocean RM&E Subgroup 2004) and the *Research, Monitoring and Evaluation – Conceptual Framework Outline* (Sovereign Collaboration Group 2006). The following are the primary management questions with respect to Estuary Habitat actions. The RM&E Actions described in this section are focused on providing information needed to answer these questions to support ongoing and adaptive management decisions.

□□ Are aquatic, riparian, and upland estuary habitat actions achieving the expected biological and environmental performance targets?

□□ Are the offsite habitat actions in the estuary improving juvenile salmonid performance and which actions are most effective at addressing the limiting factors preventing achievement of habitat, fish, or wildlife performance objectives?

□□ What are the limiting factors or threats in the estuary/ocean preventing the achievement of desired habitat or fish performance objectives?

See Table 3, Attachment B.2.6-1 for specific projects that have been currently identified for implementation in the FY 2007 to FY 2009 period for Estuary and Ocean RM&E. Additional, more detailed information supporting the identification of Estuary and Ocean RM&E Actions is provided in Attachment B.2.6-4.

Performance Measures: Performance measures for the Columbia River Estuary include reach survival, life history diversity, growth rates, and predation rates of juvenile salmonids and the bathymetry, topography, connectivity, and hydrology of estuary habitats. Survival benefits for actions implemented in the periods FY 2007 to 2009 and for FY 2010 to 2017 for estuary habitat actions have been estimated for stream and ocean-type life histories and used within the biological assessment based on methods discussed and developed in the Remand Collaboration Process. These estimated benefits provide the long-term performance targets.

Performance standards have also been set for annual tracking of project implementation projected for the periods FY 2007 to 2009 and for FY 2010 to 2017 used to estimate the long-term survival benefits. RM&E will be used to confirm and improve our understanding of the relationships between different estuary habitat actions, the environment and the survival and productivity performance measures. As this information is developed and relationships and models are updated, the Action Agencies will reconfirm the modeling estimates of expected survival improvements associated with actions. Specific performance standards, contingencies, and performance targets for estuary habitat actions are identified in more detail in the Accounting and Adaptive Management section.

A.6 Attachment 3 – Excerpts from the 2008 BiOp

Reasonable and Prudent Alternative Table (in the appendices)

RPA #1 – Implementation Plans

The Corps, BPA, and Reclamation will collectively submit to NOAA Fisheries Action Implementation Plans by the end of December 2009, December 2013, and December 2016 that

detail commitments to implement actions during subsequent years. Specifically, that Action Implementation Plans will describe the tributary and estuary habitat actions that will be funded during the 2010-2013, 2014-2016, and 2017-2018 periods. The Implementation Plans will take into account pertinent new information on climate change and effects of that information on limiting factors and project prioritization. The Action Implementation Plans will also detail any changes in hydro, predation management, hatchery, or RM&E RPA actions from the actions described in this RPA for each time period. This information will assist NOAA Fisheries in determining if the RPA is being implemented as identified in this Biological Opinion or, conversely, if re-initiation triggers defined in 50 CFR 402.16 have been exceeded.

Implementation Plans will be submitted to NOAA Fisheries in December 2009, December 2013, and December 2016.

RPA #2 – Annual Progress Reports

The Corps, BPA, and Reclamation will submit to NOAA Fisheries Annual

Progress Reports in September of all years except 2013 and 2016. The reports will cover operations for the previous calendar year. These Annual Progress Reports will describe the status of implementing all actions as of the end of the previous calendar year. For example, the 2009 RPA Progress report will describe the status of actions through December 2008. In addition to RPA action implementation status, the Annual Progress Reports will describe the status of physical or biological metrics monitoring (as described in the RM&E). Annual progress reports will include a summary of the annual forecast review and also summarize any new, pertinent climate change information or research. This information will assist NOAA Fisheries in determining if the RPA is being implemented as anticipated in this Biological Opinion or, conversely, if re-initiation triggers defined in 50 CFR 402.16 have been exceeded.

Annual Progress Reports will be submitted to NOAA Fisheries in September 2009 through 2018, except in 2013 and 2016. In 2013 and 2016, progress reports will be part of the Comprehensive Evaluation Reports.

RPA #3 – Comprehensive RPA Evaluations

The Corps, BPA, and Reclamation will submit to NOAA Fisheries Comprehensive RPA Evaluation of multi-year implementation activities by the end of June 2013 and June 2016. The Comprehensive Evaluations shall review all implementation activities through the end of the previous calendar year (as would be covered in the Annual Progress Report) and compares them to scheduled completion dates as identified in this RPA or modified in the Implementation Plans in 2009, 2013 and 2016. The Comprehensive Evaluations will also describe the status of the physical and biological factors identified in this RPA, and compare these with the expectations in the survival improvements identified in the Comprehensive Analysis or Supplemental Comprehensive Analysis. Physical and biological factors will include new information on climate change and its effects on listed salmon and steelhead. The Comprehensive Evaluation will include a discussion of the Action Agencies' plan to address any shortcomings of current estimated survival improvements as compared to the original survival estimates identified in the Comprehensive Analysis referenced in this Biological Opinion. This information will assist NOAA Fisheries in determining if the RPA is being implemented as anticipated in this Biological Opinion or, conversely, if re-initiation triggers defined in 50 CFR 402.16 have been exceeded.

Comprehensive RPA Evaluation Reports will be submitted to NOAA Fisheries in June 2013 and June 2016.

Habitat Strategy 2—Improve Juvenile and Adult Fish Survival in Estuary Habitat

RPA #36 -- Estuary Habitat Implementation 2007 to 2009

The Action Agencies will provide funding to implement specific actions identified for implementation in 2007-2009 (FCRPS BA, Attachment B.2.2) as part of a 10year estuary habitat program to achieve the estimated ESU survival benefits of 9.0% and 6.0% for ocean type and stream-type ESUs respectively (CA Attachment D-1). Projects in an early state of development such that quantitative physical metrics have not been related to estimated survival benefits will be selected per Action 37. If projects identified for implementation in 2007-2009 prove infeasible, in whole or in part, the Action Agencies will implement comparable replacement projects in 2010-2013 to provide equivalent habitat benefits needed to achieve equivalent survival benefits. Replacement projects will be selected per Action 37.

Implementation Plan -- Specific projects for implementation in the 2007-2009 period are identified in the FCPRS BA, Attachment B.2.2.

Annual Progress Reports -- Status of project implementation (including project milestones) through December of previous year for all 2007- 2009 actions. Report physical metrics for implementation achieved (e.g., # of acres protected/restored/enhanced; riparian miles protected) relative to the total needed to complete project and achieve the estimated survival benefits.

RPA #37 -- Estuary Habitat Implementation 2010-2018—Achieving Habitat Quality and Survival Improvement Targets

The Action Agencies will provide funding to implement additional specific projects as needed to achieve the total estuary survival benefits identified in the FCRPS BA Attachment B.2.2). Projects will identify location, treatment of limiting factor, targeted ESU/DPS or ESUs/DPSs, appropriate reporting metrics, and estimated biological benefits based on the achieving of those metrics. Pertinent new information on climate change and potential effects of that information on limiting factors will be considered.

 Action Agencies will actively engage the LCREP Science workgroup to identify project benefits in coordination with other regional experts, using recovery planning products and the modified LCREP project selection criteria (FCRPS BA Attachment B.2.2-3) to identify projects that will benefit salmon considered in this RPA.

 To support project selection the Action Agencies will convene an expert regional technical group. This group will use the habitat metrics to determine the estimated change in survival which would result from full implementation.

 Project proposals will clearly describe the completed project in terms of quantitative habitat metrics which can be used to quantitatively evaluate progress and completion of individual projects.

 The expert regional technical group will use the approach originally applied in the FCRPS BA (Attachment B.2.2) (*Estimated Benefits of Federal Agency Habitat Projects in the Lower Columbia River Estuary*) and all subsequent information on the relationship between actions,

habitat and salmon productivity models developed through the FCRPS RM&E to estimate the change in overall estuary habitat and resultant change in population survival.

 If actions from the previous cycle prove infeasible, in whole or in part, the Action Agencies will ensure implementation of comparable replacement estuary projects in the next implementation plan cycle to maintain estimated habitat quality improvements at the ESU/DPS level and achieve equivalent survival benefits. Selection of replacement projects, to ensure comparable survival benefits, will be made based on input from expert panels, regional recovery planning groups, the Northwest Power and Conservation Council, and NOAA Fisheries.

 FCRPS RM&E results will actively inform the relationship between actions, estuary habitat change and salmon productivity and new scientific information will be applied to estimate benefits for future implementation.

 If new scientific or other information (except incomplete implementation of project modification) suggests that habitat quality improvement estimates for projects from the previous cycle were significantly in error, the Action Agencies will examine the information and review the project or projects in question and their estimated benefits. This review will occur as part of the 2009 Annual Report and the Comprehensive RPA Evaluations in 2013 and 2016 and will be performed in conjunction with NOAA Fisheries. In the event such review find that habitat based survival improvement were significantly overstated, the Action Agencies will implement replacement projects (selected as per new projects above) to provide benefits sufficient to achieve the ESU/DPS-specific survival benefit estimated for each affected project.

Implementation Plans -- Specific projects will be identified in implementation plans in December, 2009, 2013 and 2016. Plans will include location, area extent of action, type of action, expected biological benefits, and other relevant information and authorities necessary for implementation. If the Action Agencies do not have the appropriations necessary to implement specific projects the Implementation Plans will detail the steps in place to secure those appropriations and identify contingency projects which will be implemented should those appropriations not be secured by the next check-in. Progress Guidelines: To maintain progress toward the 2018 survival benefits, each implementation cycle will identify projects the Action Agencies will fund to achieve approximately 33% of the remaining post 2007-2009 total estuary survival improvements, for each ESU/DPS, needed to achieve the total 2018 survival benefits assumed for the estuary. The remaining survival improvements needed to be met in each cycle will be determined based on the estuary survival benefits achieved from projects, as implemented, in the previous cycle. The 2016 Plan will identify steps the Action Agencies will take to ensure that projects needed to cover any remaining estuary survival deficits will be funded by 2017.

Annual Progress Reports -- Status of project implementation (including project milestones) through December of previous year for all actions identified in implementation plans. Report physical metrics for implementation achieved (e.g. # of acres protected, restored, enhanced; riparian miles protected) relative to the total needed to complete project and achieve the estimated survival benefits, by project. By ESU, report progress toward ESU/DPS-specific survival benefit. Where ESU/DPS specific survival benefits are not achieving Progress Guidelines above, identify processes or projects in place to ensure achievements by the next comprehensive report.

2013 and 2016 Comprehensive RPA Evaluation Reports -- Comprehensive report on status of project implementation, by project, (including project milestones) for all actions identified in implementation plans. Comprehensive report of physical metrics for implementation achieved

(e.g. # of acres protected/restored/enhanced; riparian miles protected; # of pile dikes removed) and still remaining, by project. Where ESU-specific survival benefits are not achieving Progress Guidelines above, identify processes or projects in place to ensure achievement by the next comprehensive report. Report results of all RM&E studies, including information from expert regional technical group, and identify how results will be applied to future implementation, if appropriate. Where new scientific or other information suggests that survival improvement estimates for projects from the previous cycle were significantly in error, the Action Agencies will describe the analytical approach used to re-evaluate the estimated survival benefits for each project affected.

RPA #38 -- Piling and Piling Dike Removal Program

To increase access to productive habitat and to reduce avian predation, the Action Agencies will develop and implement a piling and pile dike removal program.

 In 2008, the Action Agencies will work with Lower Columbia River Estuary Program to develop a plan for strategic removal of structures that have lower value to navigation channel maintenance, present low-risk to adjacent land use, support increased ecosystem function, and are cost-effective.

 Beginning in 2008 and 2009, the Action Agencies will begin implementation. Implementation will continue through 2018.

Implementation Plans -- Specific projects for implementation in the 2008-2009 period will be identified following development of a plan for strategic removal of structures in 2008. Specific projects will be identified in implementation plans in December, 2009, 2013 and 2016. If all projects cannot be identified at the start of each 3 year period, projects will be identified prospectively in the Annual Report. Plans and reports will include location, limiting factor treated, targeted ESU/s, reporting metric and expected biological benefit for each project.

Annual Progress Reports Status of project implementation (including project milestones) through December of previous year for all actions identified in implementation plans. Report physical metrics for implementation achieved (e.g. # of pilings/pile dikes removed, habitat area restored) by project.

2013 and 2016 Comprehensive RPA Evaluation Reports -- Comprehensive report on status of project implementation (including project milestones) for all actions identified in implementation plans. Comprehensive report of physical metrics for implementation achieved (e.g. # of pilings/pile dikes removed). Report describing the effect of piling and pile dike removal projects implemented on survival of salmonids by ESU/DPS.

RM&E Strategy 4—Estuary Habitat and Ocean Research, Monitoring, and Evaluation

The Action Agencies' strategy is to support performance monitoring and adaptive management related to estuary habitat actions.

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:

 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)

 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)

 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)

 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)

Implementation Plans -- Specific projects for implementation in the 2007-2009 period are identified in the FCRPS BA Attachment B.2.6-1, Table 2.12 Specific projects will be identified in implementation plans in December 2009, 2013, and 2016.

Annual Progress Report -- Status of project implementation (including project milestones) through December of the previous year for all actions identified in implementation plans.

2013 and 2016 Comprehensive RPA Evaluation Reports - The evaluation will include information from these actions.

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:

 Map bathymetry and topography of the estuary as needed for RM&E. (Initiate in FY 2007-2009 Projects)

 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)

 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)

 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)

 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)

Implementation Plans -- Specific projects for implementation in the 2007-2009 period are identified in the FCRPS BA Attachment B.2.6-1, Table 3. Specific projects will be identified in implementation plans in December 2009, 2013, and 2016.

Annual Progress Report -- Status of project implementation (including project milestones) through December of the previous year for all actions identified in implementation plans. Tabulate the amount of absolute acreage by habitat type that is restored or protected every year.

(Initiate in FY 2007-2009 Projects) Report annually on indices of productivity for the estuary and ocean (i.e., Pacific Decadal Oscillation, primary productivity indices). (Annually)

2013 and 2016 Comprehensive RPA Evaluation Reports -- The evaluation will include information from these actions.

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:

 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)

 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)

 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)

Implementation Plans -- Specific projects for implementation in the 2007-2009 period are identified in the FCRPS BA Attachment B.2.6-1, Table 3. Specific projects will be identified in implementation plans in December 2009, 2013, and 2016.

Annual Progress Report -- Status of project implementation (including project milestones) through December of the previous year for all actions identified in implementation plans.

2013 and 2016 Comprehensive RPA Evaluation Reports -- The evaluation will include information from these actions.

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:

 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.

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

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

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

Implementation Plans -- Specific projects for implementation in the 2007-2009 period are identified in the FCRPS BA Attachment B.2.6-1, Table 3 Specific projects will be identified in implementation plans in December 2009, 2013, and 2016.

Annual Progress Report -- □ Status of project implementation (including project milestones) through December of the previous year for all actions identified in implementation plans.

2013 and 2016 Comprehensive RPA Evaluation Reports -- □ The evaluation will include information from these actions.

A.7 Attachment 4 – Cross-Walk for the Estuary/Ocean between the Council's Fish and Wildlife Program and the BiOp

Memo from Jim Ruff, December 1, 2008

MEMORANDUM

TO: Estuary RM&E work group

FROM: Jim Ruff, NPCC

SUBJECT: Identification of F&WL Program management questions related to estuary and ocean outside scope of BiOp

After a review of the relevant sections of the Council's draft 2008 Fish and Wildlife Program, I have identified the following management questions related to the lower Columbia River/estuary and the ocean that may or may not be outside the scope of 2008 FCRPS BiOp RPAs and management questions. The work group can determine which of these management questions or actions are either within or outside the scope of the 2008 BiOp RPAs when we get together to review current or ongoing estuary projects and identify any "gaps" at the next meeting.

Objectives for Environmental Characteristics

- How to identify and protect habitat areas and ecological functions that are relatively productive for spawning, resting, rearing and migrating salmon and steelhead in the mainstem, i.e., how to restore and enhance habitat areas that connect to productive areas to restore more natural population structures. (p. 21)
- How to protect, restore and connect freshwater habitat in the mainstem for the life history stages of naturally spawning anadromous and resident fish. (p. 21)
- How to manage mainstem riparian areas to protect aquatic conditions and form a transition to floodplain terrestrial areas and side channels. (p.21)
- How to allow for seasonal flow fluctuations, including floods; how to reduce large and rapid short-term flow fluctuations. (p. 21)
- How best to use stored water to manage water temperatures downstream from storage where temperature benefits can be shown to provide improved fish survival. (p.22)

Emerging Habitat Issues

- Assess and, where necessary, respond to the impacts of climate change that could threaten the Program's past and ongoing investments. (p. 28)
- Collaborate on investigations of toxic contaminant source identification and long-term monitoring of priority toxic contaminants with other regional agencies to better understand how contaminants are taken up by different fish and wildlife species. (p.28)

Columbia River Estuary (p.55)

- Implement long-term effectiveness monitoring for various types of habitat restoration projects in the estuary.
- Evaluate salmon and steelhead migration and survival rates through the mainstem hydropower dams, the lower Columbia River, the estuary, and the marine environment.

- Evaluate the impact of flow regulation, dredging, and water quality on estuary-area habitat to better understand the relationship between estuary ecology and near-shore plume characteristics and salmon and steelhead productivity, abundance, and diversity.

Ocean (p. 53-54)

- Monitor the Columbia River plume and ocean conditions for impacts on salmon survival and take actions to improve the likelihood that CRB salmon can survive varying ocean conditions, i.e., determine which factors are most critical to survival. (p.53-54)
- Monitor and evaluate varying ocean conditions to develop the capability to separate ocean effects on survival of a stock from the effects of inland freshwater actions. (p. 54)
- Monitor salmon returns and climate change impacts on ocean conditions to identify factors affecting survival in the ocean and plume. (p. 54)

F&WP Objectives: Information from Jim Ruff and Nancy Leonard, April 6, 2009

Id.	Section Title of F&WP	F&WP Page #	2009 F&WP RME Objectives	Potentially applicable RPA
13.00	IV Ocean/ A. Ocean Strategies / 1. Manage for Variability	60 to 61	The Council adopts the following strategies for the freshwater plume, the near-shore ocean, and the high seas: (i) Manage for Variability - variations in ocean conditions and regional climate play a large role in the survival of anadromous fish and other species in the Columbia River Basin. Management actions should strive to help those species accommodate a variety of ocean conditions by providing a wide range of life history strategies.	RPAs 58.2, 58.4? - verify
13.01	ibid	61	(ii) The Council supports continued monitoring and evaluation of the Columbia River plume and ocean conditions for impacts on salmonid survival.	RPA 58.1 ? - verify
13.02	ibid	61	(iii) The Council also supports continued monitoring salmon returns and climate-change impacts on ocean conditions …	RPAs 3, 7, 37 ? - verify
13.03	ibid	61	(iii) ... in order to identify factors affecting survival in the ocean and plume.	RPAs 3, 7, 37 ? - verify
13.04	IV Ocean/ A. Ocean Strategies / 2. Distinguish Ocean Effects from Other	61	Distinguish Ocean Effects from Other Effects -Monitoring and evaluation actions should recognize and take into account the effect of varying ocean conditions [on salmonid survival]	FW Program only - do not believe match any RPA

Id.	Section Title of F&WP	F&WP Page #	2009 F&WP RME Objectives	Potentially applicable RPA
	Effects			
13.05	ibid	61	... and, to the extent feasible, separate the effects of ocean-related mortality from that caused in the freshwater part of the life cycle.	FW Program only - do not believe match any RPA
14.00	V The Columbia River Estuary/A. Estuary Strategies	62	The Council supports strategies that protect, enhance, and restore critical habitat and spawning and rearing grounds in the estuary and lower Columbia River. Such strategies include, but are not limited to:	RPA 60
14.01	ibid	62	Habitat restoration work to reconnect ecosystem functions such as removal or lowering of dikes and levees that block access to habitat or installation of fish-friendly tide gates, protection or restoration of riparian areas and off-channel habitat, and removal of pile dikes	RPA 60
14.02	ibid	62	Long-term effectiveness monitoring for various types of habitat restoration projects in the estuary;	FW Program only - do not believe match any RPA PR perhaps under RPA 60? - verify
14.03	ibid	62	Continued evaluation of salmon and steelhead ….. survival rates in the lower Columbia River, the estuary, and the marine environment;	RPA 58.1
14.04	ibids	62	Continued evaluation of salmon and steelhead migration ….. in the lower Columbia River, the estuary, and the marine environment;	RPA 58.1
14.05	ibid	62	Evaluation of the impact of flow regulation, dredging, and water quality on estuary-area habitat …..	61? - verify
14.06	ibid	62	…. better understand the relationship between estuary ecology and near-shore plume characteristics and salmon and steelhead productivity, abundance, and diversity;	61? - verify

Project by F&WP Objective Table

ID	Title	13.0	13.1	13.2	13.3	13.4	13.5	14.0	14.1	14.2	14.3	14.4	14.5	14.6
CUR1	Ecology of Juv Salmonids in Plume	x	x	x	x	x								x
CUR2	Acoustic Tracking for Survival POST		x	x	x	x	?				x	x		
CUR3	Canada-US Shelf Salmon Survival		x	x	x	x								
CUR4	Acoustic Telemetry Est. of Survival				x						x	x		
CUR5	Habitat Opp. & Food-Web Linkages											x	x	x
CUR6	Current and Historical Linkages											x		x
CUR7	Impact of American Shad													x
CUR8	Time of Ocean Entry Study	x	x	x	x	x								
AER1	Cumul. Eco. Response to Restoration								x	x			x	
AER2	Salmon Benefits								x					
AER3	Ref Sites & AER in Hab. Rest. Prog.								x	x				
AER4	Grays River Restoration and RME								x					
AER5	Pile Structure Evaluation Coal Ck								x				x	
AER6	Eelgrass Enhancement								x					
AER7	JBH Tide Gate Replacement								x	x				
AER8	Crims Island Monitoring								x	x				
AER9	Tenasillahe Is. Monitoring								x	x				
AER10	Monitoring at Smith and Bybee Lakes								x					
AER11	Effectiveness Monitoring at Chin R.								x					
AER12	Ramsey Lake Project Monitoring								x					
AER13	Juvenile Salmonid Stranding											x		x
STM1	LCRE Ecosystem Monitoring									x			x	x
STM2	Tidal FW Mon. Juvenile Salmonids								x			x		x
STM3	Tides and Currents												x	
STM4	ODEQ Ambient Water Quality Mon												x	
STM5	USGS Discharge and WQ Mon												x	
STM6	WDOE Ambient WQ Monitoring												x	

A.8 Attachment 5 – RPA World – Task 1 Review and Task 2 Workplan for Estuary/Ocean RME implementation

Information needs are the descriptions for the RME objectives in the Estuary/Ocean RME document.

