

Columbia Estuary Ecosystem Restoration Program

2013 ACTION PLAN

FINAL

Prepared by the Bonneville Power Administration and U.S. Army Corps of Engineers, Portland District



**US Army Corps
of Engineers®**

November 2012

Preface

The 2013 Action Plan was produced by the Bonneville Power Administration (BPA) and U.S. Army Corps of Engineers, Portland District (Corps) by updating the 2012 Action Plan with the most current plans and schedule for restoration actions and research, monitoring, and evaluation. The BPA/Corps take full responsibility for the plan's content.

The citation for this document is: BPA/Corps. 2012. *Columbia Estuary Ecosystem Restoration Program: 2013 Action Plan*. Final report, prepared by the Bonneville Power Administration and U.S. Army Corps of Engineers, Portland, Oregon.

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Executive Summary

The 2013 Action Plan for the Columbia Estuary Ecosystem Restoration Program (CEERP) was developed by the Bonneville Power Administration (BPA) and U.S. Army Corps of Engineers, Portland District (Corps) to document their plans to execute habitat restoration projects and research, monitoring, and evaluation in the lower Columbia River and estuary (LCRE) during calendar year 2013. The overall goal of the CEERP is to understand, conserve, and restore ecosystems in the LCRE. The Action Plan is one of three inter-related, annual CEERP deliverables; the others are the Synthesis Memorandum and the Strategy Report.

The Action Plan outlines restoration and research, monitoring, and evaluation (RME) actions based on the strategy developed in the Strategy Report. Monitoring and research results are evaluated in the subsequent Synthesis Memorandum, which in turn is used adaptively to update the next Strategy Report and Action Plan. In other words, the Synthesis Memorandum establishes the knowledge base for restoration ecology and engineering at site, landscape, and estuary-wide scales; the Strategy Report applies this knowledge base to provide strategic, programmatic guidance for restoration implementation and RME; and the Action Plan uses CEERP strategies to prioritize and select specific implementation and RME projects under the CEERP. The CEERP deliverables are intended to guide or inform, as appropriate, the Actions Agencies (BPA/Corps), National Marine Fisheries Service, Northwest Power and Conservation Council, restoration project sponsors, researchers, and various interested parties. The CEERP will consider information from projects funded for other purposes outside CEERP, such as studies regarding predation, toxics materials, dredging, hydrosystem operations, and tributary habitat improvements, and other topics.

The 12-month period for the CEERP deliverables is a calendar year (CY) and started with CY 2012. The 2012 Synthesis Memorandum was released regionally in August 2012. The 2012 Synthesis Memorandum feeds the 2013 Strategy Report and 2013 Action Plan, due in October 2012 to provide direction for CY 2013 activities. Within the CEERP's adaptive management process, the CEERP deliverables will be updated annually for applicability, transparency, and accountability.

The Action Plan applies the CEERP's ecosystem-based strategy to prioritize and select specific implementation and RME projects. The Action Plan was prepared by the BPA/Corps with review by and collaboration with regional restoration sponsors, researchers, and other stakeholders involved in the CEERP, including the Columbia Land Trust, Columbia River Estuary Study Taskforce, Lower Columbia Fish Recovery Board, Lower Columbia Estuary Partnership, National Marine Fisheries Service (NMFS), Northwest Power and Conservation Council (Council), Oregon Department of Fish and Wildlife, Pacific Northwest National Laboratory, U.S. Fish and Wildlife Service, U.S. Geological Survey, Washington Department of Fish and Wildlife, and others. The BPA/Corps intend to provide the Action Plan for review by NMFS, the Council, the Independent Scientific Review Panel (ISRP), and other parties. The BPA/Corps and other CEERP stakeholders will use the Action Plan for implementation organization and for tracking progress, thereby helping increase the program's certainty in attaining its goals and objectives.

This CEERP 2013 Action Plan is based on the BPA/Corps' fundamental strategy for estuary habitat actions and RME—apply an ecosystem-based approach to restoring, enhancing, or creating ecosystem structures, processes, and functions in the estuary, and perform RME to assess the effectiveness of these

actions, while building basic understanding of LCRE ecosystem functions. The Action Plan details the approach for developing and prioritizing projects. Briefly, CEERP decision-making involves an iterative process which, for Biological Opinion-related work, focuses on cost per survival benefit unit (SBU), total SBUs, and project likelihood (relative to social and technical complexity). Project sponsors are required to develop project goal maps such that preliminary SBUs are assigned. Projects proposed to the BPA and Corps will get funding based on total SBUs, cost per SBU, project likelihood, as well as other factors as applicable. As a project moves through successive phases, the estimate of cost per SBU will become more robust, thereby reducing decision uncertainty. This iterative process will continue until the project is ready for construction, at which point the Expert Regional Technical Group will assign SBUs, the last decision point for the BPA/Corps.