Metrics are the monitored indicators in the Estuary/Ocean RME document.

Data collection and analysis methods are the design, spatial/temporal scale, monitoring methods, and analysis in the Estuary/Ocean RME document.

Coordination needs are from the "possible" implementation and coordination in the Estuary/Ocean RME document.

RPA 58 Fish Performance

Subaction 58.1

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: **Subaction 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)	
Task 1 Review	**Interpretation/Issues**: What is "select"? The select reaches are survival segments (we use the term segments so as to not be confused with the hydrogeomorphic reaches of the habitat classification system). Need to review the projects and determine during the gap assessment if the "select" has been satisfied. What is considered "complete"? Next step -- recommendations for actions to alleviate poor survival, if seen. What is poor survival? How do you decide this?
	Expectations and Desired Outcome(s): 1) Annual survival estimates for CH1 and CH0 and steelhead for the selected segments of the lower river and estuary. 2) Continued monitoring in reaches where survival is poor.
Task 2 Work Plan	**Information Needs**: (from EOS 2008, p.12) Survival rate is a fundamental performance measure that can be estimated using tagging techniques for juveniles of selected species and life history types. Locations of interest include the CRE from Bonneville Dam to the plume, and selected areas of the estuary where predation rates may be relatively high.
	Metric(s): Survival rate; fitness (growth rate, residence time)
	How will the Data be Used? By Whom? These data are essential for the AA and the Region to make adaptive management decisions for planning and prioritization of actions to increase survival. Survival is a high-level indicator and will be useful to the NW Executive Information Summit (NOAA, Corps, BPA, NPCC), the NPCC effort to establish high level indicators for RME, and the Corps' Cumulative Effects

	Study and Adaptive Management Program.
	Coordination Needs: Need to coordinate with the Hydrosystem/Predation workgroup. (from EOS 2008, p.16) AFEP, FWP
	Responsible AA Staff Lead(s): Ebberts (CENWP)
	Milestones for Completion: Annual study design by January and annual report by December each year. Information syntheses by 2012 and 2015 for the 2013 and 2016 comprehensive reports, respectively.
	Data Collection and Analysis Methods: (from EOS 2008, p.16) Acoustic telemetry; survival model design; estuary-wide annually spring and summer; trend analysis.
	Data Dissemination and Use in AM: Data will be disseminated through strategies developed in RPA 72 (Data Mngt). See the RME Coordination and Data Management Workgroup. The data will be reported in the Comprehensive RPA Evaluation Reports (2013 and 2016), and used to inform the Corps' Adaptive Management Program.
Task 3 Gap Assess.	**Project List**: CUR4
	Coverage Determination: No gap for the survival component; but, there is one for the fitness component.
	Comments on projects or parts of projects that could be eliminated: None.
Task 4 Recomm	**Recommendations for changes to existing projects and/or needs for additional projects to address gaps:** Consider issuing an RFP to measure fitness of juvenile salmon at select locations in the lower Col. R. and estuary.

Subaction 58.2

RPA 58 Subaction 58.2 Develop an index and monitor and evaluate life history diversity of salmonid populations at representative locations in the estuary. (Initiate in FY 2007-2009 Projects)	
Task 1 Review	**Interpretation/Issues**: What is considered "representative"?
	Expectations and Desired Outcome(s): (from EOS 2008, p.12) Periodic quantitative assessments of the life history diversity of salmon populations in the lower Columbia River and estuary.
Task 2 Work Plan	**Information Needs**: (from EOS 2008, p.12) An index for life history diversity is needed to monitor trends in this important indicator of salmon performance. An understanding of trends in life history diversity is also important to assessing the performance of restoration projects.
	Metric(s): (from EOS 2008, p.16) Life history diversity index (to be developed) using data on juvenile salmon abundance, distribution, species comp., life history stage, stock id., etc.

	How will the Data be Used? By Whom? The region, i.e., AA, NOAA Fisheries, resource mngt agencies, RPA 37 Expert Panel on Estuary Habitat Restoration Benefits, and the research community will use the index to measure, monitor, and evaluate progress toward the goal of increasing life history diversity of salmon as it relates to fish performance in the lower river, estuary and plume.
	Coordination Needs: This is a high-level indicator that will be coordinated with NW Executive Information Summit (NOAA, Corps, BPA, NPCC), NPCC's effort on high level indicators for RME, and the Corps' Cumulative Effects Study and Adaptive Management Program. (from EOS 2008, p.16) AFEP, EOS, FWP, SWG.
	Responsible AA Staff Leads: Ebberts (CENWP)
	Milestones for Completion: Index successfully developed by March 2010; Index computations for the 2013 and 2016 comprehensive reports.
	Data Collection and Analysis Methods: TBD
	Data Dissemination and Use in AM: Data will be disseminated through strategies developed in RPA 72 (Data Mngt). See the RME Coordination and Data Management Workgroup. The index will be reported in the Comprehensive RPA Evaluation Reports (2013 and 2016).
Task 3 Gap Assess.	**Project List (link to Attachment 6)**: CUR5, CUR6, AER2, STM1
	Coverage Determination: No gap for development of the life history diversity index assuming project AER2 will be successful during 2009/2010. Monitoring coverage will be determined after the index is developed.
	Comments on projects or parts of projects that could be eliminated: None.
Task 4 Recomm	**Recommendations for changes to existing projects and/or needs for additional projects to address gaps**: Develop the index, then design the monitoring effort to support it. AER2 to review the applicability of a life-cycle modeling approach.

Subaction 58.3

RPA 58 Subaction 58.3 Monitor and evaluate juvenile salmonid growth rates and prey resources at representative locations in the estuary and plume. (Initiate in FY 2007-2009 Projects, annually review and modify until complete)	
Task 1 Review	**Interpretation/Issues**: What is considered "representative"? When are the AA done? What is "complete"?
	Expectations and Desired Outcome(s): Increased knowledge of fish performance in the estuary and plume.
Task 2 Work Plan	**Information Needs**: (from EOS 2008, p.12) Indicators of migration characteristics can reflect fish performance relative to habitats in the estuary and plume. Growth rate, which is calculated as the change in length or weight of the sampled juvenile salmon population per unit time, is a direct indicator of ecological benefits from

	estuarine habitats, especially when coupled with monitoring of diet and prey resources.
	Metric(s): (from EOS 2008, p.16) Abundance, age-size structure, distribution, residence and travel time, growth rate, migration pathway, species composition, stock identity.
	How will the Data be Used? By Whom? The region, i.e., AA, NOAA Fisheries, resource mngt agencies, RPA 37 Expert Panel, and the research community, will use the information to evaluate fish performance as it relates to actions called for in the BiOp, F&W Program and recovery efforts.
	Coordination Needs: (from EOS 2008, p.16) EOS, Corps' Anadromous Fish Evaluation Program (AFEP)
	Responsible Staff Leads: Yerxa (BPA) and Ebberts (CENWP)
	Milestones for Completion: Information syntheses by 2012 and 2016 for the 2013 and 2016 comprehensive reports, respectively.
	Data Collection and Analysis Methods: (from EOS 2008, p.16) Rotational panel design; estuary-wide, complete cycle every 4 yrs; regression and trends analysis. Monitoring Protocols –reference Appendix C, Table C1 (EOS 2008, p.C1).
	Data Dissemination and Use in AM: Data will be disseminated through strategies developed in RPA 72 (Data Mngt). See the RME Coordination and Data Management Workgroup. The information will be synthesized and reported in the Comprehensive RPA Evaluation Reports (2013 and 2016).
Task 3 Gap Assess.	**Project List (link to Attachment 6)**: CUR1, CUR5, CUR6, AER3, STM1, STM2
	Coverage Determination: 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.
	Comments on projects or parts of projects that could be eliminated: None
Task 4 Recomm	**Recommendations for changes to existing projects and/or needs for additional projects to address gaps**: Continue ongoing work, but add more sampling sites and do periodic roll-ups to provide up-to-date, comprehensive summaries of the research for managers to use to make decisions.

Subaction 58.4

RPA 58 Subaction 58.4 Monitor and evaluate temporal and spatial species composition, abundance, and foraging rates of juvenile salmonid predators at representative locations in the estuary and plume. (Initiate in FY 2007-2009 Projects, annually review and modify until complete)

Task 1 Review	**Interpretation/ Issues**: What is considered "representative"? What is considered "complete"?
	Expectations and Desired Outcome(s): Increased knowledge on predation impacts by piscivorous fish and birds in the estuary and plume.
Task 2 Work Plan	**Information Needs**: (from EOS 2008, p.12) Predation on juvenile salmonids is a concern throughout the Columbia basin, as it is in the estuary and plume.
	Metric(s): (from EOS 2008, p.16) Abundance of predators, consumption rates
	How will the Data be Used? By Whom? (from EOS 2008, p.16) Monitoring predators and their foraging rates will help for the AA and the Region determine the extent of effects of this limiting factor on salmonid performance and potential management actions.
	Coordination Needs: Avian predation and pikeminnow RPAs. The Hydro/Predation Workgroup has the lead; their work will inform Subaction 58.4. (from EOS 2008) AFEP, FWP
	Responsible AA Staff Leads: see Hydro/Predation Workgroup.
	Milestones for Completion: see Hydro/Predation Workgroup.
	Data Collection and Analysis Methods: see Hydro/Predation Workgroup.
	Data Dissemination and Use in AM: see Hydro/Predation Workgroup.
Task 3 Gap Assess.	**Project List (link to Attachment 6)**: CUR1, CUR5
	Coverage Determination: Need to consult with the Hydro/Predation Workgroup.
	Comments on projects or parts of projects that could be eliminated: None
Task 4 Recomm	**Recommendations for changes to existing projects and/or needs for additional projects to address gaps**: Need to consult with the Hydro/Predation Workgroup.

RPA 59 Estuary/Ocean Conditions

Subaction 59.1

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: **Subaction 59.1** Map bathymetry and topography of the estuary as needed for RM&E. (Initiate in FY 2007-2009 Projects)	
Task 1 Review	**Interpretation/ Issues**: Define what and how much is "needed."
	Expectations and Desired Outcome(s): Bathymetry/ topography as needed for RME in the floodplain from Bonneville Dam to the mouth of the Columbia River.

Task 2 Work Plan	**Information Needs**: (from EOS 2008, p.10) Bathymetry is a collection of depth points that represent the gradients of elevation and depth change along a surface. Topography measures the height of a point on the surface of the sediment or soil of a location, expressed relative to a datum point.
	Metric(s): (from EOS 2008, p.15) Elevation
	How will the Data be Used? By Whom? (from EOS 2008) These data are essential for the AA and the Region to quantify and characterize estuary habitats available for salmonids.
	Coordination Needs: Estuary Partnership's staff, Science Workgroup (SWG), subcontractors, and regional interests
	Responsible AA Staff Leads: Yerxa (BPA) and Ebberts (CENWP)
	Milestones for Completion: Information syntheses by 2012 and 2015 for the 2013 and 2016 comprehensive reports, respectively.
	Data Collection and Analysis Methods: (from EOS 2008, p.15) Census design; estuary-wide; remote sensing: Lidar (land) and multi-beam sonar (water); GIS analysis. Monitoring Protocols –reference Appendix C, Table C1 (EOS 2008, p.C1).
	Data Dissemination and Use in Adaptive Management: Data will be disseminated through strategies developed in RPA 72 (Data Mngt). See the RME Coordination and Data Management Workgroup. The information will be synthesized and reported in the Comprehensive RPA Evaluation Reports (2013 and 2016).
Task 3 Gap Assess.	**Project List (link to Attachment 6)**: AER1, AER3, AER6, AER7, STM1, STM2
	Coverage Determination: There is a gap until the bathymetry and topographic mapping are completed.
	Comments on projects or parts of projects that could be eliminated: None
Task 4 Recomm	**Recommendations for changes to existing projects and/or needs for additional projects to address gaps**: Continue to work within STM1 to finish the bathymetric and topographic mapping.

Subaction 59.2

RPA 59 Subaction 59.2 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)	
Task 1 Review	**Interpretation/ Issues**: None.
	Expectations and Desired Outcome(s): (from EOS 2008, p.10) Habitat maps; total area by habitat class.
Task 2 Work	**Information Needs**: (from EOS 2008, p.10) Ecosystem structures, i.e., habitats, within the historical floodplain of the CRE are very diverse, ranging from forested

Plan	wetlands to deep river channels.
	Metric(s): (from EOS 2008, p.15) Elevation; vegetation; substrate
	How will the Data be Used? By Whom? (from EOS 2008, p.15) Maps generated from surveys using aerial photos and photo points, together with application of the hierarchical classification currently being developed by the University of Washington and the U.S. Geological Survey, will allow the AA and the regional managers to monitor trends in estuary habitats beneficial to juvenile salmonids.
	Coordination Needs: (from EOS 2008, p.15) Estuary Partnership's SWG
	Responsible Staff Leads: Yerxa (BPA)
	Milestones for Completion: Information syntheses by 2012 and 2015 for the 2013 and 2016 comprehensive reports, respectively.
	Data Collection and Analysis Methods: (from EOS 2008, p.15) Census design; estuary-wide; remote sensing; GIS and trend analysis.
	Data Dissemination and Use in AM: Data will be disseminated through strategies developed in RPA 72 (Data Mngt). See the RME Coordination and Data Management Workgroup. The information will be synthesized and reported in the Comprehensive RPA Evaluation Reports (2013 and 2016).
Task 3 Gap Assess.	**Project List (link to Attachment 6)**: STM1
	Coverage Determination: Gap in that STM1 currently plans to develop the estuarine habitat classification and associates maps for 2 of the 8 reaches between the mouth and Bonneville Dam.
	Comments on projects or parts of projects that could be eliminated: None
Task 4 Recomm	**Recommendations for changes to existing projects and/or needs for additional projects to address gaps**: Expand work to complete the other 6 reaches.

Subaction 59.3

RPA 59 Subaction 59.3 Develop an index of habitat connectivity and apply it to each of the eight reaches of the study area. (Initiate in FY 2007-2009 Projects)	
Task 1 Review	**Interpretation/ Issues**: None
	Expectations and Desired Outcome(s): Index of habitat connectivity
Task 2 Work Plan	**Information Needs**: (from EOS 2008, p.10) Habitat connectivity is a landscape-scale indicator of the linkages between different habitat types in the ecosystem. This action would include an inventory of passage barriers (dikes, levees, tidegates, and culverts), which are the major stressors in the CRE because they restrict access by salmon to wetland habitats. This action is needed because of the hypothesized importance of habitat connectivity to the ecology of juvenile salmonids in the estuary.
	Metric(s): (from EOS 2008, p.15) Habitat connectivity index (to be developed) and

	number tide gates, length of active dikes, number tidal channel distributaries, habitat class.
	How will the Data be Used? By Whom? The habitat connectivity index will provide a way for the AA and the Region to track off-site mitigation habitat actions.
	Coordination Needs: (from EOS 2008, p.15) Federal Estuary/ Ocean Subgroup for RME (EOS); NW Executive Information Summit (NOAA, Corps, BPA, NPCC); NPCC high level indicators for RME; Corps Cumulative Effects.
	Responsible Staff Leads: Ebberts (CENWP)
	Milestones for Completion: Index methodology is scheduled to be completed by 2011. Information syntheses by 2012 and 2015 for the 2013 and 2016 comprehensive reports, respectively.
	Data Collection and Analysis Methods: (from EOS 2008, p.15) Census design; Estuary-wide; Remote sensing; GIS and trend analysis.
	Data Dissemination and Use in AM: Data will be disseminated through strategies developed in RPA 72 (Data Mngt). See the RME Coordination and Data Management Workgroup. The information will be synthesized and reported in the Comprehensive RPA Evaluation Reports (2013 and 2016).
Task 3 Gap Assess.	**Project List (link to Attachment 6)**: AER2
	Coverage Determination: No gap assuming AER2 is successful in developing a habitat connectivity index during 2009/2010.
	Comments on projects or parts of projects that could be eliminated: None
Task 4 Recomm	**Recommendations for changes to existing projects and/or needs for additional projects to address gaps**: None assuming the habitat connectivity index will be applicable to all 8 reaches.

Subaction 59.4

RPA 59 Subaction 59.4 Evaluate migration through and use of a subset of various shallow-water habitats from Bonneville Dam to the mouth toward understanding specific habitat use and relative importance to juvenile salmonids. (Initiate in FY 2007-2009 Projects, then annually)	
Task 1 Review	**Interpretation/ Issues**: Define "subset." Which "juvenile salmonids"? What does "migration through" mean?
	Expectations and Desired Outcome(s): Understanding of the relationship between habitat use by juvenile salmonids and features of the shallow water habitats that juvenile salmon may rely on.
Task 2 Work	**Information Needs**: (from EOS 2008, p.12) Indicators of migration characteristics can reflect fish performance relative to habitats in the estuary and plume. For example, residence times indicate the amount of time juvenile salmonids spend in the

Plan	estuary. In conjunction, migration pathways characterize the corridors and habitats where juvenile salmonids are predominantly found migrating through the system (Schreck et al. 2005). Growth rate, which is calculated as the change in length or weight of the sampled juvenile salmon population per unit time, is a direct indicator of ecological benefits from estuarine habitats, especially when coupled with monitoring of diet and prey resources.
	Metric(s): (from EOS 2008, p.16) Abundance, age-size structure, distribution, residence and travel time, growth rate, migration pathway, species composition, stock identity, habitat characteristics. Monitoring Protocols –reference Appendix C, Table C1 (EOS 2008, p.C1).
	How will the Data be Used? By Whom? The region, i.e., AA, NOAA Fisheries, resource mngt agencies, RPA 37 Expert Panel, and the research community, will use the information to evaluate migration characteristics as it relates to actions called for in the BiOp, F&W Program and recovery efforts.
	Coordination Needs: (from EOS 2008, p.16) AFEP, EOS, FWP, SWG
	Responsible Staff Leads: Ebberts (CENWP) and Yerxa (BPA)
	Milestones for Completion: Information syntheses for the 2013 and 2016 comprehensive reports. Information syntheses by 2012 and 2015 for the 2013 and 2016 comprehensive reports, respectively.
	Data Collection and Analysis Methods: (from EOS 2008, p.16) Rotational panel sampling; estuary-wide; Regression and trends analysis. Monitoring Protocols – reference Appendix C, Table C1 (EOS 2008, p.C1).
	Data Dissemination and Use in AM: Data will be disseminated through strategies developed in RPA 72 (Data Mngt). See the RME Coordination and Data Management Workgroup. The information will be synthesized and reported in the Comprehensive RPA Evaluation Reports (2013 and 2016).
Task 3 Gap Assess.	**Project List (link to Attachment 6)**: CUR4, CUR5, CUR6
	Coverage Determination: 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.
	Comments on projects or parts of projects that could be eliminated: None
Task 4 Recomm	**Recommendations for changes to existing projects and/or needs for additional projects to address gaps**: Need more work on fish/habitat associations in 2003-010-00 and 2005-001-00 and incorporate such research into the new AFEP one-pager for the 2010 planning process (i.e., a new RFP).