The BPA/Corps plan to implement restoration projects throughout the LCRE during CY2013. The projects were developed in collaboration with restoration project sponsors as described in the 2013 Strategy Report. Project status ranges from initial concept to design, with many projects in the feasibility phase. Some of the projects are land acquisitions. This restoration effort will be closely coordinated with associated ongoing CEERP RME. Four RME projects are queued for CY 2013, including two action effectiveness monitoring and research projects and two ecosystem function monitoring and research projects.

In closing, the CEERP 2013 Action Plan is responsive to the integrated strategy for restoration and RME, as described in the 2013 Strategy Report. To be successful, data and coordination are focus areas for CEERP managers with the BPA/Corps. Development of a publicly available, geospatial relational database for the LCRE commenced in 2012 and will be ongoing in 2013. Periodic coordination meetings of various kinds of CEERP-related activities are scheduled. The 2012 schedule for final versions of CEERP deliverables is 2012 Synthesis Memorandum (June), 2013 Strategy Report (November), and 2013 Action Plan (November).

Acronyms and Abbreviations

AEMR	action effectiveness monitoring and research
AER	action effectiveness research
AFEP	Anadromous Fish Evaluation Program
BiOp	Biological Opinion
BPA	Bonneville Power Administration
BPA/Corps	Bonneville Power Administration and the U.S. Army Corps of Engineers
CEERP	Columbia Estuary Ecosystem Restoration Program
CHAMP	Columbia Habitat Monitoring Program
CLT	Columbia Land Trust
Corps	U.S. Army Corps of Engineers
Council	Northwest Power and Conservation Council
CREEC	Columbia River Estuary Ecosystem Classification
CREST	Columbia River Estuary Study Taskforce
CT	Cowlitz Tribe
CUR	critical uncertainties research
CY	calendar year
EFMR	
EOS	Estuary/Ocean Subgroup
EP	Estuary Partnership (Lower Columbia Estuary Partnership)
ERTG	Expert Regional Technical Group
ESA	Endangered Species Act
FCRPS	Federal Columbia River Power System
FY	fiscal year
ISAB	Independent Scientific Advisory Board
ISRP	Independent Scientific Review Panel
JBH	Julia Butler Hansen (National Wildlife Refuge)
LCRE	lower Columbia River and estuary
MOA	Memorandum of Agreement
NMFS	National Marine Fisheries Service
NWR	National Wildlife Refuge
PNAMP	Pacific Northwest Aquatic Monitoring Partnership
ODFW	Oregon Department of Fish and Wildlife
OHSU	Oregon Health Sciences University
OSU	Oregon State University
PNNL	Pacific Northwest National Laboratory
RME (or RM&E)	research, monitoring, and evaluation

RPA	Reasonable and Prudent Alternative
SBU	survival benefit unit
SEC	site evaluation card
SRWG	Studies Review Work Group
STM	status and trends monitoring
SWG	Science Work Group
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UW	University of Washington
WDFW	Washington Department of Fish and Wildlife

Glossary

adaptive management – A structured learning process for testing hypotheses through management experiments in natural systems, collecting and interpreting new information, and making changes based on monitoring information to improve the management of ecosystems; i.e., “learning by doing.”

conceptual ecosystem model – A graphical representation or a simple set of diagrams that illustrates a set of relationships among factors important to the function of an ecosystem or its subsystems (Busch and Trexler 2003).

connectivity – See “habitat connectivity.”

controlling factors – The basic physical and chemical conditions that construct and influence the structure of the ecosystem.

control site – Locations with traits similar to the subject site prior to restoration. These sites are sampled over time to monitor any temporal shifts in baseline conditions and how the subject area might have responded over time had no restoration taken place.

core indicators – A standard subset of the suite of possible indicators that is usually measured at sample locations (Roegner et al. 2009). They must be relevant to the objective.

ecosystem – A community of organisms in a given area together with its physical environment and its characteristic climate.

ecosystem function – Ecosystem function is defined as the role the plant and animal species play in the ecosystem. It includes primary production, prey production, refuge, water storage, nutrient cycling, etc.