Subaction 59.5

RPA 59 Subaction 59.5 Monitor habitat conditions periodically, including water surface elevation, vegetation cover, plan community structure, primary and secondary productivity, substrate characteristics, dissolved oxygen, temperature, and conductivity, at representative locations in the estuary as established through RM&E. (FY 2007-2009 Projects, then annually)	
Task 1 Review	**Interpretation/ Issues**: What is considered "representative"?
	Expectations and Desired Outcome(s): A time series of habitat condition data.
Task 2 Work Plan	**Information Needs**: (from EOS 2008, p.11) Habitat conditions reflect the quality of ecological support for juvenile salmonids. Since the Action Agencies desire to conserve and restore habitats that benefit juvenile salmonid performance, it is prudent to monitor the status and trends in the quality and quantity of these habitats. Productivity indices, such as primary and secondary production rates, reveal the capability of ecosystems to support salmonids.
	Metric(s): (from EOS 2008, p.15) Vegetation, water surface elevation, substrate, accretion, water quality
	How will the Data be Used? By Whom? The region, i.e., AA, NOAA Fisheries, resource mngt agencies, and the research community, will use the information to evaluate habitat conditions as they relate to actions called for in the BiOp, F&W Program and recovery efforts.
	Coordination Needs: (from EOS 2008, p.15) EOS, BPA/ NPCC Fish and Wildlife Program (FWP)
	Responsible Staff Leads: Ebberts (CENWP) and Yerxa (BPA)
	Milestones for Completion: Information syntheses by 2012 and 2015 for the 2013 and 2016 comprehensive reports, respectively.
	Data Collection and Analysis Methods: (from EOS 2008, p.15) Rotational panel design; Estuary-wide, complete cycle every 4 yrs; trend analysis. Monitoring Protocols –reference Appendix C, Table C1 (EOS 2008, p.C1).
	Data Dissemination and Use in AM: Data will be disseminated through strategies developed in RPA 72 (Data Mngt). See the RME Coordination and Data Management Workgroup. The information will be synthesized and reported in the Comprehensive RPA Evaluation Reports (2013 and 2016).
Task 3 Gap Assess.	**Project List (link to Attachment 6)**: AER1, AER3, STM1-6
	Coverage Determination: Gap in coverage estuary-wide.
	Comments on projects or parts of projects that could be eliminated: None
Task 4 Recomm	**Recommendations for changes to existing projects and/or needs for additional projects to address gaps**: Expand habitat sampling in STM1.

RPA 60 Action Effectiveness

Subaction 60.1

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: **Subaction 60.1** Develop a limited number of reference sites for typical habitats (e.g., tidal swamp, marsh, island, and tributary delta to use in action effectiveness evaluations). (Initiate in FY 2007-2009)	
Task 1 Review	**Interpretation/ Issues**: None
	Expectations and Desired Outcome(s): Data from a suite (40 or more) of reference sites to use to target restoration, compare trajectories, and assess trends.
Task 2 Work Plan	**Information Needs**: (from EOS 2008) A network of reference sites representing tidal marshes, tidal swamps, and other estuary habitats and having relatively undisturbed ecosystem structures and processes is required for action effectiveness monitoring of restoration projects. These sites can also serve as status and trends monitoring locations.
	Metric(s): (from EOS 2008, p.18) Invasive Species Composition, Abundance, Spatial Distribution; sediment Accretion Rates; Surface Water Elevation; Bathymetry; Floodplain Topography; Dissolved Oxygen; Salinity; Temperature; Ecosystem Structures Map; Edge/Density/Sinuosity; Percent Cover by Plant Species; salmon abundance, spatial/temporal distribution, species comp.
	How will the Data be Used? By Whom? (from EOS 2008, p.17) Reference sites will be a crucial part of an action effectiveness sampling design employed by sponsors and researchers to meet needs of the AA and the Region
	Coordination Needs: AFEP, FWP, EP
	Responsible Staff Leads: Ebberts (Corps) and Yerxa (BPA)
	Milestones for Completion: Information syntheses by 2012 and 2015 for the 2013 and 2016 comprehensive reports, respectively.
	Data Collection and Analysis Methods: (from EOS 2008) see pp. B21-B.23 EOS 2008. Monitoring protocols from Roegner et al. (2008).
	Data Dissemination and Use in AM: Data will be disseminated through strategies developed in RPA 72 (Data Mngt). See the RME Coordination and Data Management Workgroup. The information will be synthesized and reported in the Comprehensive RPA Evaluation Reports (2013 and 2016).
Task 3 Gap Assess.	**Project List (link to Attachment 6)**: AER1, AER3, STM1, STM2
	Coverage Determination: No gap assuming reference site characterizations among multiple projects are integrated into one network.
	Comments on projects or parts of projects that could be eliminated: None

Task 4 Recomm	**Recommendations for changes to existing projects and/or needs for additional projects to address gaps**: AER3 to complete the reference site integration.

Subaction 60.2

RPA 60 Subaction 60.2 Evaluate the effects of selected individual habitat restoration actions at project sites relative to reference sites and evaluate post-restoration trajectories based on project-specific goals and objectives. (Initiate in FY 2007-2009 Projects, annually review and modify as appropriate or until complete)	
Task 1 Review	**Interpretation/ Issues**: What is considered "complete"?
	Expectations and Desired Outcome(s): Effectiveness monitoring data from individual restoration projects.
Task 2 Work Plan	**Information Needs**: (from EOS 2008, p.18) This action consists of monitoring multiple restoration project sites. Trends in core monitored indicators at restoration sites and a network of corresponding reference and status monitoring sites are analyzed to meet this objective (see AER 1). Where available, paired reference and restoration sites should also be compared using similarity indexes (e.g., Thom et al. 2002). In addition, evaluation based on project-specific goals should follow methods for habitat and fish monitoring outlined in Roegner et al. (2008)
	Metric(s): Various including water surface elevation, bathymetry/topography, water quality, vegetation, and fish density
	How will the Data be Used? By Whom? The region, i.e., AA, NOAA Fisheries, resource mngt agencies, and the research community, will use the action effectiveness data to assess how well the habitat actions called for in the BiOp, F&W Program and recovery efforts are working.
	Coordination Needs: AFEP, FWP, NOAA, EP
	Responsible Staff Leads: Ebberts (CENWP) and Yerxa (BPA)
	Milestones for Completion: TBD Information syntheses by 2012 and 2015 for the 2013 and 2016 comprehensive reports, respectively.
	Data Collection and Analysis Methods: (from EOS 2008) see pp. B23-B.28 EOS 2008. Monitoring protocols from Roegner et al. (2008).
	Data Dissemination and Use in AM: Data will be disseminated through strategies developed in RPA 72 (Data Mngt). See the RME Coordination and Data Management Workgroup. The information will be synthesized and reported in the Comprehensive RPA Evaluation Reports (2013 and 2016).
Task 3 Gap Assess.	**Project List (link to Attachment 6)**: AER1, AER3-12, STM2
	Coverage Determination: No gap assuming the action effectiveness research is synthesized.

	Comments on projects or parts of projects that could be eliminated: None
Task 4 Recomm	**Recommendations for changes to existing projects and/or needs for additional projects to address gaps**: Make sure there's a project that synthesizes all AER in the estuary.

Subaction 60.3

RPA 60 Subaction 60.3 Develop and implement a methodology to estimate the cumulative effects of habitat conservation and restoration projects in terms of cause-and-effect relationships between ecosystem and controlling factors, structures, and processes affecting salmon habitats and performance. (Initiate in FY 2007- 2009 Projects, annually review and modify as appropriate or until complete)	
Task 1 Review	**Interpretation/ Issues**: What is considered "complete"?
	Expectations and Desired Outcome(s): Routine, regular application of a method to estimate the cumulative effects of multiple habitat restoration projects in the LCRE.
Task 2 Work Plan	**Information Needs**: This methodology needs to be able to predict outcomes, provide a rationale to prioritize those projects likely to have the strongest effect on ecosystems, and function as a guide for identifying the efficient expenditure of restoration funding.
	Metric(s): (from EOS 2008, p.21) This action consists of research and monitoring at landscape, watershed, and site/project scales. The validation objective is to answer a question: "what was the cumulative effect of all habitat conservation and restoration efforts in the estuary relative to the program goal?"
	How will the Data be Used? By Whom? (from EOS 2008, p.21) These data will be critical to objectively determining whether habitat restoration actions in the estuary are positively affecting salmon. The region, i.e., AA, NOAA Fisheries, resource mngt agencies, and the research community, will roll-up the action effectiveness data from RPA 60.2 along with other levels-of-evidence to assess how well the habitat actions called for in the BiOp, F&W Program and recovery efforts are working. NW Executive Information Summit (NOAA, Corps, BPA, NPCC); NPCC high level indicators for RME; Corps Cumulative Effects.
	Coordination Needs: AFEP, FWP, NOAA, EP, NPCC, Corps
	Responsible Staff Leads: Ebberts (CENWP)
	Milestones for Completion: Information syntheses by 2012 and 2015 for the 2013 and 2016 comprehensive reports, respectively.
	Data Collection and Analysis Methods: (from EOS 2008) see pp. B29-B.32. Monitoring protocols from Roegner et al. (2008). Cumulative effects approach by Diefenderfer et al. (2009).
	Data Dissemination and Use in AM: Data will be disseminated through strategies

	developed in RPA 72 (Data Mngt). See the RME Coordination and Data Management Workgroup. The information will be synthesized and reported in the Comprehensive RPA Evaluation Reports (2013 and 2016).
Task 3 Gap Assess.	**Project List (link to Attachment 6)**: AER1, AER3, AER7, AER8, AER10, AER12
	Coverage Determination: No gap assuming the cumulative effects methodology and an initial assessment are completed as scheduled in 2011.
	Comments on projects or parts of projects that could be eliminated: None
Task 4 Recomm	**Recommendations for changes to existing projects and/or needs for additional projects to address gaps**: None

RPA 61 Critical Uncertainties

Subaction 61.1

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: **Subaction 61.1** Continue work to define the ecological importance of the tidal freshwater, estuary, plume, and nearshore ocean environments to the viability and recovery of listed salmonid populations in the Columbia River Basin.	
Task 1 Review	**Interpretation/ Issues**: None
	Expectations and Desired Outcome(s): Understanding of migration characteristics (who-what-when-where) and ecology (diet, available prey, residence times, growth rates) for juvenile salmonids year-round in tidal freshwater (RM 35-146), the estuary proper (RM 0-35), and the plume.
Task 2 Work Plan	**Information Needs**: (from EOS 2008, p.25) The null hypothesis is tidal freshwater, estuary, plume, and nearshore ocean environments have no effect on the viability or recovery of listed salmonid populations in the Columbia Basin. The research need is to determine the extent of any estuary ecological functions that are limiting for juvenile salmon, because knowledge of limiting factors may lead to more effective resource allocation. This will improve the understanding of plume dynamics and their role in salmon life histories.
	Metric(s): (from EOS 2008, p.28) see Table 3.
	How will the Data be Used? By Whom? (from EOS 2008, p.25) This is a major uncertainty, the resolution of which will determine the importance of estuary/ocean actions in the overall recovery effort for listed salmonids and help the AA and the Region prioritize funding.
	Coordination Needs: AFEP, FWP, NOAA
	Responsible Staff Leads: Ebberts (CENWP) and Yerxa (BPA)

	Milestones for Completion: Information syntheses by 2012 and 2015 for the 2013 and 2016 comprehensive reports, respectively.
	Data Collection and Analysis Methods: (from EOS 2008, p.28) TBD by researchers
	Data Dissemination and Use in AM: Data will be disseminated through strategies developed in RPA 72 (Data Mngt). See the RME Coordination and Data Management Workgroup. The information will be synthesized and reported in the Comprehensive RPA Evaluation Reports (2013 and 2016).
Task 3 Gap Assess.	**Project List (link to Attachment 6)**: CUR1, CUR3-8, STM1, STM2
	Coverage Determination: There is a gap because a roll-up has not been programmed.
	Comments on projects or parts of projects that could be eliminated: None
Task 4 Recomm	**Recommendations for changes to existing projects and/or needs for additional projects to address gaps**: Continue ongoing work, but need to add work elements to 1998-014-00, 2003-010-00, and 2005-001-00 and do periodic roll-ups to provide up-to-date, comprehensive summaries of the research for managers to use to make decisions.

Subaction 61.2

RPA 61 Subaction 61.2 Continue work to define the causal mechanisms and migration/behavior characteristics affecting survival of juvenile salmon during their first weeks in the ocean.	
Task 1 Review	**Interpretation/ Issues**: None
	Expectations and Desired Outcome(s): Understanding of the relationship between ocean conditions and juvenile salmon survival.
Task 2 Work Plan	**Information Needs**: (from EOS 2008, p.26) The null hypothesis is neither the timing of ocean entry, juvenile migration pattern, in-estuary growth and survival, nor ocean conditions affect a) juvenile salmonid survival during their first weeks in the ocean or b) inter-annual variations in sizes of runs of returning adult salmonids.
	Metric(s): (from EOS 2008, p.28) see Table 3.
	How will the Data be Used? By Whom? This is a major uncertainty, the resolution of which will determine the role of early ocean entry in salmon population performance and help the AA and the Region prioritize funding.
	Coordination Needs: AFEP, FWP, NOAA
	Responsible Staff Leads: Ebberts (CENWP) and Yerxa (BPA)
	Milestones for Completion: Information syntheses by 2012 and 2015 for the 2013 and 2016 comprehensive reports, respectively.
	Data Collection and Analysis Methods: (from EOS 2008) TBD by researchers

	Data Dissemination and Use in AM: Data will be disseminated through strategies developed in RPA 72 (Data Mngt). See the RME Coordination and Data Management Workgroup. The information will be synthesized and reported in the Comprehensive RPA Evaluation Reports (2013 and 2016).
Task 3 Gap Assess.	**Project List (link to Attachment 6)**: CUR1-3, CUR8
	Coverage Determination: No gap.
	Comments on projects or parts of projects that could be eliminated: BPA is currently conducting an internal review of the POST project.
Task 4 Recomm	**Recommendations for changes to existing projects and/or needs for additional projects to address gaps**: None

Subaction 61.3

RPA 61 Subaction 61.3 Investigate the importance of early life history of salmon populations in tidal fresh water of the lower Columbia River.	
Task 1 Review	**Interpretation/ Issues**: None
	Expectations and Desired Outcome(s): Understanding of migration characteristics (who-what-when-where) and ecology (diet, available prey, residence times, growth rates) for juvenile salmonids year-round in RM 35-146.
Task 2 Work Plan	**Information Needs**: (from EOS 2008, p.26) The null hypothesis is shallow water habitats in the tidal freshwater reach of the CRE are not important to the growth and survival of ocean-type salmon. This includes the effect of timing of ocean entry and whether concurrent monitoring of ocean conditions and salmonid migration patterns, growth, and survival can be used to predict inter-annual variations in sizes of runs of returning adult salmonids. The need is to collect concurrent environmental and juvenile salmonid data during the first weeks in the ocean and correlate these data with adult salmonid returns.
	Metric(s): (from EOS 2008, p.28) see Table 3.
	How will the Data be Used? By Whom? This is a major uncertainty, the resolution of which will determine the importance of estuary/ocean actions in the overall recovery effort for listed salmonids and help the AA and the Region prioritize funding.
	Coordination Needs: AFEP, FWP, NOAA
	Responsible Staff Leads: Ebberts (CENWP) and Yerxa (BPA)
	Milestones for Completion: Information syntheses by 2012 and 2015 for the 2013 and 2016 comprehensive reports, respectively.
	Data Collection and Analysis Methods: (from EOS 2008) TBD by researchers
	Data Dissemination and Use in AM: Data will be disseminated through strategies

	developed in RPA 72 (Data Mngt). See the RME Coordination and Data Management Workgroup. The information will be synthesized and reported in the Comprehensive RPA Evaluation Reports (2013 and 2016).
Task 3 Gap Assess.	**Project List (link to Attachment 6)**: CUR4-6, AER1, AER3, STM2
	Coverage Determination: There is a gap because a roll-up has not been programmed.
	Comments on projects or parts of projects that could be eliminated: None
Task 4 Recomm	**Recommendations for changes to existing projects and/or needs for additional projects to address gaps**: Continue ongoing work, but need to add work elements to 2003-010-00 and 2005-001-00 and do periodic roll-ups to provide up-to-date, comprehensive summaries of the research for managers to use to make decisions.

Subaction 61.4

RPA 61 Subaction 61.4 Continue development of a hydrodynamic numerical model for the estuary and plume to support critical uncertainties investigations.	
Task 1 Review	**Interpretation/ Issues**: None
	Expectations and Desired Outcome(s): Two-dimensional hydrodynamic model of the lower river, estuary, and plume including the floodplain.
Task 2 Work Plan	**Information Needs**: (from EOS 2008, p.26) The null hypothesis is the regulation of river flows by the FCRPS does not reduce available salmonid habitats through effects on wetting and drying of the floodplain in the estuary. Water surface elevation, i.e., wetting and drying, of floodplain habitats is fundamental to the ecological processes that are the basis for estuary habitat restoration action involving tidal reconnection, such as dike breaches, tide gate retrofits, and culvert replacements. Water surface elevation affects habitat opportunity, capacity, and functionality. Thus, there is a research need to continue development, validation, and implementation of hydrodynamic numerical models for the estuary.
	Metric(s): (from EOS 2008, p.28) see Table 3
	How will the Data be Used? By Whom? This is a key support effort to research determining the importance of estuary/ocean actions in the overall recovery effort for listed salmonids.
	Coordination Needs: AFEP, FWP, NOAA
	Responsible Staff Leads: Ebberts (CENWP) and Yerxa (BPA)
	Milestones for Completion: Information syntheses by 2012 and 2015 for the 2013 and 2016 comprehensive reports, respectively.
	Data Collection and Analysis Methods: (from EOS 2008, p.28) TBD by researchers
	Data Dissemination and Use in AM: Data will be disseminated through strategies

	developed in RPA 72 (Data Mngt). See the RME Coordination and Data Management Workgroup. The information will be synthesized and reported in the Comprehensive RPA Evaluation Reports (2013 and 2016).
Task 3 Gap Assess.	**Project List (link to Attachment 6)**: CUR1, CUR5, STM3, STM5
	Coverage Determination: No gap although examining other modeling approaches should be considered.
	Comments on projects or parts of projects that could be eliminated: None
Task 4 Recomm	**Recommendations for changes to existing projects and/or needs for additional projects to address gaps**: Apply HEC-RAS to habitat restoration needs.

A.9 Attachment 6 – Project World -- Task 3b Project Assessment

Project Review Comments (Task 3b) -- indicate RPA numbers for each work element.

Project improvements are actions that would help the project better meet the BiOp.

For tracking purposes, the id' numbers in parentheses are from the previous numbering system.

CUR1: Ecology of Juvenile Salmonids in the Nearshore Ocean

Full Title: Ecology of Juvenile of Salmonids in the Nearshore Ocean
BPA Project No.: 1998-014-00
Project Sponsor: NMFS
Project Funder: BPA
RPA Action/Subaction(s): 58.3*, 58.4*, 61.1, 61.2*, 61.4*
F&W Program Objective: 13.0, 13.1, 13.2, 13.3, 13.4, 14.6
Project Status: Ongoing
Information Source: Pisces
Contract(s): 32386, 33937, 36802, 37595, 38533, CR-95763
Focal Species – Populations: All CR
Pisces Work Element Number(s), Name, Title, and Description: 31711 Characterize spatial and temporal physical features of the plume. Describe, through observations, historical reconstruction, and numerical physical modeling, the temporal and spatial features of the Columbia River plume important for salmon in relation to ocean conditions. 31909 Assess the role of the coastal habitat on salmon growth and survival. Data will be collected to determine the following: Through analytical assessment of biological features of juvenile salmon in and out of the Columbia River plume assess the role of unique features of the Columbia River plume that affect salmon growth and survival. 34334 Assess the role of the plume on salmon growth and survival. Through analytical assessment of biological features of juvenile salmon in and out of the Columbia River plume, assess the role of unique features of the Columbia River plume that affect salmon growth and survival. 34335 Measure composition, distribution, and abundance of pelagic and nektonic species, including salmonids, from fall of 2008 and spring 2009 in the Columbia River plume and off coastal Oregon and Washington. Three cruises each year (September 2008, May and June 2009) from Newport, Oregon to northern Washington and 8 cruises just in the Columbia River plume (August-April).
Deliverable and Description: Cruise Reports. Deliverable Complete - 2/30/09 May Cruise - May 15-30, 2008 June Cruise - June 15-30, 2008 September Cruise - Sept 15-30, 2008 Predator Cruises - April 15 - Aug 31, 2008 Cruise reports will be submitted electronically will be submitted 2 months after completion of each cruise. Four Cruise Reports - details sampling locations, physical conditions on each tract line, pelagic species observed from trawls, and samples acquired for further analysis - February 2009. Physical Habitat Metrics Report. Report produced delineating updated physical metrics that describe features of the plume that affect growth and survival of juvenile salmon. * Work supports OGI/OHSU modeling work completed under project (under another contract), in support of this contract. OGI02 deployment - 6/08-4/09 Cruise forecasts - 5/08-10/08 Update of circulation database completed - 2/09

Preliminary database of physical habitat opportunity completed -03/09 Report and manuscript on integration of plume metrics with biologic features to model the interaction of the plume and salmon survival - 4/09 Physical Habitat Metrics Report Cont'. OGI02 deployment - 6/08-4/09 Cruise forecasts - 5/08-10/08 Update of circulation database completed - 2/09 Preliminary database of physical habitat opportunity completed - 3/09 Report and manuscript on integration of plume metrics with biologic features to model the interaction of the plume and salmon survival - 4/09. Collect and Enter Data. Juvenile salmon species confirmed from cruise sampling, weighed and measured, dissected and samples distributed for analyses to assess genetic composition, growth characteristics, food consumed, disease and parasite status. Database is updated. Data regarding each individual juvenile salmon sampled in 2007 and some information from sampling in 2008, including species, size, location of capture, associated oceanographic conditions of sample site, food composition, disease and parasite load, growth features entered into an Access database of all juvenile salmon sampled from this project for the period beginning in 1998 to the present. Datasets will be incorporated to updated Access database including current sample analysis. Attach copy of journal submission in Pisces. Copy of manuscripts (can be draft form) submitted to peer-reviewed journals will be attached in Pisces. This will be completed by Project Lead, Ed Casillas. Assess the role of the plume on salmon growth. Datasets incorporated to updated Access database including current sample analysis - 10/1/08 Draft report on juvenile salmon and plume and ocean conditions - 3/30/08 Completed manuscripts - 8/31/09. Nektonic species sampling - Plume and coastal Oregon and Washington Deliverables complete - August 31, 2009 September Cruise - Sept 15-30, 2008 May Cruise - May 15-30, 2009 June Cruise - June 15-30, 2009. Predator cruises - Aug. 1, 2008, Apr 15-July 31, 2009. Cruise reports will be submitted electronically 4-5 mos. after completion of each cruise Four cruise reports - details sampling locations, physical conditions on each tract line, pelagic species observed from trawls, and samples acquired for further analysis - July 31, 2008.
Project Review and WE Comments: SOW addresses the BiOp.
Tags: None
Project Improvements: None at this time.
Other Comments: Coordinate w/ E3, E7, and E11.