ecosystem process – Ecosystem processes are any interactions among physicochemical and biological elements of an ecosystem that involve changes in character or state.

ecosystem structure – Ecosystem structure is defined as the types, distribution, abundances, and physical attributes of the plant and animal species composing the ecosystem.

extensive monitoring – Monitoring of a few selected core indicators over a large spatial scale.

habitat – The physical, biological, and chemical characteristics of a specific unit of the environment occupied by a specific plant or animal.

habitat capacity – A category of habitat assessment metrics including "habitat attributes that promote juvenile salmon production through conditions that promote foraging, growth, and growth efficiency, and/or decreased mortality," for example, invertebrate prey productivity, salinity, temperature, and structural characteristics (cf. Simenstad and Cordell 2000).

habitat connectivity – A measure of how connected or spatially continuous a corridor between habitats or among habitats in a matrix is.

habitat opportunity or access – A category of habitat assessment metrics that "appraise the capability of juvenile salmon to access and benefit from the habitat's capacity," for example, tidal elevation and geomorphic features (cf. Simenstad and Cordell 2000).

habitat usage – Measures of juvenile salmonid/habitat relationships in the estuary such as residence time, growth, and diet.

indicator – A measurable parameter that characterizes an important aspect of the ecosystem and is sensitive to changes in the system.

intensive monitoring – Monitoring of many core and higher order indicators locally, i.e., over a small spatial scale.

life history diversity – Different spatial and temporal patterns of migration, habitat use, spawning, and rearing displayed within a population of Pacific salmon.

limiting factor – Physical, chemical, or biological features that impede species and their independent populations from reaching viability status.

monitoring – The systematic process of sampling design, collection, storage, and analysis of data related to a particular system at specific locations and times (Busch and Trexler 2003).

monitored indicator– See “indicator.”

ocean-type life history – General life-history pattern for salmon in which juveniles migrate to sea during their first year after emergence.

protocol – The standardized methodology to collect data for a monitoring indicator (Busch and Trexler 2003).

realized function – A category of habitat assessment metrics that includes any direct measures of physiological or behavioral responses that can be attributable to fish occupation of the habitat and that promote fitness and survival; for example, survival, habitat-specific residence time, foraging success, and growth (cf. Simenstad and Cordell 2000).

reference site – Locations considered to be representative of the desired outcome of the restoration action. Reference sites are used to characterize the spatial heterogeneity of the target condition and any temporal shift in the target condition over time due to climate change, maturation, etc. This differs from a “control” site, which should be similar to the restored site before restoration.

restoration – Return of an ecosystem to a close approximation of its previously existing condition (NRC 1992).

sample – To collect data under a prescribed sampling design.

stream-type life history – General life-history pattern for salmon in which juveniles migrate to sea after 1 year of rearing in their natal stream system.

stressor – An entity or process that is external to the estuary or anthropogenic and that affects controlling factors on estuarine ecosystem structures or processes. A component of a conceptual model.

track – To access, assess, and summarize information made available by others.

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1.0 Introduction

The purpose of the Columbia Estuary Ecosystem Restoration Program (CEERP)¹ 2013 Action Plan is to document the process and resulting plans for implementing the CEERP strategy for ecosystem restoration and research, monitoring, and evaluation (RME) in the lower Columbia River and estuary (LCRE) during calendar year (CY) 2013. The Bonneville Power Administration (BPA) and the U.S. Army Corps of Engineers, Portland District (Corps) jointly instituted the CEERP to implement federal ecosystem restoration actions and RME in the LCRE in response to various requirements, mandates, and authorities (see the 2013 Strategy Report). The BPA and the Corps (BPA/Corps) conduct the CEERP using an adaptive management process that includes an Action Plan containing the annual blueprint for ecosystem restoration and RME actions in tidally influenced areas of the LCRE floodplain (Figure 1). The 2013 Action Plan is based on the 2012 Action Plan (BPA/Corps 2012b), which responded to the 2012 Strategy Report (BPA/Corps 2012a).

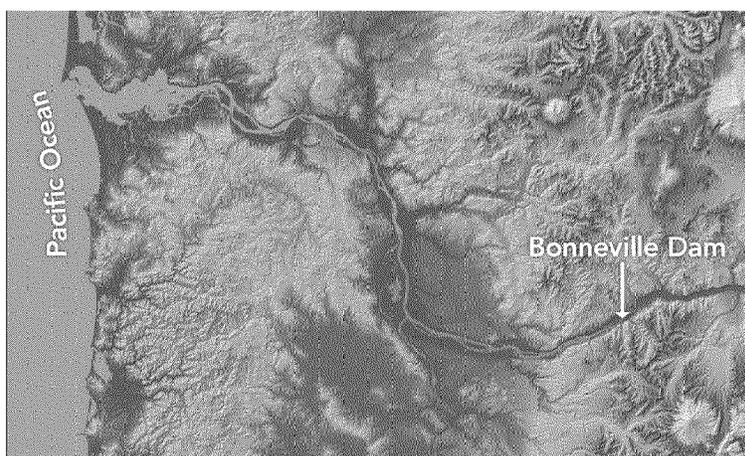


Figure 1. Map of Lower Columbia River and Estuary Study Area

The annual action plans also serve the implementation plans for the Biological Opinion (BiOp) on operation of the Federal Columbia River Power System (FCRPS) required by the U.S. District Court (U.S. District Court 2011). In addition to the FCRPS BiOp, the CEERP addresses recovery plans for Endangered Species Act-listed salmon and steelhead species (Lower Columbia Fish Recovery Board 2010; NMFS 2011), the Washington Memorandum of Agreement on Estuary Habitat Actions (Washington-Action Agencies 2009), and various federal Water Resources Development Acts, Sections 206, 536, and 1135.

The CEERP is an integral part of BPA's implementation of the estuary provisions of the Northwest Power and Conservation Council's (Council's) 2009 Fish and Wildlife Program (Council 2009). The

¹ CEERP is a name recently established for the BPA/Corps estuary restoration effort that started with the 2000 FCRPS BiOp. Broadly speaking, the goal of the CEERP is to understand, conserve, and restore ecosystems in the LCRE. CEERP restoration actions are also intended to provide survival benefit units (SBUs) for salmonids established in the 2008 FCRPS BiOp, i.e., 45 units for ocean-type and 30 units for stream-type salmon, by 2018 (NMFS 2008). The ecosystem-based strategy prioritizes restoring habitat, increasing access to areas that have been cut off from the main-stem system; restoring habitat capacity and the quality of existing habitats for juvenile salmonids; and controlling predators (Simenstad and Cordell 2000; Johnson et al. 2003). The intent is to implement projects that provide the most SBUs at the least cost to rate payers.

CEERP specifically addresses the Council's estuary strategies for habitat reconnections, long-term effectiveness monitoring, estimation of juvenile salmon survival rates, impacts from estuary stressors, and partnerships. The Lower Columbia Subbasin Plan (Council 2005), part of the Council's Fish and Wildlife Program, was a building block for the CEERP because of its comprehensive assessment of identifying limiting factors and environmental conditions for a suite of focal species in the LCRE and a wide range of potential management actions. Furthermore, the Council's RME/Artificial Production Categorical Review Recommendation Report – Recommendation 3 to monitor and evaluate the effectiveness of habitat actions in the estuary (ISRP 2010) is being fulfilled by the CEERP, as this Action Plan demonstrates.

The 2013 Action Plan was prepared by the BPA/Corps in collaboration with regional restoration sponsors, researchers, and other stakeholders participating and collaborating in the CEERP. The BPA/Corps desire to provide the Action Plan for review by the National Marine Fisheries Service (NMFS), the Council, the Independent Scientific Review Panel (ISRP), and other interested parties. The BPA/Corps intend that the 2013 Action Plan, along with the CEERP 2013 Strategy Report, address the ISRP and Council recommendations for BPA-funded projects designed to support a programmatic approach to LCRE habitat restoration and RME within an adaptive management process. The BPA/Corps and other CEERP stakeholders will use the Action Plan for implementation organization and for tracking progress, thereby helping to increase the program's certainty in attaining its goals and objectives.

1.1 Goal and Objectives

The BPA/Corps have formulated a programmatic goal and objectives for the CEERP. The overall goal of the CEERP is to understand, conserve, and restore ecosystems in the LCRE. The CEERP objectives are three-fold. 1) Increase the opportunity for access by aquatic organisms to and for export of materials from shallow water habitats.² 2) Increase the capacity and quality of estuarine and tidal-fluvial ecosystems.³ 3) Improve ecosystem realized functions.⁴ Restoration projects are implemented to meet the survival benefit unit (SBU) goals and RME is performed to reduce uncertainty and assess effectiveness, while answering the management questions (see details in Sections 2.0 and 3.0).