CUR2: Acoustic Tracking for Survival (POST)

Full Title: Acoustic Tracking for Survival (POST)
Project No.: 2003-114-00
Project Sponsor: Kintama
Project Funder: BPA
RPA Action/Subaction(s): 61.2
F&W Program Objective: 13.1, 13.2, 13.3, 13.4, 14.3, 14.4
Project Status: Ongoing
Information Source: Pisces
Contract(s): 32081, 35492, CR-104585, BPA-4339

Focal Species – Populations: Sn SpC Lawyer Cr / MC SpC Yakima

Pisces Work Element Number(s), Name, Title, and Description:

32685 To evaluate the performance of V6 acoustic tags, construct and design a series of field experiments to evaluate the detection efficiency using 180 KHz V6 acoustic tags. Field trials will be conducted in freshwater, estuarine, and marine environments to determine the detection range (proportion of transmissions successfully decoded) as a function of tag depth and horizontal range

32977 Complete a series of tasks that will identify an optimal array geometry and corresponding tag programming to incorporate the use smaller V6 tags (These tags transmit at a different frequency, 180 KHz). This will enable researchers to tag smaller smolts (approximately 95 mm in size) and to detect the smolts in both the river and the ocean.

39561 Install Acoustic tracking array. Five detection "lines" will be deployed in the Columbia / Snake R system, to track acoustically tagged smolts downriver and allow a comparison of survival of acoustically tagged smolts with previous measurements using PIT tags. The final freshwater detection line will be deployed on the Astoria Bridge. Nodes have the potential to be deployed worldwide, and could be used to track the movements of a wide variety of marine / aquatic animals. Four detection lines will be placed in the ocean using BPA funding in 2008 and 2009. The northern detection lines will be placed perpendicular to shore off Lippy Point, NW Vancouver Island and Graves Harbor, Alaska. The southern lines will be placed just south of Willapa Bay, Washington, 40 km north of the Columbia River mouth and the furthest southern line located at Cascade Head, will be situated ~130 km south of the Columbia River mouth.

39562 Tag 1,200 smolts for release & 400 to be held as controls Snake River and Yakima River spring Chinook smolts will be surgically implanted with Vemco V9-6L acoustic tags.

39564 Establish relative movements and survival of Yakima & Snake R smolts. Assess the relative movements and survival of tagged smolts from the two stocks over the in-river and ocean array. Develop a statistical comparison of whether survival is similar between the stocks, and if not, identify in what geographic sectors of the array survival differs.

39565 Install acoustic tracking array (Astoria Bridge) A detection sub-array will be deployed along Astoria Bridge to track acoustically tagged smolts downriver and allow a direct measurement of survival of acoustically tagged smolts to the ocean.

Deliverable and Description:

Evaluate V6 Acoustic Tag Performance. Kintama will produce a matrix from each aquatic environment tested to show how transmission varies as a function of tag depth and sensor range.

Array design. An array design and cost specification for a seamless acoustic array system that can track salmon smolts throughout the Columbia River watershed and out to sea along the west coast of North America. The system will specify expected performance standards for different size of acoustic tags: 5.5 mm (V6), 7 mm (V7), and 9 mm (V9)

Preliminary analysis of results (oral and written). Complete preliminary report on the year's work placing the results in context of the two primary policy issues of whether: (a) Below Bonneville survival measured over the array is similar for the two stocks; if so, this will make "delayed" mortality caused by the hyrdrosystem less likely as an explanation of the poorer SARs of Snake R fish; (b) Establish whether barging helps or reduces Snake R Chinook survival by effectively increasing the period of time the smolts are placed in the ocean environment (if survival per day is lower here than in freshwater, then overall survival may be reduced more by transportation than if the smolts are allowed to migrate downriver).

Project Review and WE Comments: (3/23 meeting = directly pertains to 61.2 Note: not all ERMEW members agreed with this assessment.) (3/31 meeting = CT, JR, and AC agreed that the projects pertains to 61.2, not 61.1.)

Tags: PIT and Vemco acoustic transmitters
Project Improvements: When they're available, see comments from Skalski and Giorgi (Hydro WG); review internal to BPA is underway.
Other Comments: Need to coordinate w/ Hydro WG on this project. Hydro RPAs tie to this project too. This project is cost-shared with other funding sources. Sample size is a concern. Tag effects are also a concern. This project needs a thorough statistical review. Also, needs to include an analytical objective to associate migration rates with environmental conditions to address causal mechanisms.

CUR3: Canada-US Shelf Salmon Survival Study

Full Title: Canada-US Shelf Salmon Survival Study
Project No.: 2003-009-00
Project Sponsor: Canada Department of Fisheries and Oceans
Project Funder: BPA
RPA Action/Subaction(s): 61.1, 61.2
F&W Program Objective: 13.1, 13.2, 13.3, 13.4
Project Status: Ongoing
Information Source: Pisces
Contract(s): 34892, 39197,
Focal Species – Populations: All CR
Pisces Work Element Number(s), Name, Title, and Description: 34370 Collect juvenile salmon and oceanographic data in coastal regions extending from the west coast of Vancouver Island to southeast Alaska and inshore fjord systems. 34371 Provide a physical, chemical, and biological characterization of the ocean environment encountered by juvenile salmon from the west coast of Vancouver Island to southeast Alaska. 34372 Assess the stock of origin, the biological and physiological status of juvenile salmon in northern and southern regions of the Gulf of Alaska. 34373 Analyze the extent of nutrient limitation resulting from changes in mixed-layer depth, decreasing salinity, and increasing temperature from the 1990s through 2006 / 2007. 34374 Analysis of the biological and physiological status of juvenile salmon in northern and southern regions of the Gulf of Alaska. 34375 Examine the relationship between the marine survival of Pacific salmon and the biological attributes of juvenile salmon and ocean conditions collected during the ocean surveys.
Deliverable and Description: Collect Data Samples. Provide the biological and oceanographic samples that will be necessary to determine the growth, bioenergetics status, and stock of origin of juvenile salmon, their feeding habits, and to characterize the ocean environment utilized by juvenile salmon. Collect baseline data. Baseline data necessary to characterize the ocean environment utilized by juvenile salmon and to test the theory that changes in water column stability are driving the differential productivity of northern and southern regions of the Gulf of Alaska. Data will be stored in a shared database with the Institute of Ocean Science and in a separate Data Access database maintained at the

Pacific Biological Station in Nanaimo, British Columbia. These data will be subsequently used in peer-reviewed publications. Collect and assess biological data. Provide the biological data that will be necessary to determine the growth, bioenergetics status, and stock of origin of juvenile salmon. Data will be stored in a Data Access database maintained at the Pacific Biological Station in Nanaimo, British Columbia. These data will be subsequently used in peer-reviewed publications. Analysis of data. Identification of the physical and biological changes in the ocean that lead to reduced ocean survival through changes in growth. This analysis will be published in a peer-reviewed scientific journal. Analysis of data. Identify the extent of the region of poor growth and survival. Quantification and detection of impacts of differing ocean productivity on salmon growth and survival. Identify relationships among growth, bioenergetics performance, and coastal ocean conditions. Identify the stocks occurring in regions of poor growth and establish their migration strategies relative to stocks whose migration moves them rapidly out of regions of reduced growth potential. These analyses will be published in peer-reviewed scientific journals. Initial assessment of factors affecting Pacific salmon Provide an initial assessment of the factors affecting the marine survival of Pacific salmon. Depending on their predictive power, the relationships derived from this analysis may be used to forecast the size of salmon runs.
Project Review and WE Comments: SOW addresses an element of the BiOp.
Tags: None
Project Improvements: TBD.
Other Comments: SOW repeated each year. Should there be modifications based on new knowledge? BPA COTR will be meeting w/ project sponsors about the intended direction for this project -- what's next? How important is this work to CUR1 and its ocean conditions index? Are there efficiencies or add'l info' that can be obtained thru better inter-project coor.?

CUR4: Acoustic Telemetry Estimation of Salmon Survival

Full Title; A Study of Salmonid Survival and Behavior through the Columbia River Estuary Using Acoustic Tags
AFEP Study Code: EST-02-P-01
Project Sponsor: NMFS/ PNNL
Project Funder: USACE, Portland District
RPA Action/Subaction(s): 58.1*, 59.4, 61.1, 61.3 (could be modified to address 61.2)
F&W Program Objective: 13.3, 14.3, 14.4
Project Status: Ongoing
Information Source: AFEP 2009 One-Pagers, document=09 Final 1 pagers Master.pdf
Contract(s): n/a
Focal Species – Populations (or AFEP life history type):
Pisces Work Element Number(s): n/a

Pisces WE Description: n/a

Deliverables: (or AFEP objective):

OBJECTIVES:

1. Estimate survival from Bonneville Dam through at least five river reaches to the mouth of the Columbia River for yearling and subyearling Chinook salmon, and possibly steelhead.

2. Quantify the effects of FCRPS passage history on mortality of emigrant juvenile yearling and subyearling Chinook downstream of Bonneville Dam; compare survival for spill, RSW, JBS, and turbine passage. For each release replicate calculate and compare mortality rates between treatment groups.

3. Monitor and map estuary migration pathway and habitat associations and behaviors relative to these pathways to support estuary habitat restoration activities.

4. Determine the fate of subyearling Chinook salmon that ceases migration in the Columbia River downstream of Bonneville Dam.

5. Determine over-winter survival of subyearling Chinook who cease migration in the lower river and estuary.

6. Estimate survival probabilities for yearling and subyearling Chinook salmon within the plume.

7. Competitively procure prototypes of "rearing Chinook" acoustic micro-transmitters for function and biocompatibility evaluation.

Deliverable Description: (or AFEP Management Purpose and Background):

MANAGEMENT PURPOSE: The management implications are wide-ranging: (1) the actual survival of ESA listed salmon in the lower 146 miles is unknown; (2) survival through this reach may differ for fish with different passage histories through the FCRPS, (3) "passage history-specific mortality" may be realized and studied in this stretch of the river, (4) effects/impacts of the transportation program could also be evaluated within this program and (5) survival into and through the plume may provide information previously unknown related to FCRPS passage. Additionally, most survival studies using active tags in the lower Columbia and Snake rivers in the past have only looked at shorter reaches whereas these other types of mortality may manifest themselves later (i.e., farther downstream) in the emigration period.

BACKGROUND. The Columbia River estuary is an important transition habitat to emigrating juvenile salmon, and the Corps has requirements to evaluate survival and habitat restoration actions. Recent evidence suggests that improvement in survival of the estuarine and early ocean life history phase of Columbia River salmon may be critical to the recovery of endangered stocks. Survival success of Columbia River salmon hinges on the complex interaction of smolt quality and the abiotic and biotic ocean conditions at the time of entry and during their first year of ocean residence. Factors that potentially affect age-class recruitment during the first months of ocean residency include fish size and health status at the time of entry, entry timing, and ocean conditions during the first months. These factors are influenced or controlled by several aspects of the Columbia River estuary: differences in life history strategies, river flow (hydropower system management), and estuarine habitat availability and quality. Therefore, it is important to understand how salmonids use the estuary, both spatially and temporally, and how different ESU's, life history types, and various rearing, passage, and condition histories use and benefit from the estuary, and how these conditions affect ocean entry timing and survival. The development of micro-acoustic transmitters enables their use in the lower Columbia River and estuary environment for both ocean- and stream-type salmon. This will allow the following hypotheses to be evaluated a) interannual, life history (ocean- and stream-type), and biological (size/age) differences impact estuarine habitat selection and residence time, b) residence may vary within season, c) estuarine habitat use is patchy, not uniform, and salmonids key on specific habitat features, d) different passage route (bypass, transport, unknown) affect system mortality, and e) delayed

or passage-history specific mortality is exhibited during the lower river/estuarine residence/transit. Spatial and temporal observations of fish utilization of the estuary habitat are needed that link back to the variables described above, to develop hydropower management scenarios that benefit survival, growth, and health of juvenile salmon in the Columbia River estuary and their entry into and survival in the near shore ocean environment. It will be imperative that this research be discussed thoroughly with regional fishery managers to outline and prioritize actions.
Project Review and WE Comments: SOW fully covers the survival component in the BiOp.
Tags: Acoustic transmitters and PIT
Project Improvements: None at this time.
Other Comments: Could be modified to include the plume/nearshore. Could address shallow water work when tags get smaller. Continue to apply knowledge from tag effects research by others.

CUR5: Habitat Opportunities & Food-Web Linkages

Full Title: Habitat Opportunities & Food-Web Linkages
Project No.: 2003-010-00
Project Sponsor: NMFS/ OHSU/ PSU/ UW
Project Funder: BPA
RPA Action/Subaction(s): 58.2, 58.3, 58.4, 59.4, 61.1, 61.3, 61.4 (Could be relevant to 60.3 in the future.)
F&W Program Objective: 14.4, 14.5, 14.6
Project Status: Ongoing
Information Source: Pisces
Contract(s):
Focal Species – Populations: All CR
Pisces Work Element Number(s), Name, Title, and Description: 26932 Estimate Food Web Support. Conduct historical change analysis for Grays River study site. Compile seamless, georeferenced GIS database of bathymetry from the estuary mouth to Bonneville Dam. Characterize juvenile salmon consumption and prey selectivity of juvenile salmon in natural and restoring habitats at transition from Grays River to Columbia River estuary. 31903 Evaluate life history and trophic responses to historic changes in estuarine habitat types and conditions. We propose to expand the assessment of salmonid life histories and food webs to include a greater variety of habitats that will be monitored in the mainstem estuary (through the USACE-funded monitoring program) and to compare salmon rearing conditions in the mainstem estuary with those of a smaller tributary system (Grays River) nested within it (WE G below). 31904 Determine whether the responses of juvenile salmon species and life history types to a restoring wetland-habitat landscape in lower Grays River differ from salmon habitat-use patterns documented for the mainstem Columbia River estuary. 32013 Estimate Habitat and Food Web Support from Grays River Wetlands. Characterize juvenile salmon habitat co-occurrence, diet composition, consumption rate and prey selectivity of juvenile salmon in natural and restoring habitats at transition from Grays River to Columbia River estuary.

32643 Analyze Historic Tidal Datum Levels -- Puget Island to Bonneville -- to support the overall project by providing a time-space history of tidal datum levels for the Puget Island to Bonneville reach, and applying this information in the context of: a) habitat change analysis, and b) analyses of historic bathymetry.

34958 Reconstruct the historic extent of estuarine and floodplain habitats and changes in climate, river flow, and sediment balance, Astoria to Bonneville Dam. Compute historical changes in habitat areas and elevations on a prototype basis. Define the hydrologic and climatic contexts for the Columbia River estuary over the last 150 years, and separate the influences of climate and the hydropower system (FCRPS) on hydrologic factors influencing habitat. And, provide the physical basis for other analyses of historic habitat.

36054 Evaluate contemporary and future habitat changes caused by climatic and anthropogenic variability at estuary and site-specific scales using 3D numerical models that refine, extend and synthesize our characterization of the variability of estuarine habitat opportunity.

36057 Evaluate alternative management scenarios for restoring salmon habitat opportunity and capacity. We will analyze the implications - on circulation, morphodynamics and salmon habitat opportunity - of management scenarios identified during a March 8, 2006 workshop and the 2008 workshop.

38098 Habitat-Life History Linkages in a Tributary Estuary: Determine whether the responses of juvenile salmon species and life history types to a restoring wetland-habitat landscape in lower Grays River differ from salmon habitat-use patterns documented for the mainstem Columbia River estuary.

Deliverable and Description:

Historic change and trophic interactions over restoring estuarine landscape. GIS synthesis of historic bathymetric and topographic structure of Columbia River estuary.

Juvenile Salmon Performance in Grays River Tributary. Integrated dataset of juvenile salmon species and life history occurrence by habitat (reference vs. restored) and diet composition and prey availability.

H-sheets, tidal datum, and historical flow, sediment, and temperature analyses. Remaining H-sheets georeferenced and digitized Updated Kukulka and Jay (2003) tidal models to account for tidal changes back to 1925 Analysis of flow and temperature patterns from presently available tide and temperature data Updated sediment transport estimates to account for sediment trapping behind Snake R. dams Estimated historical changes in tidal datum levels from hourly data set for the period 1925 to present Analysis of water temperature trends relative to climate indices and reservoir influences Data will be shared in progress report at annual project review meeting (tentative early 2009) NOAA will provide oversight for this work element, will work with PIs from UW and PSU to select metrics for analyzing habitat changes, and will review habitat-change results.

Food web sources and parasites: analyses, databases, and data shared in progress reports. Linked databases of food web isotopic results and otolith chemistry and increment widths for juvenile Chinook salmon of different freshwater and estuarine life histories Synthesis and presentation of isotopic (food web and estuarine residency) results at the annual project review meeting (tentative early 2009), and submission of a draft manuscript to a peer-reviewed scientific journal at the end of the project (09 contract) Data shared in progress report on parasite results at the annual project meeting (tentative early 2009) which will contribute to a draft report for journal submission at the end of this project (09 contract) Data shared in summary presentation at the annual project meeting on evidence for isotopic chronosequence in food web changes as validated by otolith microchemistry and microstructure evidence NOAA will survey population demographics and work with WDFW otolith laboratory to identify priority metrics and samples for otolith analysis of life histories. NOAA will also oversee parasite analyses (actual laboratory analyses supported by other funds) and coordinate with UW for stable isotope analyses.

Provide Historic Tidal Datum Levels-- Puget Island to Bonneville. Provide historic tidal datum for the region to support the historic mapping effort from Puget Island to Bonneville.

Historic reconstruction. PSU serves as the lead for the tidal, river flow, shallow-water habitat area, and datum level aspects of this Work Element. PSU provides data to NOAA and UW and coordinates with both. Update Kukulka and Jay (2003) models to account for tidal changes back to 1940 Analysis of flow and temperature patterns from presently available tide and temperature data Updated sediment transport estimates to account for sediment trapping behind Snake R. dams Estimated historical changes in tidal datum levels from hourly data set for the period 1940 to present (most stations), 1902-date (Vancouver), 1925-date (Astoria) Analysis of water temperature trends relative to climate indices and reservoir influences Progress report at annual project review meeting.

Management scenarios, review of alternatives. PSU serves as the lead for the tidal, river flow, shallow-water habitat area, and datum level aspects of this Work Element. PSU provides data to NOAA and UW and coordinates with both. Participate in selection of priority management scenarios Participate in review of model results for alternative scenarios and progress report at annual project review meeting.

Circulation databases and forecasts of habitat opportunity. OHSU will complete the majority of this work element, in coordination with NOAA. Tasks: -- Extended estuary-wide circulation databases for historic (1880-1890) and contemporary (1999-2009) periods and associated habitat opportunity metrics -- High resolution circulation database for Russian Island for 2002-07 -- High resolution circulation database for Grays River for selected historical and contemporary periods.