1.2 Adaptive Management Process

The CEERP is implemented using an adaptive management process entailing five phases (Figure 2)—decisions, actions, monitoring/research, synthesis and evaluation, and strategy (Thom 2000). The process feeds back on itself so that decisions and actions are based on input from previous RME and strategy phases (see Figure 3 for a hypothetical example of this process). Teams of key staff perform specific

² Habitat access/opportunity is a habitat assessment metric that "appraises the capability of juvenile salmon to access and benefit from the habitat's capacity," for example, tidal elevation and geomorphic features (cf. Simenstad and Cordell 2000).

³ Habitat capacity/quality is a habitat assessment metric involving "habitat attributes that promote juvenile salmon production through conditions that promote foraging, growth, and growth efficiency, and/or decreased mortality," for example, invertebrate prey productivity, salinity, temperature, and structural characteristics (cf. Simenstad and Cordell 2000).

⁴ Realized function is a category of habitat assessment metrics that includes any direct measures of physiological or behavioral responses that can be attributable to fish occupation of the habitat and that promote fitness and survival; for example, survival, habitat-specific residence time, foraging success, and growth (cf. Simenstad and Cordell 2000).

functions and assume certain responsibilities to produce desired outcomes (Table 1 and Table 2). The CEERP adaptive management process is described in detail by Thom et al. (2012). The Action Plan is the deliverable from the Decide Phase in the CEERP adaptive management process.

The 12-month period for the CEERP deliverables is a calendar year and started with CY 2012. The 2012 Synthesis Memorandum, a comprehensive compilation of science to date concerning juvenile salmon ecology and ecosystem restoration in the LCRE, was released in August 2012. The 2012 Synthesis Memorandum feeds the 2013 Strategy Report and 2013 Action Plan. The CEERP deliverables will be updated annually for transparency and accountability.

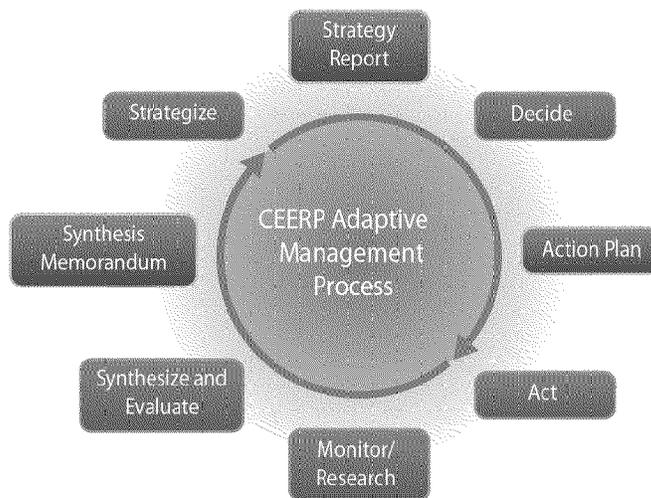


Figure 2. CEERP Adaptive Management Process. Brown and blue boxes signify adaptive management phases and deliverables, respectively.

Table 1. CEERP Adaptive Management Phases, Teams, and Deliverables (from Thom et al. 2012; abbreviated terms used in tables are defined in the list in the front matter of this report)

Phase	Responsible Parties	Function	Deliverable(s)
Strategize	BPA/Corps, Council, SRWG, SWG, EOS	Provide strategic priorities on project types that will provide the most benefit	Strategy Report
Decide	BPA/Corps (final decisions); Council, ISRP, SWG, SRWG, ERTG (inputs)	Select projects and identify RME for a given implementation year	Action Plan, Feasibility Studies
Act (Implementation)	BPA/Corps; Sponsors	Implement restoration projects	Design Memoranda, As-Built Drawings
Monitor and Research	BPA/Corps; Researchers	Study “on the ground” implementation	Site Evaluations, Technical Reports
Synthesize and Evaluate	BPA/Corps, NMFS, Council, ERTG	Synthesis RME findings and make recommendations to inform following years’ strategy	Synthesis Memorandum