Select management scenarios, review of alternatives OHSU will participate with NOAA and other PIs in review of model results and selection of priority management scenarios. Tasks: -- Selection of priority management scenarios -- Review of model results for alternative scenarios and progress report at annual project review meeting (tentative early 2009)

Collect Grays River data on salmon habitat, life histories & prey availability. * NOAA WILL TAKE THE LEAD ON THE MARK RECAPTURE SURVEYS IN LOWER GRAYS RIVER AND GRAYS BAY AND UW WILL ASSIST CREST WITH ALL BIWEEKLY MONITORING AND WILL CONDUCT ADDITIONAL SURVEYS ASSOCIATED WITH STUDIES OF SALMONID DIETS, LIFE HISTORY, AND PREY RESOURCES. Collect Grays River data and develop sampling plan, databases, simulation modeling, and data shared via draft report. List of preferred sampling sites and full sampling plan for 2008. Database of physical-chemical parameters from lower Grays River and interface with mainstem estuary Database of salmon life histories, residency, growth, and abundance Databases of wetland prey availability and salmon diet composition and consumption Updates to numerical model (see WE-D) for the Grays River and Grays Bay study region Data shared in progress report of Grays River results to date at annual project review meeting (tentative early 2009) and draft report comparing salmon performance in tributary and mainstem estuaries at the end of this project (09 contract) NOAA will oversee sample site selection and design by the research team and the design of experimental hatchery releases and fish marking activities by WDFW. NOAA will take the lead on fish recapture surveys during the experimental hatchery releases, and will coordinate with CREST and UW routine (biweekly) monitoring of fish abundance, prey resources, and salmon diet. NOAA will maintain the fish data base and work with CREST and WDFW to synthesize all fish survey and otolith results on salmon life histories, residency, and growth in lower Grays River.

Project Review and WE Comments: SOW addresses the BiOp.

Tags: Batch marking; no tags

Project Improvements: Perhaps move to mainstem.

Other Comments: Coordinate w/ CUR6. BPA plans to consider refinement based on BiOp needs (this comment applies to all projects). Hydrodynamic modeling (WE 32643) needs to be integrated into the overall effort. NOAA needs to be the only contractor (no separate contracts with BPA for individual

work elements). Need to make sure the role-up WE 36057 is truly happening. Improve application to RPA 60.3.

CUR6: Current and Historical Linkages between Estuary Habitats and Salmon

Full Title: Estuarine Habitat and Juvenile Salmon – Current and Historic Linkages in the Lower Columbia River and Estuary
AFEP Study Code: EST-P-02-02
Project Sponsor: NMFS
Project Funder: USACE, Portland District
RPA Action/Subaction(s): 58.2, 58.3, 59.4*, 61.1, 61.3*
F&W Program Objective: 14.4, 14.6
Project Status: Last year will be 2009 – report only
Information Source: AFEP 2009 One-Pagers, document=09 Final 1 pagers Master.pdf
Contract(s):
Focal Species – Populations (or AFEP life history type): all ESU's
Pisces Work Element Number(s):
Pisces WE Description (or AFEP Description):
Deliverables: (or AFEP objective): **OBJECTIVES:** 1. Evaluate the diversity and importance of life history strategies used by juvenile salmonids from RM 40 to Bonneville Dam 2. Evaluate salmon prey resources and performance (e.g., growth, foraging success) at representative locations in the tidally influenced portion of the lower Columbia River 3. Determine habitat-specific rearing patterns among different source populations (ESU's) in the Columbia River estuary from RM 40 to Bonneville Dam.
Deliverable Description: (or AFEP Management Purpose and Background): **MANAGEMENT PURPOSE**: Understand the significance of tidal freshwater and estuarine habitats (with emphasis on the region from RM 40 to Bonneville Dam) to the life history and performance of diverse salmon populations of the Columbia River Basin. Little information is available on which habitats are important, why they are important, and how they are used and for how long. The goal of this research will be to answer critical uncertainties about the ecological importance of estuarine habitat types that have rarely been examined in the tidal freshwater reaches of the estuary, and that will be needed to support future estuary restoration activities. Additionally, additional information on potential ecosystem restoration sites will be obtained by selection of specific sites for this study. **BACKGROUND:** Studies completed to date reveal that the Columbia River estuary 1) is used by juvenile salmonids all year long, 2) is used by juvenile salmon representative of all ESU's, 3) that shallow water habitats associated with marsh and forested wetlands are used by smaller juvenile salmon of each ESU whereas larger juveniles use the larger order channels, 4) residence time for juveniles salmon averages 21 days in wetland habitats that contribute to their growth and survival, 5) that insects

represent a major food source and source of energy for juvenile salmon, and 6) insects are associated with vegetated wetland sites. The focus of the information is generated from the mouth of the Columbia River to RM 40. Although Chinook salmon stocks from the lower Columbia River dominate this reach, it is hypothesized that tidally influenced habitat from RM 40 to Bonneville Dam will be used to a greater extent by mid and upper Columbia basin salmon stocks in a similar manner. However, this is unknown and needs to be verified.

Project Review and WE Comments: SOW addresses the BiOp. Research to date has been concentrated in the Cathlamet Bay area and the lower tidal freshwater.

Tags: PIT (limited)

Project Improvements: None at this time.

Other Comments: NMFS feels this is a BiOp critical project that should not be terminated. The funding issue should go to the NOAA/AA coordination group. There are discussions underway outside of the RME review process that may have bearing. CUR6 needs to be coordinated w/ CUR5 and STM2.

CUR7: Impact of American Shad

Full Title: Impact of American Shad

Project No.: 2007-275-00

Project Sponsor: USGS

Project Funder: BPA

RPA Action/Subaction(s): 61.1

F&W Program Objective: 14.6

Project Status: Ongoing

Information Source: Pisces

Contract(s): 36371, CR-105192, 32815

Focal Species – Populations:

Pisces Work Element Number(s), Name, Title, and Description:

28821 Construct databases with PIT tag and biological data from individual adult American shad, and biological data from juvenile shad.

29343 Convene and moderate symposium on Columbia River American shad.

39229 Develop bioenergetics models. Bioenergetics models will be used to predict the effect of diet overlap between shad and juvenile salmon on the growth and size at entry into the estuary of juvenile salmon. Models for juvenile and adult shad will estimate forage consumed by the shad population in reservoirs and the lower river. Models for juvenile Chinook salmon will estimate consumption based on known growth increments of juvenile and predict the effect of diet overlap with American shad on growth. Data collected during the duration of this project will serve to improve parameter estimates used in the bioenergetics modeling.

39230 Describe diet and life history of juvenile and adult shad. Diets of juvenile and adult shad will be described by gut analysis. Guts that were preserved for analysis in the laboratory will be examined. Biological information that was collected to understand growth, diet, and life history of these fish will

be summarized and described.

28819 Describe diet and life history of juvenile and adult shad. Diets of juvenile and adult shad will be described by gut analysis. Biological information will be collected to understand growth, diet, and life history of these anomalous fish.

28820 Mark/ Tag Animals. PIT tag adult shad. PIT tag adult American shad in the estuary near Astoria, Oregon to determine migration timing to upstream dams. We purchased 1000 PIT tags in 2007 that will be used in 2008. PIT Tags used in laboratory experiments in 2007 were recovered and can be used again.

40095 Produce Journal Article. Journal articles describing various findings. Work done on this project should result in at least four peer-reviewed journal articles that can be produced during the third contract year. These papers would report on the prevalence of Ichthyophonus in juvenile and adult shad, the observed levels of thiaminase activity in juvenile and adult shad, document the occurrence of freshwater-type juvenile shad in the Columbia Basin and report on how juvenile shad as preyfish contribute to the size and growth of smallmouth bass, northern pikeminnow, and walleye in lower Columbia River reservoirs.

Deliverables and Descriptions:

Biological information databases Electronic files

Oral presentations of results. At least one oral presentation on preliminary results from this project will be made at a professional meeting during this contract period.

Biological information databases. Electronic files.

Compile information on bioenergetics model parameters. Construction and parameterization of bioenergetics models using literature derived values.

Diets of juvenile and adult American shad. Datasets on diets of juvenile and adult American shad. During this contract period adult shad will be collected from the estuary and juvenile shad will be collected during downstream migration. Tissue samples will be taken from dorsal musculature and stored at -80C until processed. Guts will be preserved for analysis in the laboratory. Analyses of samples collected during this contract period will be completed during the next contract period. Biological data on fish collected (size, weight, condition, etc.) and data from gut analyses describing forage will be entered into spreadsheets or databases (Excel or Access) on desktop PC's, proofed and error-checked, and backed up on servers and other media at the Columbia River Research Laboratory.

Collect and process fish for laboratory analysis. Datasets containing biological data on collected fish (lengths, weights, gender, condition, and fish health assessment). Data entered into spreadsheets or databases (Excel or Access) will be proofed and error-checked and will reside on desktop PC's, backed up onto the Columbia River Research laboratory's network and other media. American shad and northern pikeminnow will be collected, and adult salmon will be sampled at federal hatcheries concomitantly with USFWS pathologists. At least 210 shad and 40 additional fish of other species, primarily northern pikeminnow, will be screened for ichthyophonus. Tissues will be processed and sent to the USGS's Marrowstone Field Station for histological analysis. For thiaminase analyses, 120 shad will be collected and shipped to the USGS's Columbia Environmental Research Center for laboratory analysis. Results from laboratory analyses will be produced and reported during the next contract period.

Bioenergetics models. Construction and parameterization of bioenergetics models.

Diets and life history of juvenile and adult American shad. Datasets on diets of juvenile and adult American shad. Biological data on fish collected (size, weight, condition, etc.) and data from gut analyses describing forage will be entered into spreadsheets or databases (Excel or Access) on desktop PC's, proofed and error-checked, and backed up on servers and other media at the Columbia River Research Laboratory.

Journal articles. Manuscripts.
Project Review and WE Comments: SOW addresses the BiOp in terms of understanding the ecology of juvenile salmon as affected by shad through competition for food resources.
Tags: PIT
Project Improvements: None at this time.
Other Comments: Status TBD upon receipt of results. Coordinate w/ Hydro. This is an invasive species. Need to develop recommendations to significantly reduce their impact on salmon.

CUR8: Time of Ocean Entry Study

Full Title: Evaluation of the Relationship among Time of Ocean Entry, Physical, and Biological Characteristics of the Estuary and Plume Environment and Adult Return Rates
AFEP Study Code: EST-P-02-03
Project Sponsor: NMFS
Project Funder: USACE, Portland District
RPA Action/Subaction(s): 61.1, 61.2
F&W Program Objective: 13.0, 13.1, 13.2, 13.3, 13.4
Project Status: Nearly complete; too few adult returns for a meaningful analysis (Emmett, 2008 AFEP Annual Review)
Information Source: AFEP 2007 one-pagers, document=NWD Final 1 pagers07.pdf
Contract(s):
Focal Species – Populations (or AFEP life history type): all ESU's
Pisces Work Element Number(s) (or AFEP objective):
Pisces WE Description (or AFEP Description):
Deliverables: (or AFEP objective): 1. Correlate SARs with environmental conditions. 2. Identify potential indicators (biotic, abiotic, or a combination of both) of salmonid marine survival that could be used to improve management actions.
Deliverable Description: (or AFEP Goal and Management Purpose): **GOAL**: The goal of this study will be to examine the relationship among time of salmonid ocean entry, physical and biological characteristics of the Columbia River estuary and near shore plume environment, and smolt-to adult return rates (SARs) for yearling chinook and/or coho salmon. The last release of juvenile emigrants occurred in 2006, this work will focus on adult return rates and the analysis of physical and biological features measured when juveniles were released. **MANAGEMENT PURPOSE:** While this program has potential management purposes more suited to the hatchery, harvest, and transportation programs than specific estuarine studies, the Portland District feels this data coupled with outside funding (BPA and NMFS) of estuary and near shore/plume habitats biological and physical characteristics is too valuable and important NOT to continue for the cost.
Project Review and WE Comments: SOW addresses the BiOp. Will sunset in 2009.

Tags: PIT
Project Improvements: None.
Other Comments: Research also supported hatchery/barge release issues. Research waiting on adult returns (2009, some 2010).

AER1: Cumulative Effects Study

Full Title: Evaluating Cumulative Ecosystem Response to Habitat Restoration Projects in the Lower Columbia River and Estuary
AFEP Study Code: EST-02-P-04
Project Sponsor: PNNL/ NMFS/ CREST/UW
Project Funder: USACE, Portland District
RPA Action/Subaction(s): 59.1, 59.5, 60.1, 60.2, 60.3*
F&W Program Objective: 14.1, 14.2, 14.5
Project Status: Ongoing
Information Source: AFEP 2009 One-Pagers, document=09 Final 1 pagers Master.pdf
Contract(s): n/a
Focal Species – Populations (or AFEP life history type): all ESUs
Pisces Work Element Number(s): n/a
Pisces WE Description: n/a
Deliverables: (or AFEP Objectives): **OBJECTIVES**: 1. Support the cumulative effects assessment at a pilot and estuary wide scales through field work to document the selected higher-order metrics, develop time-series, and expand the spatial and temporal diversity of sites for cumulative effects analysis: At Kandoll, Crims Island, and Vera restoration and reference sites sample all the core metrics (Roegner et al., 2008) plus material flux. At Julia Butler Hanson, sample hydrology, vegetation, and flux and use HEC-RAS to model wetted-area for the Cumulative Effects Study. At selected natural breach sites, sample hydrology, morphology, vegetation, and fish abundance. 2. Test estuary wide the cumulative effects analysis methodology developed in previous years, including GIS assessments, discrete hydrologic modeling, and meta-analyses. 3. Support the Corps to implement an adaptive management framework developed in FY08 to support decisions by the Corps and others regarding LCRE habitat restoration activities.
Deliverable Description (or AFEP Management Purpose and Background): **MANAGEMENT PURPOSE**: The management implications are wide-ranging: (1) Decision support for estuarine restoration project prioritization; (2) evaluation of the ecological performance of collective estuarine restoration actions; (3) methods and data for Corps authorities under various Water Resources

Development Acts (Sections 206, 306, 536, 1135); (4) protocols to sample listed subyearling fish in estuarine wetlands; (5) database for assessment of relative benefit of investments in tributary versus estuarine wetland habitats; and (6) a collaborative approach for a multi-stakeholder environment.

BACKGROUND: The types of estuarine restoration being implemented in the LCRE by the Corps and others include activities to: (1) reconnect backwater channels, sloughs and oxbows and recover estuarine wetlands through dike removal and tide gate replacement; (2) reconnect upland drainages and freshwater inflow through removal of armored channels, culverts, diversions, and other channelizing structures; (3) remove intertidal fills and piling fields; (4) allow natural accumulation of large woody debris; (5) place dredged material; and, (6) remove armor from shorelines. Such ecological restoration requires that detrimental changes be reversed to a ***measurable degree***. However, existing data collection and analytical methods are insufficient to evaluate the cumulative benefits to the ecosystem or salmon populations.

Project Review and WE Comments: SOW fully addresses BiOp RPA 60.3.

Tags: None

Project Improvements: Need linkage between habitat restoration and juvenile salmon survival.

Other Comments: Study ends 2010/2011, but the CE framework will continue to be implemented regionally and periodically as needed by the AA. Data may be useful to others for meta-analysis of action effectiveness research data. Objectives need to be recrafted to link to the RPA subactions.

AER2: Salmon Benefits

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

AFEP Study Code: EST-09-P-01

Project Sponsor: PNNL/UW

Project Funder: USACE, Portland District

RPA Action/Subaction(s): 58.2, 59.3*

F&W Program Objective: 14.1

Project Status: Just started

Information Source: AFEP 2009 One-Pagers, document=09 Final 1 pagers Master.pdf

Contract(s): n/a

Focal Species – Populations (or AFEP life history type): all ESUs

Pisces Work Element Number(s): n/a

Pisces WE Description: n/a

Deliverables: (or AFEP objective):

OBJECTIVES:

1. Develop and test with existing data quantitative methods to apply in the lower Columbia River to index:

    a. Life history diversity for salmonids at representative locations;

    b. Habitat connectivity by reach estuary wide

2. Assess feasibility and, if feasible, develop a technical approach to estimate the survival benefits associated with specific habitat restoration actions in the lower Columbia River and estuary.

Deliverable Description: (or AFEP Management Purpose and Background):

MANAGEMENT PURPOSE: Implement the Reasonable and Prudent Alternative (RPA) of the 2008 Biological Opinion on Operation of the Federal Columbia River Power System.

BACKGROUND: RM&E Strategy 4 concerning the estuary/ocean is based on the *Research, Monitoring, and Evaluation for the Federal Columbia River Estuary Program* released by the Action Agencies and NOAA Fisheries in January 2008. This ecosystem-based RM&E effort has an adaptive management framework with specific goals and objectives for status and trends monitoring, action effectiveness and critical uncertainties research, implementation and compliance monitoring, and synthesis and evaluation. Many of the estuary RM&E objectives were included as RPA actions. However, although existing projects within the Anadromous Fish Evaluation Program and the Columbia Basin Fish and Wildlife Program address many of the RPA actions, there are gaps in coverage. Specifically, the following elements, among others, of RPA Actions 58, 59, and 60 are not covered elsewhere: life history diversity index, habitat connectivity index, and estuary restoration-associated survival benefits.

The life history diversity of salmonid populations in the Columba basin has decreased in the last 100 years. Such diversity likely contributes to resilience in salmonid populations in a changing environment. One of the goals of habitat restoration in the lower Columbia River and estuary (LCRE) is to increase salmonid life history diversity. Therefore, as called for in Action 58, a quantitative method is needed to index and periodically monitor life history diversity in the LCRE.

Another goal of the LCRE habitat restoration effort is to increase habitat connectivity thereby improving the opportunity for juvenile salmonids to access shallow-water, off-channel habitats where they can forage and find refuge from predators during their migration to the ocean. A method to quantify and periodically monitor habitat connectivity, however, has not been developed and applied for the LCRE, as required by Action 59.

The 2008 Biological Opinion included an assessment of the survival benefits of habitat restoration actions in the LCRE proposed in the Biological Assessment. The assessment was necessarily based on professional judgment using the best available knowledge because data on incremental benefits to juvenile salmonid survival associated with specific restoration projects do not exist for the LCRE. This research need regarding survival benefits pertains to Action 60, calling for evaluation of habitat restoration actions. It is not certain that increased survival as an outcome of restoration can be measured and/or indexed in terms of life history diversity or habitat connectivity, but an evaluation of the potential is necessary given the requirements of the BiOp.

Project Review and WE Comments: SOW addresses the BiOp.

Tags: Possibly acoustic transmitters and/or PIT

Project Improvements: None at this time.

Other Comments: New project 2009. Intended to identify linkages to survival benefits from habitat restoration. NMFS has concerns about this project being redundant w/ CUR6. This project applies to RPA 37.4, 37.5, 37.6 – survival benefits of habitat restoration.

AER3: Reference Sites and Action Effectiveness Research within the Habitat Restoration Program

Full Title: Habitat Restoration Program RME

Project No.: 2003-011-00
Project Sponsor: Estuary Partnership
Project Funder: BPA
RPA Action/Subaction(s): 58.3, 59.1, 59.5, 60.1*, 60.2, 60.3, 61.3
F&W Program Objective: 14.1, 14.2
Project Status: Ongoing
Information Source: Pisces
Contract(s): 35012, CR-99492, CR-103315, CR-114988
Focal Species – Populations: All CR
Pisces Work Element Number(s), Name, Title, and Description: 25600 Quantitatively measure of restoration effectiveness through analysis of past and present monitoring data by development of a quantitative tool for measuring restoration effectiveness in the Lower Columbia River Estuary. Retrieve and compile (in a GIS format) physical, chemical, and biological data originally collected from 1974 to 1985 as part of the Columbia River Estuary Data Development Program (CREDDP). 25615 Otter Point – Baseline monitoring -- conduct baseline monitoring of the dike breach site to establish pre-project conditions. 31086 Sharnelle Fee - Monitoring of Baseline Conditions -- accomplish specific baseline data collection required for restoration design and evaluation of post-construction effectiveness monitoring. The following baseline data sets, using standardized monitoring protocols outlined in “Monitoring Protocols for Salmon Habitat Restoration Projects in the Lower Columbia River and Estuary” (Roegner et al., 2006), will be completed: water quality, vegetation, fish use, bathymetry and sediment accretion/loss. 36038 Mirror Lake AE- I-84 Culvert Passage Improvement -- assess the post-construction (as-built) condition at the I-84 culvert by: measuring and documenting the locations of a subset (10-20%) of "shadow rocks" (rocks added to culvert to provide cover and hydraulic refugia (e.g., slower water locations for salmon moving through the culvert); documenting and observing orientations of same shadow rocks with physical markings (spray paint); measuring and documenting dimensions of constructed channel, locations of shadow rocks within the channel, and depth of flow; and inspecting the general layout and effectiveness of passage improvements at providing hydraulic refugia, diverting low flows, and improving passage on the culvert apron. 36039 Mirror Lake Young Creek AE - LWD Structures -- document the post-construction condition of Young Creek (the section of the Mirror Lake site where the Contractor will install large wood structures) so that future monitoring efforts may use these data to assess the structures' effectiveness at increasing habitat diversity (primarily creating pool habitat) and also qualitatively assess the effectiveness of each structure at recruiting debris. 36040 Mirror Lake AE - Stream Canopy Cover and Temperature -- use automated data logging equipment to continuously monitor temperature at eleven locations distributed throughout the Mirror Lake site. 36046 Fort Clatsop Habitat, Fish and Fish Prey Sampling -- monitor sediment accretion (1 summer and winter event), channel cross-sections (1 summer event, landscape change with photo-points (2 summer events), fish community (2 winter events, 5 spring/summer events), prey availability (2 winter events, 5 spring/summer events), and prey utilized by salmon (or stomach contents), (2 winter events, 5 spring/summer events). At Scappoose Bottomlands, the Contractor will monitor the fish community,

fish prey availability, and prey utilized by salmon (2 winter events, 5 spring/summer events).