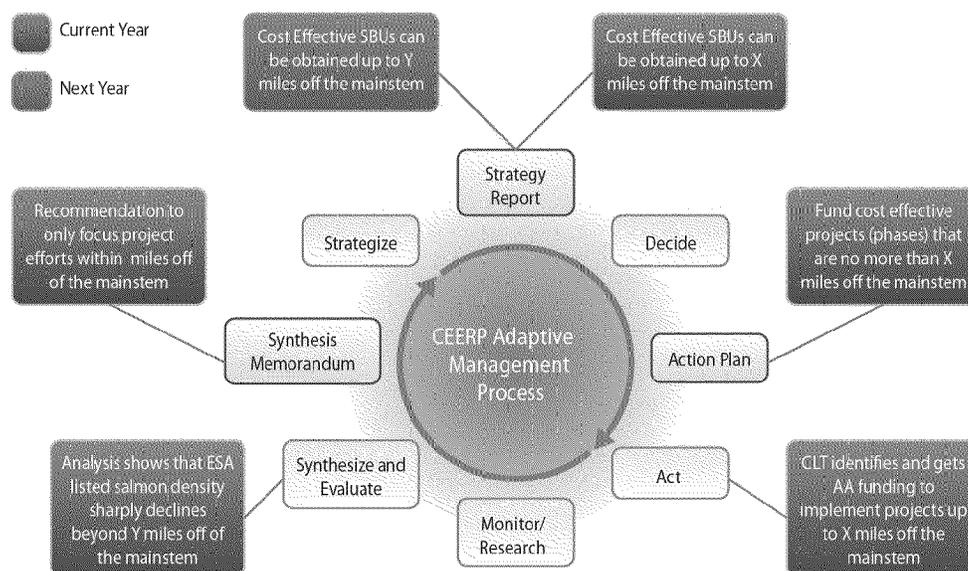


Figure 3. Hypothetical Example of the CEERP Adaptive Management Process

Table 2. CEERP Roles and Responsibilities

Entity	CEERP Role and Responsibility
BPA/Corps	<p>BPA/Corps fund habitat actions in the CEERP Action Plan.</p> <p>Corps implements habitat actions under authorities in Water Resources Development Act Sections 536, 1135, 206.</p> <p>Corps implements RME through the Congressionally funded Columbia River Fish Mitigation Project and its Anadromous Fish Evaluation Program (AFEP) in response in part to the 2008/2010 FCRPS BiOp.</p> <p>BPA implements habitat restoration and RME through the Council’s Fish and Wildlife Program in response in part to the 2008/2010 FCRPS BiOp.</p> <p>Corps funds the CEERP Synthesis Memorandum and both BPA/Corps rely upon these findings to inform adaptive management of the CEERP Strategy.</p> <p>The BPA/Corps ensure that ERTG scoring criteria are consistent with BPA/Corps policies.</p>
National Marine Fisheries Service	<p>Reviews the annual CEERP Strategy Reports, Action Plans, and Synthesis Memoranda.</p> <p>Considers CEERP documents and findings to inform Endangered Species Act (ESA) consultations on the FCRPS BiOp.</p> <p>Is responsible for overseeing implementation of the Estuary Module of the Columbia Recovery Plans and, therefore, coordinates with the BPA/Corps’ CEERP.</p> <p>Participates in the SRWG, SWG, EOS, and ERTG Steering Committee.</p> <p>Reviews for ESA compliance for actions implemented under the CEERP Action Plan.</p> <p>Ensures that ERTG scoring criteria are consistent with NMFS policies.</p>
Northwest Power and Conservation Council	<p>Develops the Columbia River Basin Fish and Wildlife Program. Makes funding recommendations pertaining to BPA funded projects in the estuary consistent with the Northwest Power Act.</p> <p>Oversees and coordinates ISRP review of BPA/Corps projects.</p>

Table 2. (contd)

Entity	CEERP Role and Responsibility
Independent Scientific Review Panel	Reviews RME and restoration project scopes and methodologies for scientific rigor, consistent with the Northwest Power Act (http://www.nwcouncil.org/fw/isrp/background.htm)
Expert Regional Technical Group	Reviews, scores, and provides comments on restoration projects queued by the BPA/Corps. Assigns SBUs for ocean- and stream-type juvenile salmon from LCRE habitat restoration actions implemented by the BPA/Corps, as called for in the 2008 FCRPS BiOp. Provides technical input on restoration topics queued by the BPA/Corps.
Science Work Group (EP)	Provides advice and support to the EP Board of Directors and staff on scientific and technical issues. Oversees and coordinates technically oriented aspects of the EP's habitat restoration program, long-term monitoring strategy, and data management efforts. Helps ensure the EP is working collaboratively and supporting regional needs. Provides a forum for the exchange of scientific information about the LCRE. Reviews proposed restoration and RME projects.
Studies Review Work Group (AFEP)	Reviews the RME projects funded by the Corps for the CEERP. Participates in the annual AFEP review, which includes CEERP RME projects. Coordinates with other review groups through the Corps.
Estuary/Ocean Subgroup for Federal RME	As tasked by the BPA/Corps and NMFS, develops RME plans and guidance for the LCRE. The EOS functions under the auspices of the federal BiOp-related RME planning process to implement federal RME in the estuary.
Sponsors	Develop, design, propose, and implement restoration projects. Sponsors include the Columbia Land Trust, Columbia River Estuary Study Taskforce, Cowlitz Tribe, Estuary Partnership, Oregon Department of Fish and Wildlife, and Washington Department of Fish and Wildlife.
Researchers	Perform RME. Research agencies include NMFS, Oregon Department of Fish and Wildlife, Pacific Northwest National Laboratory (PNNL), U.S. Fish and Wildlife Service, and U.S. Geological Survey.

1.3 Contents

The sections of the 2013 Action Plan that follow are responsive to the BPA/Corps' fundamental strategy for estuary habitat actions and RME—apply an ecosystem-based, landscape approach to restore, enhance, or create ecosystem structures, processes, and functions in the estuary, and perform RME to assess the effectiveness of these actions, while building our understanding of ecosystems in the LCRE. The 2013 Action Plan provides plans for restoration (Section 2.0) and RME (Section 3.0). We explain how CEERP project decisions are made using the integrated strategy for restoration and RME described in the 2013 Strategy Report. Here we list and describe projects and explain the rationale for the planned restoration and RME efforts. We also present plans for supporting activities, such as data management and dissemination and the 2012 schedule of CEERP activities (Section 4.0). Note that abbreviated terms used in tables are defined in the list included in the front matter of this report.

2.0 Restoration Plan

This section contains the restoration component of the 2013 Action Plan to implement the strategy formulated in the 2013 Strategy Report. Within the CEERP, the BPA/Corps implement integrated restoration and RME projects (Figure 4). After providing background on CEERP strategy and objectives below, we present the project prioritization and selection (decision-making) process and list and describe the projects to be implemented in 2012. Projects for out-years 2013–2018 currently are being developed, but it is too early and sensitive in the project development cycle to present the prospective projects here. We anticipate, though, using a process in the out-years similar to that used for 2012 and 2013 to identify and prioritize restoration projects.