36137 Sandy River Delta and Mirror Lake-Vegetation -- assess vegetation planting success and collect photo point data at the Sandy River Delta and Mirror Lake restoration sites and locate, delineate and sample a reference site. Monitor three areas at the Sandy River Delta planted with funds from the Estuary Partnership (Sandy River stream bank, 15 acres, and south bank/north slough, 20 acres), US Army Corps of Engineers (north side of Sundial Island, 155 acres) and BPA (the SW quad of Sundial Island, 40 acres).

36155 Fort Clatsop-Habitat, Salmon and Salmon prey Action Effectiveness -- monitor sediment accretion (once in summer and in winter), channel cross-sections (once in summer), landscape change with photo-points (twice in summer), fish prey availability (five sampling events in summer), and prey utilized by salmon (or stomach contents, five events in summer). Collect additional salmon samples for stock, otolith, and lipid analyses from 2 sites on the mainstem Lewis and Clark River to determine the stock and condition of salmon entering the Lewis and Clark River near the Fort Clatsop restoration and reference sites. At Scappoose Bottomlands, the Contractor will monitor the fish community, fish prey, and prey utilized by salmon (five sampling events in summer). Process fish prey and utilization samples collected at the Fort Clatsop sites and Scappoose Bottomlands and fish prey samples from Mirror Lake.

36159 Mirror Lake- Fish and Fish Prey --sample the fish community, fish prey, and prey utilized by salmon at five sampling events between April and August 2008.

36160 Mirror Lake-Otolith -- analyze salmon otoliths from Mirror Lake, 2 sites on the Lewis and Clark River, Scappoose Bottomlands to assess differences in salmon growth rates at the sites and to identify correlations between habitat characteristics and growth rates.

36161 Lipid Contents and Classes -- analyze salmon samples collected from Mirror Lake, 2 sites on the Lewis and Clark River, and Scappoose Bottomlands for lipids associated with growth and metabolism. Analyze samples for fish health data (e.g., relationships between fish body fat and growth rates associated with otoliths) among sites and to identify correlations between habitat characteristics and fish condition.

36162 Genetic Stock -- analyze salmon fin clips from Mirror Lake, Fort Clatsop restoration and reference sites, 2 sites on the Lewis and Clark River, and Scappoose Bottomlands to determine the genetic stock of salmon using the sites and to assess possible differences in growth rates and lipid content between different stocks.

36163 Stomach Contents Taxonomy -- l analyze the taxonomy of stomach contents collected from juvenile salmon from Mirror Lake to identify which food resources are utilized by salmon.

36170 Scappoose Creek at Hogan Ranch- Vegetation -- sample vegetation along five established transects on Hogan Ranch to assess vegetation changes following livestock exclusion. Monitor areas planted with native trees and shrubs and examine vegetation survival, vigor, and presence of invasive species and compile vegetation transect and survival data collected under this contract with previous datasets, creating a complete record of monitoring activities.

36171 Scappoose Creek at Hogan Ranch-Water Quality Sampling -- monitor water quality monthly for temperature, dissolved oxygen, turbidity, conductivity, and pH usingl data loggers to record hourly temperature and depth readings at six locations along the creek. Also, collect monthly E. coli bacteria samples at Hogan Ranch to assess the impacts of livestock exclusion on water quality.

36172 Scappoose Creek at Hogan Ranch-Photo Point -- collect photo-points twice during late spring and summer and record and map locations of photo-points and other monitoring locations with a GPS unit. Also, collect and compile representative photo-points, creating a visual survey of vegetation changes over time and compile locations for photo-points and monitoring associated with previous datasets to create a complete record of monitoring activities.

36219 Mirror Lake Restoration-Assess Stream Canopy Cover and Temperature -- use automated data logging equipment to continuously monitor temperature at eleven locations distributed throughout the

Mirror Lake site.

36236 Pile Structure Data Collection for Final Selection - develop the daily itinerary, objectives, and information to be collected during four days of site visits to approximately 15 pile structures in the lower Columbia River, as well as site visit logistical support.

36242 Deer Island-- collect baseline topographical and water properties data on the island's primary slough channel..

36244 Deer Island. -- assess the fish community in the project area. Customized nets with liveboxes will be fitted on tidegate culverts to determine whether juvenile salmonids are able to pass into Deer Island Slough. Adjacent areas with unimpeded access to the Columbia River will be sampled to determine whether juvenile salmonids are in the vicinity of the tidegates. Nets will remain in place to sample both incoming and outgoing portions of the tidal cycle

36250 Perkins Creek Restoration and Enhancement-Develop Baseline Data required for restoration design and evaluation of post-construction effectiveness monitoring, including water quality, vegetation, and fish use.

37226 Ref Sites. Develop a network of reference sites in tidal marshes, swamps and other estuary habitats having relatively undisturbed ecosystem structure and processes to provide a baseline characterization of the status for different habitats to address fundamental uncertainties regarding fish and wildlife habitats in the estuary and provide resource managers a means of statistically analyzing and comparing projects with habitat restoration project sites coming on line, to assess effectiveness not only at the site scale but of the coordinated inter-agency estuary-wide habitat protection/restoration program.

42015 Pile Dikes. Identify 1-2 pilot projects. Pre-monitoring is needed to identify appropriate sites for pilot projects and may include the collection of sediment, local hydrology, bathymetry, water quality and fish usage data. Permits required for fish usage monitoring will be acquired before monitoring commences. Pre-monitoring data collection will be focused on spur dikes within river reaches D, E and F. Two transverse dikes near the Port of Kalama will require fish usage data.

Deliverable and Description:

Documentation of vegetation planting. 5 sets of photo-points of the riparian plantings will be described in latitude/longitude coordinates and include in the project final report. The Estuary Partnership and our BPA COTR will inspect and verify the monitoring photos before the contract is complete. Key photos will be attached in PISCES.

Data Analysis, GIS Maps, Method Development. Development of methods that can then be applied in subsequent years to all the data. Several GIS maps will be completed for method development. The data will be publicly available through the Estuary Partnership's habitat restoration coordinator. A data management plan is in development detailing data sharing and the Estuary Partnership will review the deliverables before they are included in the Annual Report to be attached in PISCES.

Documentation of baseline conditions. Complete topographic survey to understand variation in elevation that can be correlated with existing tidal data. Establish baseline conditions for the channel in terms of water quality conditions, bathymetry profile, sediment characteristics, and existing fish populations and perform same quantitative measurements at the South Clatsop Slough Restoration Project. The data will be available from the habitat restoration coordinator and a data sharing plan is currently being developed. The Estuary Partnership verify the monitoring information and provide the relevant data in our annual report.

Baseline Conditions Assessment. Baseline monitoring parameters will include: Topographic survey of entire restoration area; channel cross-section and profile survey; vegetation transect data and community map related to elevation; juvenile salmonid use data; monthly (minimum) water quality data; water depth data for the site and river.

Data Collection and Analysis of Planting Success. The Contractor will provide a summary report describing all sampling methods and activities (including quality assurance and quality control

[QA/QC] information) and summarizing results. The Contractor's summary report will serve as the Contractor's contribution to the Estuary Partnership's annual report to BPA. The Contractor will provide raw data in a standardized format provided by the Estuary Partnership. All deliverables will be provided in electronic and hard copy format to the Estuary Partnership.

Data Collection and Analysis. The Contractor will prepare and submit a summary report that includes the following: (1) For the September 2008 and August 2009 sampling events, CADD drawings converted to pdf files documenting locations of shadow rocks within the culvert and dimensions and layout of the constructed channel. (2) For all three sampling events, a narrative documenting the assessment methodology and commenting on the general layout and effectiveness of passage improvements at providing hydraulic refugia, diverting low flows, and improving passage on the culvert apron. (3) For all three sampling events, photo documentation of the site from monumented locations. The Contractor will provide a summary report describing all sampling methods and activities (including quality assurance and quality control (QA/QC) information) and summarizing results. The Contractor will provide raw data in a standardized format provided by the Estuary Partnership. All deliverables will be provided in electronic and hard copy format to the Estuary Partnership.

Data Collection and Analysis. The Contractor will prepare and submit a summary report that includes the following: (1) Excel files with data and profiles for twenty (20) cross-sections. (2) Task description narrative documenting methodology and commenting on the general effectiveness of the four LWD structures, particularly as it relates to debris recruitment, hydraulic refugia, and creation of pool habitat. (3) Maps documenting the locations of LWD structures and cross-sections. (4) Photo documentation from monumented locations. (5) GPS coordinates of all monitoring locations. The Contractor will provide a summary report describing all sampling locations, methods, and activities (including quality assurance and quality control (QA/QC) information) and summarizing results. The Contractor will provide raw data in a standardized format provided by the Estuary Partnership. All deliverables will be provided in electronic and hard copy format to the Estuary Partnership.

Data Collection and Analysis. Using ODOT's 2005 temperature report as a template, the Contractor will provide a summary report describing all sampling locations, methods, and activities (including quality assurance and quality control (QA/QC) information) and summarizing results. The Contractor will provide raw data in a standardized format provided by the Estuary Partnership. All deliverables will be provided in electronic and hard copy format to the Estuary Partnership.

Vegetation Data Collection and Analysis. The Contractor will provide a summary report describing all sampling methods and activities (including quality assurance and quality control (QA/QC) information) and summarizing results. The Contractor's summary report will serve as the Contractor's contribution to the Estuary Partnership's annual report to BPA. The Contractor will provide raw data in a standardized format provided by the Estuary Partnership. All deliverables will be provided in electronic and hard copy format to the Estuary Partnership.

Water Quality Data Collection and Analysis. The Contractor will provide a summary report describing all sampling methods and activities (including quality assurance and quality control (QA/QC) information) and summarizing results. The Contractor's summary report will serve as the Contractor's contribution to the Estuary Partnership's annual report to BPA. The Contractor will provide raw data in a standardized format provided by the Estuary Partnership at the start of the project. All deliverables will be provided in electronic and hard copy format to the Estuary Partnership.

Scappoose Photo-Point Data Collection and Analysis. The Contractor will provide a summary report describing all sampling methods and activities (including quality assurance and quality control (QA/QC) information) and summarizing results. The Contractor's summary report will serve as the Contractor's contribution to the Estuary Partnership's annual report to BPA. The Contractor will provide raw data in a standardized format provided by the Estuary Partnership at the start of the project. All deliverables will be provided in electronic and hard copy format to the Estuary Partnership.

Habitat, Fish, and Fish Prey Sampling Data Collection and Analysis. The Contractor will provide copies

of environmental compliance permits and a summary report describing all sampling methods and activities (including quality assurance and quality control (QA/QC) information) and summarizing results. The Contractor's summary report will serve as the Contractor's contribution to the Estuary Partnership's annual report to BPA. The Contractor will provide raw data in a standardized format provided by the Estuary Partnership. All deliverables will be provided in electronic and hard copy format to the Estuary Partnership.

Fish and Fish Prey Data Collection and Analysis The Contractor will include a description of all sampling methods and activities (including quality assurance and quality control [QA/QC] information) and summarizing results in a summary report to the Estuary Partnership. The Contractor's summary report will serve as the Contractor's contribution to the Estuary Partnership's annual report to BPA. The Contractor will provide raw data in a standardized format provided by the Estuary Partnership. All deliverables will be provided in electronic and hard copy format to the Estuary Partnership.

Summary Report. The Contractor will provide a summary report describing all sampling methods and activities (including quality assurance and quality control [QA/QC] information) and summarizing results. The Contractor's summary report will serve as the Contractor's contribution to the Estuary Partnership's annual report to BPA. The Contractor will provide raw data in a standardized format provided by the Estuary Partnership. All deliverables will be provided in electronic and hard copy format to the Estuary Partnership.

Final Action Effectiveness Report. The Contractor will provide copies of environmental compliance permits and a final report describing all sampling methods and activities (including quality assurance and quality control (QA/QC) information) and summarizing results. The Contractor will provide raw data in a standardized format provided by the Estuary Partnership. All deliverables will be provided in electronic and hard copy format to the Estuary Partnership.

Final Report. The Contractor will provide a final report describing all sampling methods and activities (including quality assurance and quality control (QA/QC) information) and summarizing results. The Contractor will provide raw data in a standardized format provided by the Estuary Partnership. All deliverables will be provided in electronic and hard copy format to the Estuary Partnership.

Otolith Final Report. The Contractor will provide a final report describing all sampling methods and activities (including quality assurance and quality control (QA/QC) information) and summarizing results. The Contractor will provide raw data in a standardized format provided by the Estuary Partnership. All deliverables will be provided in electronic and hard copy format to the Estuary Partnership.

Lipid Report. The Contractor will provide a final report describing all sampling methods and activities (including quality assurance and quality control (QA/QC) information) and summarizing results. The Contractor will provide raw data in a standardized format provided by the Estuary Partnership. All deliverables will be provided in electronic and hard copy format to the Estuary Partnership.

Genetic Stock Report. The Contractor will provide a final report describing all sampling methods and activities (including quality assurance and quality control (QA/QC) information) and summarizing results. The Contractor will provide raw data in a standardized format provided by the Estuary Partnership. All deliverables will be provided in electronic and hard copy format to the Estuary Partnership.

Stomach Analysis Final Report. The Contractor will provide a final report describing all sampling methods and activities (including quality assurance and quality control (QA/QC) information) and summarizing results. The Contractor will provide raw data in a standardized format provided by the Estuary Partnership. All deliverables will be provided in electronic and hard copy format to the Estuary Partnership.

2008 Data Collection Report. The Contractor will provide a final report describing all sampling methods and activities (including QA/QC information) and summarizing results. The Contractor will provide raw data in a standardized format provided by the Estuary Partnership. All deliverables will be

provided in electronic and hard copy format to the Estuary Partnership.

2008 Data Collection. The Contractor will provide a brief memo summarizing the field effort, including sampling locations, methods, and photographs displaying the data. The Contractor will provide raw data in a standardized format provided by the Estuary Partnership. A final report on the temperature data will be included in the Contractor's 2008-2009 effectiveness monitoring activities. All deliverables will be provided in electronic and hard copy format to the Estuary Partnership.

Specific Site Data for Selection of Pile Structure Projects. The Contractor will provide planning and logistical support for four days of Pile Structure site visits. Logistical support includes finding and scheduling a boat and boat captain suitable for the lower Columbia River and the trip's objectives. The Estuary Partnership will pay the boat operator directly. Each trip shall accommodate 5-7 people. The Contractor will collect site information for up to 15 project sites; site information collection will be determined through meetings between Estuary Partnership staff and the Contractor team. Site information data will be provided to the Estuary Partnership in hard copy and electronic format.

Topographic Survey and Baseline Monitoring. The Contractor will provide, in hard copy and electronic format, the topographic survey, ground-truthed LIDAR, and baseline data for water levels and tidal flux inside and outside Deer Island Slough.

Final Report. The Contractor will provide, in hard copy and electronic format, a report describing species composition and timing of juvenile salmonids in the vicinity of the tidegates and passage of individuals through the tidegates into Deer Island Slough, as well as a description of fish community and aquatic habitats in Deer Island Slough and lower Tide Creek.

Completed Pre-Project Assessment. The Contractor will submit baseline monitoring, in hard copy and electronic format, describing their findings.

Monitoring Results Report. This report will describe the testable hypotheses, parameters, methods and protocols used to collect baseline, implementation and post project monitoring data for the pilot pile structure removal project(s). A model that can assess pile structure removal in the lower Columbia River estuary for specific known site conditions may also be produced. A report will include analysis of monitoring data and a summary of the developed model with discussion of outcomes and recommendations for continued work. Due to the short timeline from field data collection to end of fiscal year, this report will be a letter report.

Characterization of 13 Reference Sites. The Contractor will deliver a letter report, in electronic and hard copy, documenting the location and description of monitoring sites, the sampling methods, and preliminary results.

Pre-Monitoring. Pre-monitoring may include the collection of sediment, local hydrology, bathymetry, water quality and fish usage data. Permits required for fish usage monitoring will be acquired before monitoring commences. Data collection will be focused on spur dikes within river reaches D, E and F. Two transverse dikes near the Port of Kalama will require fish usage data.

Project Review and WE Comments: SOW addresses the BiOp.

Tags: None

Project Improvements: None at this time.

Other Comments: Data may be useful to others for meta-analysis of action effectiveness research data. BPA intends to move the AER and Reference Sites here into the Ecosystem Mon project (STM1) and CE (AER1). Also pertains to RPA 38.

AER4: Grays River Watershed Assessment

Full Title: Grays River Watershed Assessment

Project No.: 2003-013-00

Project Sponsor: CREST/PNNL

Project Funder: BPA

RPA Action/Subaction(s): 60.2

F&W Program Objective: 14.1

Project Status: Ongoing

Information Source: Pisces

Contract(s): CR-94981, 26934 REL 15

Focal Species – Populations:

Pisces Work Element Number(s), Name, Title, and Description:

31450 Implement the Restoration Monitoring And Assessment Plan (RMAP) -- The RMAP will be based on a Before—After (BA) study design for a quantitative assessment of changes in physical, hydrological, and biological characteristics associated with the restoration channel modifications. Accordingly, pre-restoration efforts during FY08 may include, but not be limited to: • establishment of permanent cross-sections for measuring channel bed elevations • installation of water level data loggers at the cross-sections and other selected locations • longitudinal surveys of channel bed elevation along the thalweg • measurements of channel bed surface and subsurface grain sizes at cross-sections and other selected locations • estimates of hyporheic exchange within salmon spawning areas and other selected locations • inventory of existing large woody debris (LWD) and LWD jams • mapping of channel boundaries • establishment of permanent photograph points • compilation of fall Chinook and chum salmon redd locations • measurements of macroinvertebrate composition at the cross-sections and other selected locations • inventory and mapping of riparian plant communities.

31452 Use the RMAP to guide the analyses of data collected under Work Element #157. Data analyses during FY08 will focus on pre-restoration evaluation of hydrologic and geomorphic processes, which may include but not be limited to: hydrology (e.g., stage:discharge curves, hyporheic exchange, floodplain connectivity, etc.) geomorphology (e.g., sediment transport capacity, armoring ratios, longitudinal slope and bedforms, etc.) channel condition and habitat quality (e.g., substrate embeddedness, LWD frequency and type, pool frequency, residual pool depth, etc.) riparian condition (e.g., structure, disturbance, canopy cover, etc.)

31453 Present monitoring results to at least one regional, national, or international conference such as the American Fisheries Society, American Geophysical Union, or International Symposium on Ecohydraulics.

Deliverable and Description:

Pre-restoration data Monitoring and assessment data delivered in electronic format and hardcopy reports

Evaluation of pre-restoration processes Monitoring and assessment data, metadata, and statistical analyses delivered in electronic format and hardcopy reports; select data may also be presented at scientific conferences and published in peer-reviewed scientific papers

Presentation One presentation to an appropriate scientific conference.

Project Review and WE Comments: SOW addresses the BiOp -- 60.2 action effectiveness monitoring

Tags: None
Project Improvements: None at this time.
Other Comments: Project ends in May 2010 and further funding for post-construction monitoring is uncertain. Pre-monitoring has been completed. Construction has not yet occurred (scheduled for 2009). The need for this project is being evaluated internally at BPA.

AER5: Pile Structure Evaluation Coal Ck

Full Title: Pile Structure Evaluation Coal Ck
Project No.: not available
Project Sponsor: PNNL/USGS
Project Funder: USACE, Portland District
RPA Action/Subaction(s): 60.2 (also RPA 38)
F&W Program Objective: 14.1, 14.5
Project Status: Ongoing
Information Source: Krista Jones, Estuary Partnership, document=LCRE STM and CUR and AER Matrix version 020509.doc (modified by GEJ)
Contract(s):
Focal Species – Populations:
Pisces Work Element Number(s):
Pisces WE Description: This is the pilot study for monitoring action effectiveness of a pile removal.
Deliverables:
Deliverable Description: Baseline: Water quality and habitat monitoring, occurring once before project implementation Effectiveness: Water quality and habitat monitoring occurring during implementation and/or post-implementation.
Project Review and WE Comments: SOW pertains to the BiOp
Tags: TBD
Project Improvements: None at this time.
Other Comments: Relatively new project; needs ESA permitting coordination w/ NOAA. The piles and derelict vessel have been removed. Post-monitoring will occur if funds are available.

AER6: Eelgrass Enhancement and Restoration

Full Title: Eelgrass Enhancement and Restoration
Project No.: 2007-513-00

Project Sponsor: PNNL/NMFS/OHSU
Project Funder: BPA
RPA Action/Subaction(s): 59.1, 60.2
F&W Program Objective: 14.1
Project Status: Ongoing (innovative project; to be completed in August 2009)
Information Source: Pisces
Contract(s): CR-94448
Focal Species – Populations: None
Pisces Work Element Number(s), Name, Title, and Description: 29970 Monitor and compare crab use in experimental plots. NOAA will monitor and compare crab use in three habitat types: natural eelgrass meadows, eelgrass transplant areas, and unvegetated susbstrate in the Columbia River Estuary. 30650 Identify areas with sufficient light for eelgrass growthAcquire and composite turbidity (K490) MODIS imagery and in-situ data to determine areas with sufficient light for eelgrass growth. 30695 Identify areas with suitable salinity levels and current conditions for eelgrass growth. Acquire salinity and water predictions based on an existing 3-D hydrodynamic model developed by the Oregon Graduate Institute of Science and Technology (OGI). 30724 Identify environmental stressors which will impact site suitability. Using georeferenced video/imagery along with other spatial datasets within a GIS, presence and type of environmental stressors will be documented. For this project, we will focus on types of physical disturbances (nearshore modifications) such as overwater structures, shoreline armoring, and industry that may impact submerged aquatic vegetation.
Deliverable and Description: Evaluate site selection methodology and monitoring results. Results section of final report, including figures, maps, & tables. Data distribution: Limited CDs of raw data will be available. Data will be further distributed (or points of contact recognized) through either an interactive map or direct distribution through a web interface. Documentation of Field Data Collected. Documentation (photos, spreadsheets) of field collected data. All data will be subject to PNNL's QA policy. Documentation of Field Data Collected. Documentation (photos, spreadsheets) of field collected data parameters and initial interpretation of results. Response variables include time series of crab abundance and mean size in each habitat type. Create GIS dataset with documentation. GIS compatible dataset and Federal Geographic Data Committee (FGDC) compliant metadata. GIS compatible dataset will be a raster dataset unless another format is requested for ease of use. The information contained will either be binary (sufficient or insufficient light) or contain one measure of light (light attenuation, surface irradiance at depth, or light). GIS datasets for water elevation, currents and bottom salinity. GIS datasets based on computational grid containing information on water elevation, currents and bottom salinity, with documentation. Geospatial Stressor Dataset. Shapefile from representing points of interest from geo-referenced video with attributes that describes environmental stressors/structures in the specific areas of interest. FGDC compliant metadata will be created for shapefile.
Project Review and WE Comments: Linkage between eelgrass and juvenile salmon needs to be

explicit. This could be applicable to action effectiveness monitoring, the action being eelgrass plantings in the estuary.
Tags: None
Project Improvements: n/a
Other Comments: This project is nearly complete. It's one of the Council's innovative projects; as such it has a fixed term. If the method and assessment are positive, then consider pursuing enhancement projects, including necessary AER. The primary reason for funding was not the FCRPS BiOp. If eelgrass is truly important to juvenile salmon, then consider establishing reference site(s).

AER7: Julia Butler Hanson Tide Gate Replacement

Full Title: Julia Butler Hanson Tide Gate Replacement
Project No.: not available
Project Sponsor: USFWS/PNNL
Project Funder: USACE, Portland District
RPA Action/Subaction(s): 59.1, 60.2, 60.3
F&W Program Objective: 14.1, 14.2
Project Status: Pre-mon has been completed. Construction scheduled for 2009. Post-mon will continue for several yrs following construction.
Information Source: BDE, Johnson and Diefenderfer (2008)
Contract(s): n/a
Focal Species – Populations: n/a
Pisces Work Element Number(s): n/a
Pisces WE Description/Objectives Baseline monitoring of tide gate replacement and installation project sites at the Julia Butler Hansen (JBH) National Wildlife Refuge was carried out in 2007. The refuge is located near Skamokowa, Washington at about river kilometer (rkm) 55. The U.S. Corps of Engineers (USACE) is constructing multiple tide gates on this U.S. Fish and Wildlife Service site in phases, beginning in 2008. Therefore, 2007 baseline monitoring was conducted on Ellison Slough and Duck Lake Slough, both slated for 2008 construction, as well as an unnamed channel with a previously replaced tide gate. Baseline monitoring of 2009 construction sites is planned for 2008. Monitored indicators included landscape features and vegetation. Water properties flux monitoring was initiated in 2007 as well on a four-season sampling plan.
Deliverables: Data summaries
Deliverable Description: Annual reports to the Corps
Project Review and WE Comments: 59.1, 60.2, 60.3
Tags: PIT to look at juvenile fish passage, residence time, etc.
Project Improvements: None at this time.
Other Comments: The primary reason for funding this project is NOT the FCRPS BiOp. The project is

included anyway because it provides data that can be used to inform estuary/ocean RME. Data may be useful to others for meta-analysis of action effectiveness research data. Objectives need to be related better back to the RME RPAs.

AER8: Crims Island Restoration Monitoring

Full Title: Crims Island Restoration Monitoring
Project No.: not available
Project Sponsor: USGS
Project Funder: USACE, Portland District
RPA Action/Subaction(s): 60.2, 60.3
F&W Program Objective: 14.1, 14.2
Project Status: Ongoing
Information Source: BDE, Johnson and Diefenderfer (2008)
Contract(s): n/a
Focal Species – Populations: n/a
Pisces Work Element Number(s): n/a
Pisces WE Description/Objectives In 2005, the Corps' Portland District implemented a restoration project at Crims Island located at river kilometer 88 in the lower Columbia River. The restoration action included breaching a dike in two locations, removing material to the correct elevation for tidal wetland development, and the excavation of tidal channels. Monitoring of this project provides an opportunity to assess habitat improvement at the site and, in conjunction with other restoration project evaluation, to assess the cumulative ecosystem response to habitat restoration. The monitoring objectives were to: 1. Assess fish community composition and fish passage at the restored areas. 2. Collect post-restoration monitoring data on vegetation, elevation, and channel development during 2006 and 2007. 3. Collect data on the flux of ecosystem components in and out of the restored site.
Deliverables: Data summaries
Deliverable Description: Annual reports to the Corps
Project Review and WE Comments:
Tags:
Project Improvements:
Other Comments: The primary reason for funding this project is NOT the FCRPS BiOp. The project is included anyway because it provides data that can be used to inform estuary/ocean RME. Data may be useful to others for meta-analysis of action effectiveness research data.

AER9: Tenasillahe Island Restoration Monitoring

Full Title: Tenasillahe Island Restoration Monitoring
Project No.: not available
Project Implementer: USFWS
Project Funder: USACE, Portland District
RPA Action/Subaction(s): 60.2
F&W Program Objective: 14.1, 14.2
Project Status: Ongoing
Information Source: ERF3 (Corps)
Contract(s): n/a
Focal Species – Populations: n/a
Pisces Work Element Number(s): n/a
Pisces WE Description/Objectives The Corps will improve tidegate outlets at existing locations in the flood control levee surrounding Tenasillahe Island and construct inlet structures and channels at two locations to improve fisheries access and egress and improve water circulation in interior channels. Monitoring actions for the interim feature will cover 3 years in the estimated 10-year life of this feature and then be discontinued with implementation of the long-term restoration feature for Tenasillahe Island. Pre-Construction Monitoring Effort a. Hydrology/Hydraulic Analysis 1. Hydrology and hydraulic modeling of interior channels to determine existing condition and evaluate structural requirements, with implementation of inlet structures, to maintain interior water levels at present elevations to preclude impacts to Columbian white-tailed deer. b. Juvenile Salmonid/Fisheries Use: Juvenile salmonid use will be measured in the interior channels of Tenasillahe Island and in comparable natural channels at nearby Welch Island. c. Benthic Invertebrate Productivity: Sampling locations, methodology and level of effort will be comparable to that described for post-construction monitoring. Post-Construction Monitoring Effort a. Benthic Invertebrate Productivity: Benthic invertebrate productivity will be measured. The sampling timeframe would be Spring and Fall. b. Juvenile Salmonid/Fisheries Use: Juvenile salmonid use will be measured in the interior channels of Tenasillahe Island and in comparable natural channels at nearby Welch Island.
Deliverables: Data summaries
Deliverable Description: Annual reports to the Corps
Project Review and WE Comments:
Tags:
Project Improvements:
Other Comments: The primary reason for funding this project is NOT the FCRPS BiOp. The project is included anyway because it provides data that can be used to inform estuary/ocean RME. Data may be useful to others for meta-analysis of action effectiveness research data.

AER10: Monitoring at Smith and Bybee Lakes

Full Title: Monitoring at Smith and Bybee Lakes
Project No.: not available
Project Sponsor: Ducks Unlimited
Project Funder: Ducks Unlimited
RPA Action/Subaction(s): 60.2, 60.3
F&W Program Objective: 14.1
Project Status:
Information Source: http://www.ducks.org/Oregon/OregonProjects/2261/OR321SmithandBybeLakesProject.html
Contract(s): n/a
Focal Species – Populations: n/a
Pisces Work Element Number(s): n/a
Pisces WE Description: n/a Ducks Unlimited and partners recently completed the restoration of 1,600 acres of wetlands on Smith & Bybee Lakes, located in Portland at the confluence of the Willamette and Columbia Rivers. This wetland complex is owned and managed by Metro Parks and Greenspaces, and is proclaimed to be the largest protected urban wetland in the United States. The primary objective of this project was to restore as much of the natural hydrology to the site as possible with the understanding that during some parts of the year water would need to be physically retained in the wetlands. Restoration involved removing a dam and tide-gate, and replacing it with a large water control structure that captures tidal waters, allows for water management, and provides fish passage into the lakes. The previous structure had converted the wetlands into one two permanent lake s , and did not provide any management options. Monitoring objectives included: 1. Fish community structure and passage rates. 2. Water quality, including temperature and dissolved oxygen.
Deliverables:
Deliverable Description:
Project Review and WE Comments: None
Tags: None
Project Improvements: n/a
Other Comments: The primary reason for funding this project is NOT the FCRPS BiOp. The project is included anyway because it provides data that can be used to inform estuary/ocean RME. Data may be useful to others for meta-analysis of action effectiveness research data.

AER11: Effectiveness Monitoring at Chinook R.

Full Title: Effectiveness Monitoring at Chinook R.
Project No.: 2003-006-00

Project Sponsor: CREST
Project Funder: BPA
RPA Action/Subaction(s): 60.2
F&W Program Objective: 14.1
Project Status: Chinook R. estuary monitoring has been completed (pre-restoration monitoring; restoration action did not occur); funding shifted to lower Grays monitoring. Project terminated (TY).
Information Source: Pisces
Contract(s): 28223
Focal Species – Populations: LC Ch Chinook R.
Pisces Work Element Number(s), Name, Title, and Description: 14696 Collect / Generate / Validate Field and Lab Data Collect and analyze stomach content samples from juvenile salmon A representative subset (maximum of 10 per sample location per sampling event) of captured Chinook salmon, coho salmon, and chum salmon will be used to determine prey species utilization. Sampling will be accomplished using non-lethal gastric lavage. Samples will be preserved and archived for analysis by the University of Washington WET laboratory. Individual prey items will be identified to family or lowest practical taxonomic level.
Deliverable and Description: Juvenile Salmon Stomach Content Sampling and Analysis A representative subset (maximum of 10 per sample location) of captured Chinook salmon, coho salmon, and chum salmon will be used to determine prey species utilization. Sampling will be accomplished using non-lethal gastric lavage. Samples will be preserved and archived for analysis by the University of Washington WET laboratory. Individual prey items will be identified to family or lowest practical taxonomic level.
Project Review and WE Comments: Baseline monitoring data stomach contents of juvenile salmon at this site in Reach B will be useful to 60.2.
Tags: None
Project Improvements: n/a
Other Comments: The primary reason for funding this project is NOT the FCRPS BiOp. The project is included anyway because it provides data that can be used to inform estuary/ocean RME. Data may be useful to others for meta-analysis of action effectiveness research data.

AER12: Ramsey Lake Project Monitoring

Full Title:
Project No.: not available
Project Sponsor: City of Portland, Bureau of Environmental Services
Project Funder: NOAA Coastal Restoration Program
RPA Action/Subaction(s): 60.2, 60.3
F&W Program Objective: 14.1
Project Status: Completed, except for ongoing hydrology monitoring

Information Source: Krista Jones, Estuary Partnership, document=LCRE STM and CUR and AER Matrix_version 020509.doc (modified by GEJ)
Contract(s): n/a
Focal Species – Populations: n/a
Pisces Work Element Number(s): n/a
Pisces WE Description: n/a
Deliverables: Pre and post-construction monitoring of actions to: Remove culvert and rip rap; Install LWD; Revegetation
Deliverable Description: 1. Fish Presence 2. Bird monitoring 3. Hydrology 4. Vegetation (post) 5. Wildlife 6. Photo-points
Project Review and WE Comments: None
Tags: None
Project Improvements: n/a
Other Comments: The primary reason for funding this project is NOT the FCRPS BiOp. The project is included anyway because it provides data that can be used to inform estuary/ocean RME. Data may be useful to others for meta-analysis of action effectiveness research data.

AER13: Juvenile Salmonid Stranding

Full Title:
Project No.: not available
Project Sponsor: PNNL/UW
Project Funder: USACE, Portland District
RPA Action/Subaction(s): n/a, see comment below
F&W Program Objective: 14.4, 14.6
Project Status: Pre-channel improvement phase has been completed; waiting for post-phase to begin
Information Source: Gary Johnson, document=Stranding SOW_092803whp.GEJcomments.doc
Contract(s): n/a
Focal Species – Populations: all ESUs
Pisces Work Element Number(s): n/a
Pisces WE Description: n/a

Deliverables:

The overall goal of study is to address the impact of the deepening project on juvenile salmon stranding, specifically, to assess the consequence of dredging to deepen the navigational channel on the risk of fish stranding by commercial vessels.

The two objectives of the study are to:

- **Assess the effect of channel deepening on the risk of juvenile fish stranding with a before and after comparison, and**
- **Determine the magnitude of wake and the resulting wave run-up generated by passing vessels before and after channel deepening and relate the wake to ship characteristics and shoreline physical factors with factors analysis.**

Deliverable Description: The U.S. Army Corps of Engineers (Corps) maintains the Federal Navigation Channel in the Columbia River through operation and maintenance dredging. Currently, the navigation channel is maintained at an minimum(?) depth of 40 ft. The Corps has proposed improvements to the main navigation channel that include deepening the channel to 43 ft.

The Corps shall minimize effects from stranding through the following actions…Develop and implement a stranding study to evaluate parameters that influence stranding. Potential factors include river cross-sectional area, velocity, water level, bank configuration, location along river, slope of bank, ship traffic past site, and type, size, draft, and speed of vessel.

Project Review and WE Comments: None

Tags: None

Project Improvements: n/a

Other Comments: The primary reason for funding this project is NOT the FCRPS BiOp. The project is included anyway because it provides data that can be used to inform estuary/ocean RME.

STM1: LCRE Ecosystem Monitoring

Full Title: LCRE Ecosystem Monitoring

Project No.: 2003-007-00

Project Sponsor: Estuary Partnership

Project Funder: BPA

RPA Action/Subaction(s): 58.3, 59.1*, 59.2*, 59.5, 60.1, 61.1, 61.3

F&W Program Objective: 14.2, 14.5, 14.6

Project Status: Ongoing

Information Source: Pisces
Contract(s):28838, 29395, 33854, 33959, 33960, 39272, 39594
Focal Species – Populations: All CR Chinook salmon
Pisces Work Element Number(s), Name, Title, and Description: 32759 Collect sediment samples for the characterization of grain-size. 35830 Habitat Monitoring Data. Collection and Analysis. Deliver a summary report to the Estuary Partnership of the habitat monitoring data that will detail the monitoring findings and include maps, including GIS shape files, of vegetation at each site. Conduct the on-the-ground field sampling at fish sampling sites so that vegetation and fish sampling sites are in close proximity. Survey wetland topography and characterize vegetation cover, plant community structure, and sediment at 5-6 sites in tidal-freshwater wetlands in a to be determined reach of the lower river. 35832 Monitor fish and fish prey at five selected sites within an To Be Determined (TBD) reach of the estuary to provide information on juvenile salmon use of the tidal freshwater portion of the Columbia River estuary and process salmon samples for stock, growth rates, stomach contents, and fish condition. 35870 Stomach Contents and prey Taxonomy Analysis. Analyze field samples and juvenile salmon stomach contents samples to characterize prey availability at various sampling sites and to identify prey types consumed by salmon from different sites and collected at different sampling times. 35878 Collect otoliths from salmon to estimate fish growth rates and determine growth rate differences in salmon collected from different sites and identify correlations between habitat characteristics and growth rates. 35912 Biochemical Measures of Fish Growth and Condition. Collect salmon samples and analyze for lipid content and classes to assess the usefulness of this measurement for evaluating salmon growth and condition. 35927 Collect genetic samples from Chinook salmon, which they will analyze for genetic stock identification to determine which Chinook salmon stocks are using the estuary. 36126 Seasonal Water Quality Monitoring. Deploy two water-quality probes to collect dissolved oxygen, temperature, water-surface elevation, and conductivity data every 30 minutes for three months and use this information to characterize water-column conditions at Ecosystem Monitoring Project (EMP) sites during times when fish are present. 36131 Provide Geomorphology and Hydrology Context for Columbia River Estuarine Ecosystem Classification. (1) scientific support for the Classification by identifying relationships between Ecosystem Classification components and geomorphic and hydrologic processes (e.g., flow, sediment transport, and episodic geologic events such as volcanism, earthquakes, and landslides) forming those components; and (2) Ecosystem Classification criteria for delineating ecosystems and habitats at smaller spatial scales (e.g., complex and catena components). 36188 Habitat Classification System Bathymetric Data Collection- From September 1, 2007 - August 31, 2008, the Contractor collected and analyzed data for the tidal freshwater wetlands project, and developed ancillary GIS data (diked areas, floodplain boundary, and dredge material/fill). For work during September 1, 2008 - August 31, 2009, the Contractor will incorporate both datasets into the Columbia River Estuary Ecosystem Classification (Ecosystem Classification). The Contractor will also incorporate new bathymetric datasets (if appropriate) and criteria based on river geomorphology and hydrology for delineating habitats at smaller spatial scales into the Ecosystem Classification. 36190 Develop Ecosystem Classification System for the Columbia River and Estuary Landscapes -- update the Ecosystem Classification with monitoring results (from the tidal freshwater wetlands project) and ancillary GIS layers (diked areas, floodplain boundaries, and dredge material/fill) and incorporate newly available bathymetric datasets (if appropriate) into the Ecosystem Classification. 36193 Create a Community Profile of Freshwater-Tidal Forested/Scrub-Shrub Wetlands in the LCR to characterize the biological community of representative tidal freshwater riparian and floodplain

forested/scrub-shrub wetlands in the lower Columbia River and estuary. Monitor vegetation, bird, terrestrial insect, and benthic macroinvertebrate communities at three case study areas and summarize existing freshwater-tidal forested/scrub-shrub wetland info' for the characterization.
36554 Coordinate efforts to map the bathymetry of the lower Columbia River and estuary. The Contractor will implement the strategic plan for bathymetric data collection developed by the Contractor and the University of Washington and focus on priority data gaps identified at the 2007 Bathymetry Workshop.

Deliverable and Description:

Report of pilot probabilistic sampling design for selected metrics and one hydrogeomorphic reach. USGS will work in coordination with EPA, the Estuary Partnership, NOAA, and PNNL to develop a pilot probabilistic sampling design for selected metrics and one hydrogeomorphic river reach in the lower Columbia River.

Summary report on lab analysis of prey species found in stomach contents of juvenile Chinook.

Summary report on lab analysis of otoliths from juvenile Chinook salmon.

Summary report on analysis of biochemical measures of growth & fish condition from juvenile Ch.

Summary report on the genetic stock composition of juvenile salmonids.

Data gap acquisition strategy. USGS will assist the University of Washington with preplanning and a workshop for gap data acquisition in preparation for new land cover and bathymetry acquisition during Year 6.

Sediment grain size at Ecosystem Monitoring Project locations. (1) Data in both hardcopy and electronic format and (2) a section in the annual report describing field and analytical methods used and an analysis of the data.

Geomorphology and Hydrology Context for Columbia River Estuarine Ecosystem Classification The Contractor will provide: (1) a full discussion of the geologic and geomorphic context of the each of the hydrogeomorphic reaches; (2) proposed refinements to the complex and catena Ecosystem Classification criteria based on the formative geomorphic and hydrologic processes; and (3) examples showing how this approach can inform predictions about future habitat changes; and (4) a description of how this approach can assist in prioritizing restoration activities. The Contractor will also provide the ancillary GIS datasets (diked areas, floodplain boundaries, and dredge material/fill) to the Estuary Partnership.

Collection and Analysis of Habitat Data. The Contractor will develop a summary report describing the methods and protocols used to collect habitat monitoring data, including vegetation cover, plant community structure and substrate characteristics in the selected reach of study. The Contractor will include analysis of field data (including a summary of multi-year data from select sites) and vegetation maps, with discussion of methods and outcomes, and recommendations for continued work. Due to the short timeline from filed data collection to end of fiscal year, this report will be a summary report.

Stomach Contents and Prey Taxonomy Analyses. The Contractor will provide a summary report on the final lab analysis of prey species found at sampling sites and in stomach contents of juvenile Chinook salmon from the lower Columbia River and estuary. The Contractor will provide the data in electronic format to the Estuary Partnership and as a summary in the Year 5 Annual Report.

Summary Report of Lipid Data and Analyses. The Contractor will provide a summary report on the final lab analysis of biochemical measures of growth and condition from juvenile Chinook salmon from the lower Columbia River and estuary. The Contractor will provide these data will be reported in electronic format to the Estuary Partnership and as a summary in the Year 5 Annual Report.

Summary Report of the Water Quality Seasonal Data. The Contractor will provide data in hardcopy and electronic format and deliver a summary report (describing field and analytical methods and data analyses) to the Estuary Partnership. The Contractor will make the water-quality data available on the

internet via the NWIS. Bathymetric Data Collection. The Contractor with provide a summary report of their efforts associated with this task in electronic and hard copy format to the Estuary Partnership. Community Profile of Freshwater-Tidal Communities. The Contractor will deliver a PowerPoint presentation for the Estuary Partnership and provide a summary report to the Estuary Partnership describing their monitoring activities during September 1, 2007 - August 31, 2008. For monitoring activities during September 1, 2008 - August 31, 2009, the Contractor will deliver a summary report (including preliminary sampling results, discussion of methods and outcomes, vegetation maps, and fauna lists) in electronic and hard copy format to the Estuary Partnership. Bathymetric Data with the University of Washington, the Contractor will develop a scope of work for bathymetric data collection, identify the appropriate process to select a subcontractor(s), select a subcontractor to collect and process bathymetric data, and manage the data collection in the lower river. The Contractor will compile new bathymetry data, make it available to BPA and other interested parties, and provide a summary report of bathymetric data collection efforts to BPA.
Project Review and WE Comments: SOW addresses the BiOp, especially RPA 59.
Tags: None
Project Improvements: Apply and finish the habitat classification for all 8 reaches (2 of 8 will be completed in Fy09).
Other Comments: Make sure the Monitoring Protocols (Roegner et al. 2009) are used as appropriate. Sampling for habitat conditions (STM) has been less than the effort prescribed in the Hab Mon Design (EOS 2008). Coordinate w/ CUR5, CUR6, STM2. (3/31/09 Meeting – The bathymetry work and habitat classification are some priorities. Others TBD.) (4/7/09 Mtg – Habitat Classification system needs to cover all eight reaches, not just two.)

STM2: Tidal Freshwater Monitoring Study

Full Title:
Project No.: 2005-001-00
Project Sponsor: PNNL/ODFW/UW/NMFS
Project Funder: BPA
RPA Action/Subaction(s): 58.2, 58.3, 59.1, 59.4, 59.5, 60.1, 60.2, 61.1, 61.3
F&W Program Objective: 14.1, 14.4, 14.6
Project Status: Ongoing
Information Source: Pisces
Contract(s): 26934 REL 7, CR-94565, 26934 REL 14
Focal Species – Populations: All CR
Pisces Work Element Number(s), Name, Title, and Description: 30446 A) Collect shallow (0-2 m) beach seine to determine the abundance (catch per unit effort), size (length and weight), and species composition through time. B) Determine the stock identity of juvenile salmon collected in the seines. C) Determine diet of yearling and subyearling salmon collected at the sampling sites. D) Collect ancillary data during seine field work (e.g., water temperature, tide stage,

daylight, river stage, river flow). E) Collect data on habitat characteristics: • Bathymetry • Vegetation and Percent Cover • Hydrology • Beach material • Slope. 30448 Assess feasibility to apply acoustic telemetry technology for action effectiveness research and quantify residence times and migration pathways in shallow, tidal freshwater habitats.
Deliverables and Descriptions: Raw fish data. The raw fish data including fish counts by species and ancillary data (e.g., water temperature) for each seine set during each sampling episode for each sample site will be provided in an appendix to the annual report. On-the-ground work associated with fish data collection cannot proceed until final documentation is received from BPA environmental compliance staff. Analyzed fish data. Using the data from WE 162, we will compute catch per unit effort (CPUE) by species and analyze these data to compare CPUE among sample sites, over time, and relationships with ancillary variables. Acoustic telemetry assessment. An assessment of the feasibility of using acoustic telemetry in shallow, tidal freshwater habitats of the lower Columbia River will be provided in the Annual Report. Fish and habitat data. The raw fish and habitat data including fish counts by species and ancillary data (e.g., water temperature) for each seine set during each sampling episode for each sample site will be provided in an appendix to the annual report. Analyzed fish and habitat data. Using the data from WE 162, we will compute catch per unit effort (CPUE) by species and analyze these data to compare CPUE among sample sites, over time, and relationships with ancillary and habitat variables. Acoustic telemetry assessment. An assessment of the feasibility of using acoustic telemetry in shallow, tidal freshwater habitats of the lower Columbia River will be provided in the Annual Report.
Project Review and WE Comments: SOW addresses the BiOp.
Tags: Acoustic transmitters (from AFEP studies)
Project Improvements: None at this time.
Other Comments: Coordinate w/ other tidal freshwater RME (CUR5 and CUR4). The work element description need to better explain linkage to the RPAs.

STM3: Tides and Currents

Full Title:
Project No.: not available
Project Sponsor: NOAA
Project Funder: NOAA
RPA Action/Subaction(s): 59.5, 61.4
F&W Program Objective:
Project Status: ongoing
Information Source: Krista Jones, Estuary Partnership, document=LCRE STM and CUR and AER Matrix_version 020509.doc (modified by GEJ)
Contract(s): n/a

Focal Species – Populations: n/a
Pisces Work Element Number(s): n/a
Pisces WE Description: n/a
Deliverables: Objective: To provide the national infrastructure, science, and technical expertise to monitor, assess, and distribute tide, current, water level, and other coastal oceanographic products and services that support NOAA's mission of environmental stewardship and environmental assessment and prediction.
Deliverable Description: 17 stations in LCRE
Project Review and WE Comments: None
Tags: None
Project Improvements: n/a
Other Comments: The primary reason for funding this project is NOT the FCRPS BiOp. The project is included anyway because it provides data that can be used to inform estuary/ocean RME.

STM4: ODEQ Ambient Water Quality Monitoring

Full Title:
Project No.: not available
Project Sponsor: ODEQ
Project Funder: ODEQ
RPA Action/Subaction(s): 59.5
F&W Program Objective: 14.5
Project Status: ongoing
Information Source: Krista Jones, Estuary Partnership, document=LCRE STM and CUR and AER Matrix_version 020509.doc (modified by GEJ)
Contract(s): n/a
Focal Species – Populations: n/a
Pisces Work Element Number(s): n/a
Pisces WE Description: n/a
Deliverables: Objectives 1. Assess water quality conditions and trends 2. Provide data for TMDL models 3. Provide a basis for compliance with WQ standards
Deliverable Description: Monitoring Information Alkalinity, BOD, Chlorophyll a, Specific Conductance, Dissolved Oxygen(DO), DO % Saturation , e.

coli, Ammonia, Nitrate & Nitrite, pH, Pheophytin a, Dissolved Ortho-Phosphate, Total Phosphate, Total Solids, Temperature, Turbidity Metrics are measured at most sites, 6 times per year, monthly at 6 Willamette Trend sites #sites in LCRE ????
Project Review and WE Comments: None
Tags: None
Project Improvements: n/a
Other Comments: The primary reason for funding this project is NOT the FCRPS BiOp. The project is included anyway because it provides data that can be used to inform estuary/ocean RME.

STM5: USGS Discharge and Water Quality Mon

Full Title:
Project No.: not available
Project Sponsor: USGS
Project Funder: USGS
RPA Action/Subaction(s): 59.5, 61.4
F&W Program Objective: 14.5
Project Status: Ongoing
Information Source: Krista Jones, Estuary Partnership, document=LCRE STM and CUR and AER Matrix_version 020509.doc (modified by GEJ)
Contract(s): n/a
Focal Species – Populations: n/a
Pisces Work Element Number(s): n/a
Pisces WE Description: n/a
Deliverables: Objective: To provide an ongoing characterization of the concentrations and mass flux of sediment and chemicals.
Deliverable Description: **Sites:** 3 sites in LCRE (Warrendale, Beaver, and Willamette River at Portland) Metric: Water-soluble pesticides, suspended and dissolved trace elements, major ions, nutrients, carbon, and suspended sediment Freq.: 10-12 times per year at 6 sites, including Beaver, Warrendale, and Willamette
Project Review and WE Comments: None
Tags: None
Project Improvements: n/a
Other Comments: The primary reason for funding this project is NOT the FCRPS BiOp. The project is

included anyway because it provides data that can be used to inform estuary/ocean RME.

STM6: WDOE Ambient Water Quality Monitoring

Full Title:
Project No.: not available
Project Sponsor: WDOE
Project Funder: WDOE
RPA Action/Subaction(s): 59.5
F&W Program Objective: 14.5
Project Status: Ongoing
Information Source: Krista Jones, Estuary Partnership, document=LCRE STM and CUR and AER Matrix_version 020509.doc (modified by GEJ)
Contract(s):
Focal Species – Populations: n/a
Pisces Work Element Number(s): n/a
Pisces WE Description: n/a
Deliverables: Objectives: 1. Determine whether water quality at sampling sites exceeds water quality standards. 2. Assess the status of water quality in Washington. 3. Provide analytical water quality information that describes present conditions and changes (trends). 4. Provide timely and high-quality data for other users.
Deliverable Description: Sites: Core long-term sites (62 sites total, 4 in LCRE); Basin sites, 2000-2004 (91 sites total; 4 in LCRE) Metrics: Ammonia, nitrate & nitrite, total phosphorus, specific conductance, total nitrogen, suspended solids, fecal coliform bacteria, oxygen, temperature, flow, pH, turbidity, metals, soluble reactive phosphorus
Project Review and WE Comments: None
Tags: None
Project Improvements: n/a
Other Comments: The primary reason for funding this project is NOT the FCRPS BiOp. The project is included anyway because it provides data that can be used to inform estuary/ocean RME.

A.10 Attachment 7 – Project by RPA World -- Summary of Task 3c RPA Gap Assessment

Project by RPA Table and Scores

Updated 6/1/09

Score	Criterion																
1	Complete, the RPA is fully covered and met by past and existing projects; discontinue work related to this RPA																
2	Ongoing, the RPA is fully covered by existing work; continue work related to this RPA																
3	Ongoing, the RPA is partially covered by existing work; continue work related to this RPA and add new work elements																
4	Ongoing, the RPA is partially covered by existing work; continue work related to this RPA and initiate an RFP																
5	Nothing, the RPA is not being covered by any project; initiate an RFP																
	Bonneville Power Administration	**2**	**2**	**3**	**3**	**3**	**3**	**3**	**4**	**3**	**3**	**3**	**2**	**3**	**2**	**3**	**2**
	Corps of Engineers	**2**	**2**	**2**	**2**	**3**	**3**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**3**
	National Marine Fisheries Service	**2,4**	**3,4**	**3**	**3**	**2,3**	**2,4**	**3**	**4**	**3**	**2**	**3**	**3**	**3**	**2**	**3**	**2**
	NW Power & Conservation Council	**2**	**3**	**3**	**3**	**2**	**2**	**3**	**4**	**3**	**2**	**3**	**2**	**3**	**2**	**3**	**2**
●	= full coverage of the RPA																
●	= partial coverage of the RPA																
ID	**Title**	**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**
CUR1	Ecology of Juv Salmonids in Plume			●	●									●	●		●
CUR2	Acoustic Tracking for Survival POST														●		
CUR3	Canada-US Shelf Salmon Survival													●	●		
CUR4	Acoustic Telemetry Est. of Survival	●							●					●		●	
CUR5	Habitat Opp. & Food-Web Linkages		●	●	●				●					●		●	●
CUR6	Current and Historical Linkages		●	●					●					●		●	
CUR7	Impact of American Shad													●			
CUR8	Time of Ocean Entry Study													●	●		
AER1	Cumul. Eco. Response to Restoration					●				●	●	●	●			●	
AER2	Salmon Benefits		●					●									
AER3	Ref Sites & AER in Hab. Rest. Prog.			●		●				●	●	●	●			●	
AER4	Grays River Restoration and RME											●					
AER5	Pile Structure Evaluation Coal Ck											●					

AER6	Eelgrass Enhancement					●						●						
AER7	JBH Tide Gate Replacement					●						●	●					
AER8	Crims Island Monitoring											●	●					
AER9	Tenasillahe Is. Monitoring											●						
AER10	Monitoring at Smith and Bybee Lakes											●	●					
AER11	Effectiveness Monitoring at Chin R.			●								●						
AER12	Ramsey Lake Project Monitoring											●	●					
AER13	Juvenile Salmonid Stranding																	
STM1	LCRE Ecosystem Monitoring			●		●	●			●	●			●		●		
STM2	Tidal FW Mon. Juvenile Salmonids		●	●		●			●	●	●	●		●		●		
STM3	Tides and Currents									●								●
STM4	ODEQ Ambient Water Quality Mon									●								
STM5	USGS Discharge and WQ Mon									●								●
STM6	WDOE Ambient WQ Monitoring									●								

RPA Coverage Comments

RPA Subaction	Agency	Score	Comment
58.1	BPA	2	No comment
	Corps	2	No comment
	NMFS	2,4	The only way this RPA sub action is being accomplished is through the use of acoustic-tags. Acoustic-tags tell you if the fish was in a certain location based on the array location. They get at the issue of survival but not fitness. Determining the survival and fitness of ESA-listed stocks cuts to the core of the measures of success for the FCRPS BiOp. It would be better to take a multiple lines of evidence approach with a more ecologically/biologically based research study. Put out an RFP for a new study(s) to accomplish a quality check on the survival estimates in CUR4 and measure juvenile salmonid *fitness*. Score 2 for the survival component. Score 4 for the fitness component.
	NPCC	2	No comment
	Consensus		
58.2	BPA	2	No comment
	Corps	2	The AER2 project will be making the determination of applicability of this to management actions, need to determine index first before additional time and money is invested.
	NMFS	3,4	There is no one project that fully covers this work (shaded bullet). The Actions Agencies need to reevaluate the ending of CUR6 and fund that so there will be at least total coverage for this RPA sub-action from that project, and then add additional work elements to CUR5 and AER2 to make sure we have complete coverage. Given the fact that life history diversity is a critical benefit the estuary provides for ESA-listed salmonids, we need to make sure we have full coverage for this RPA sub-action. Score 3 for index development. Score 4for the monitoring and evaluation component.
	NPCC	3	Since no current project fully covers this RPA, not certain whether it needs to be expanded to other "representative" sites to develop index.
	Consensus		
58.3	BPA	3	Need additional sampling sites.
	Corps	2	No comment.
	NMFS	4	The work elements in CUR5 need expansion, CUR6 needs to be funded, to ensure that we have at least one shaded bullet for this RPA sub-action. Because this RPA deals with both the estuary and the plume, a new study from the RFP could do the roll-up over the system (BON through plume). Additional work elements are needed for the roll-up component.
	NPCC	3	These projects need to be expanded into tidal-freshwater areas above RM 40 up to BON Dam.
	Consensus		
58.4	BPA	3	No comment.
	Corps	2	The Col. R. Avian Predation Program is covering the avian predation issue.
	NMFS	3	Add work elements to CUR5 to make sure we have at least one shaded bullet for the RPA sub-action that covers the estuary.
	NPCC	3	No comment
	Consensus		
59.1	BPA	3	LCREP still needs to complete mapping bathymetry and topography estuary-wide.

RPA Subaction	Agency	Score	Comment
	Corps	3	No comment
	NMFS	2,3	Combine results from other projects via STM1. We need to make sure we have bathymetry for the entire estuary. If STM1 cannot so the work, then move to D and initiate a new RFP.
	NPCC	2	No comment
	Consensus		
59.2	BPA	3	LCREP needs to finish up two current reaches and begin on all other reaches.
	Corps	3	No comment
	NMFS	2,4	Continue this work and expand to all estuary reaches. If LCREP is not able to do this work, put out a new RFP to complete the work.
	NPCC	2	No comment
	Consensus		
59.3	BPA	3	I am not sure about this one.
	Corps	2	No comment
	NMFS	3	AER2 is a new project. It is the only one covering this sub-action, and we do not know if it will actually provide that coverage. First, as was suggest during the SRWG meeting, a new work element needs to be added to AER2 to incorporate a life-cycling modeling approach into the project. Second, we should consider expand already existing projects (CUR5) to provide at least partial support for the RPA sub-action. Score 3 to add work elements for life-cycle modeling in AER2 and additional research under CUR5.
	NPCC	3	Not certain whether new AER2 project will develop an index for all eight reaches below BON Dam.
	Consensus		
59.4	BPA	4	We may need to change/add additional locations.
	Corps	2	Also fully covered with CUR4? Action effectiveness research addresses this RPA as does STM2.
	NMFS	4	The only project listed with full coverage of this RPA sub-action is CUR6 and that is being discontinued. Funding should be continued for the CUR6 this project to fully cover this RPA sub-action, or if that's not possible then do an RFP. Also, need roll-up on this one.
	NPCC	4	This project needs to be expanded into tidal-freshwater areas above RM 40 up to BON Dam.
	Consensus		
59.5	BPA	3	No comment.
	Corps	2	Score 2 assumes we'll integrate all habitat monitoring including reference sites (60.1), action effectiveness (60.2), etc. and do a roll-up.
	NMFS	3	We need one project with full coverage; this should be STM1. The existing projects should be evaluated to see which ones(s) could/should be expanded. If none of these are appropriate, then move to initiating a new RFP for full coverage. We also need to add in a new work element in the appropriate project to "roll-up" the results of all this work for this RPA sub-action.
	NPCC	3	No current project fully covers this RPA element; thus it needs to be expanded
	Consensus		
60.1	BPA	3	We may want to add additional action effectiveness reference sites as we continue to implement. Let's think about this; it may not be nec.
	Corps	2	No comment
	NMFS	2	We need one project that provides total coverage. We also need to make sure AER3 does the "roll-up" the results of all this work for this RPA sub-action. In particular, we need to make sure that we have the

RPA Subaction	Agency	Score	Comment
			correct sites identified as reference sites.
	NPCC Consensus	2	No comment.
60.2	BPA	2	Same comment as above on 60.1.
	Corps	2	No comment
	NMFS	3	We also need to add in a new work element in the appropriate project(s) (AER1) to "roll-up" the results of all this work for this RPA sub-action.
	NPCC Consensus	3	Since no current project fully covers this RPA, not certain whether it needs to be expanded to other sites.
60.3	BPA	2	No comment.
	Corps	2	No comment
	NMFS	3	We also need to add in a new work element in the appropriate project(s) (AER1) to "roll-up" the results of all this work for this RPA sub-action.
	NPCC Consensus	2	No comment.
61.1	BPA	3	No comment.
	Corps	2	No comment
	NMFS	3	We need one project that provides total coverage and "rolls-up" the results of all this work for this RPA sub-action. Score 4 because maybe a new RFP is necessary to roll-up from BON to and including the ocean.
	NPCC Consensus	3	No comment
61.2	BPA	2	BPA is currently reviewing POST project in regards to making sure it is adequately addressing management questions.
	Corps	2	No comment
	NMFS	2	No change needed.
	NPCC Consensus	2	No comment.
61.3	BPA	3	No comment.
	Corps	2	No comment
	NMFS	3	We need one project that provides total coverage and "rolls-up" the results of all this work for this RPA sub-action. The only project listed with full coverage of this RPA sub-action is CUR6 and that is being discontinued. Finding should be continued for this project to fully cover this RPA sub-action.
	NPCC Consensus	3	This project needs to be expanded into tidal-freshwater areas above RM 40 up to BON Dam.
61.4	BPA	2	No comment.
	Corps	3	Need to work on HEC-RAS applications for habitat restoration planning, engineering and evaluation.
	NMFS	2	No change needed.
	NPCC Consensus	2	No comment.

A.11 RPA Coverage Report

July 29, 2009, Estuary/Ocean RME Workgroup (contact GEJ, 503 417 7567)

Introduction

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

Methods

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

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

General Findings

General findings include:

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

- There is an overarching need for synthesis of the collective information on many RPAs. This "roll-up" will be very relevant to BiOp reporting requirements. This is a high priority.

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.

RPA 58 – Monitor and Evaluate Fish Performance in the Estuary and Plume

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

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

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

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

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

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

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

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

RPA 59 – Monitor and Evaluate Migration Characteristics and Estuary/Ocean Conditions

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

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

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

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

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

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

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

- Coverage: There is a gap in that this subaction has not been fully addressed by the ongoing projects because we do not definitively know the relative importance of various habitat types to juvenile salmon. The Corps respectfully disagrees because, in their opinion, the existing research meets the intent/need of this subaction.
- Recommendations: Need more work on fish/habitat associations in 2003-010-00 and 2005-001-00 and also incorporate fish/habitat research into the new AFEP one-pager for the 2010 planning process (i.e., a new RFP).

Subaction 59.5 Monitor habitat conditions periodically, including water surface elevation, vegetation cover, 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.

RPA 60 – Monitor and Evaluate Habitat Actions in the Estuary

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

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

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

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

Subaction 60.3 Develop and implement a methodology to estimate the cumulative effects of habitat conservation and restoration projects in terms of cause-and-effect relationships

between ecosystem and controlling factors, structures, and processes affecting salmon habitats and performance.

- Coverage: No gap assuming the cumulative effects methodology and an initial assessment are completed as scheduled in 2011. AFEP project EST-02-P-04 is well along on this RPA subaction.
- Recommendations: None, except make sure the deliverables from this project are carried forward after the projects ends in spring 2011.

RPA 61 – Investigate Estuary/Ocean Critical Uncertainties

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

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

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

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

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

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

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

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

Summary Table

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

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

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

[C] Defer to Hydro/Predation Workgroup.

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

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