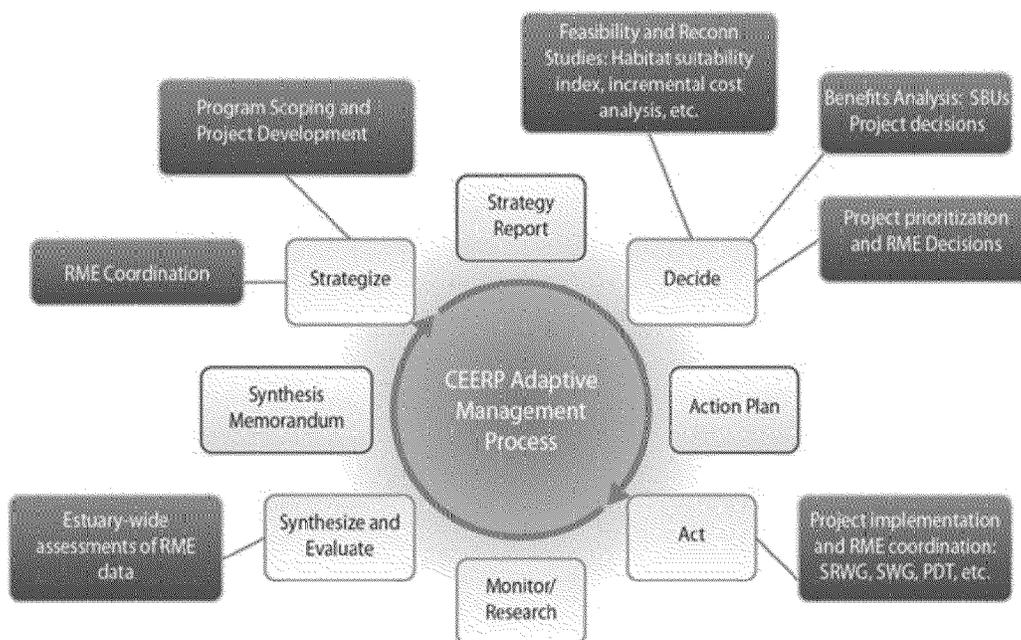


Figure 4. CEERP’s Integrated Restoration Project Planning and RME⁵

The BPA/Corps’ strategy for LCRE habitat restoration makes use of existing programs, processes, technical groups, and plans to avoid redundancy and increase efficiency. The main existing programs, with their associated processes and technical groups, are the Corps’ Anadromous Fish Evaluation Program (AFEP) and the Council’s Fish and Wildlife Program. Important existing plans include the Council’s Columbia River Basin Fish and Wildlife Program, which provides programmatic goals and objectives (Council 2009); the Council’s Lower Columbia Subbasin Plan, which characterizes limiting factors, threats to the environment, and proposed solutions (Council 2005); and the NMFS BiOp on FCRPS Operations, which provides restoration mandates, SBU goals, and RME actions (NMFS 2008). Furthermore, the Expert Regional Technical Group (ERTG) provided guidance for CEERP projects: bigger area is better than smaller area; close to the main stem is better than farther away; restoring remnant channels is better than excavating new ones; natural processes are preferred over engineered

⁵ The difference between action effectiveness monitoring and action effectiveness research is that monitoring concerns extensive sampling of a few core indicators across many restoration projects, whereas research concerns intensive sampling of core and higher-order indicators at a few selected projects.

processes; a holistic perspective from a landscape scale is better than a narrow, site-specific perspective (ERTG 2010a, 2011). In general, the BPA/Corps' approach to LCRE restoration for 2013 and beyond is to expedite project development using an aggressive, systematic, collaborative approach that is informed by the best available science from the collective RME effort to date.

During 2013, the BPA/Corps will work with local parties and agencies to aggressively pursue and implement habitat protection and restoration projects in the LCRE floodplain as part of the CEERP. As the CEERP matures, projects will be implemented even more efficiently and strategically than in the past. The overall goal for 2013 is to make noticeable progress towards BiOp goals for ocean- and stream-type fish. The BPA/Corps' emphasis in 2013 will be on projects that will deliver high numbers of SBUs and/or low cost per SBU, while concurrently meeting our cost-share partners' goals and objectives for their respective restoration projects.

2.1 Decision-Making Process

In the project development process, CEERP stakeholders actively pursue potential opportunistic and strategic sites. In many cases, local parties, landowners, and communities are an integral part of the project development process, because it is often their properties that are being considered for conservation and restoration and without their willing participation and cooperation the projects cannot be implemented. Once a project is initiated and developed in the Strategy Phase of the adaptive management process, it enters the Decide Phase (Figure 2) where decisions are made about implementing the project.

CEERP decision-making (Figure 5) involves an iterative process which, for BiOp-related work, focuses on technical review, cost per SBU and total SBUs, and project likelihood in terms of technical complexity, social acceptance, and other factors. All BPA-funded restoration projects go through the Estuary Partnership's Science Work Group (EP's SWG) review process for habitat restoration projects involving a ranking step using specific criteria (available at www.lcrep.org/sites/) and "Tier 2" prioritization (Evans et al. 2006). Corps-funded projects are reviewed and scrutinized during the Corps' standard feasibility study process (e.g., Section 536). (Technical review is explained further in the next paragraph.) For both BPA- and Corps-funded work, project sponsors are required to develop project templates that include maps showing the acreage/mile goals for each project restoration activity. This allows the BPA/Corps to assign a preliminary SBU for internal planning and decision-making purposes. Project likelihood is determined using a questionnaire that ascertains the project's social and technical complexity. Project funding decisions by the BPA/Corps are based on total SBUs, cost per SBU, project likelihood, as well as other factors, as applicable. Projects are often funded in stages (e.g., initial design, final design, and construction). If a project meets the BPA/Corps' goals based on these criteria at various decision-points in the process, the BPA/Corps will fund the next stage of the project. If sponsors identify key project information that would materially change the preliminary SBU estimate or cost estimate, the BPA/Corps will recalculate cost per SBU before making any decisions about funding the next project stage. As the project moves through successive stages, the estimate of cost per SBU will become more robust, thereby reducing decision uncertainty. This iterative process will continue until the project is ready for construction, at which point the ERTG assigns SBUs, which are reviewed by the BPA/Corps and are usually the final decision point.

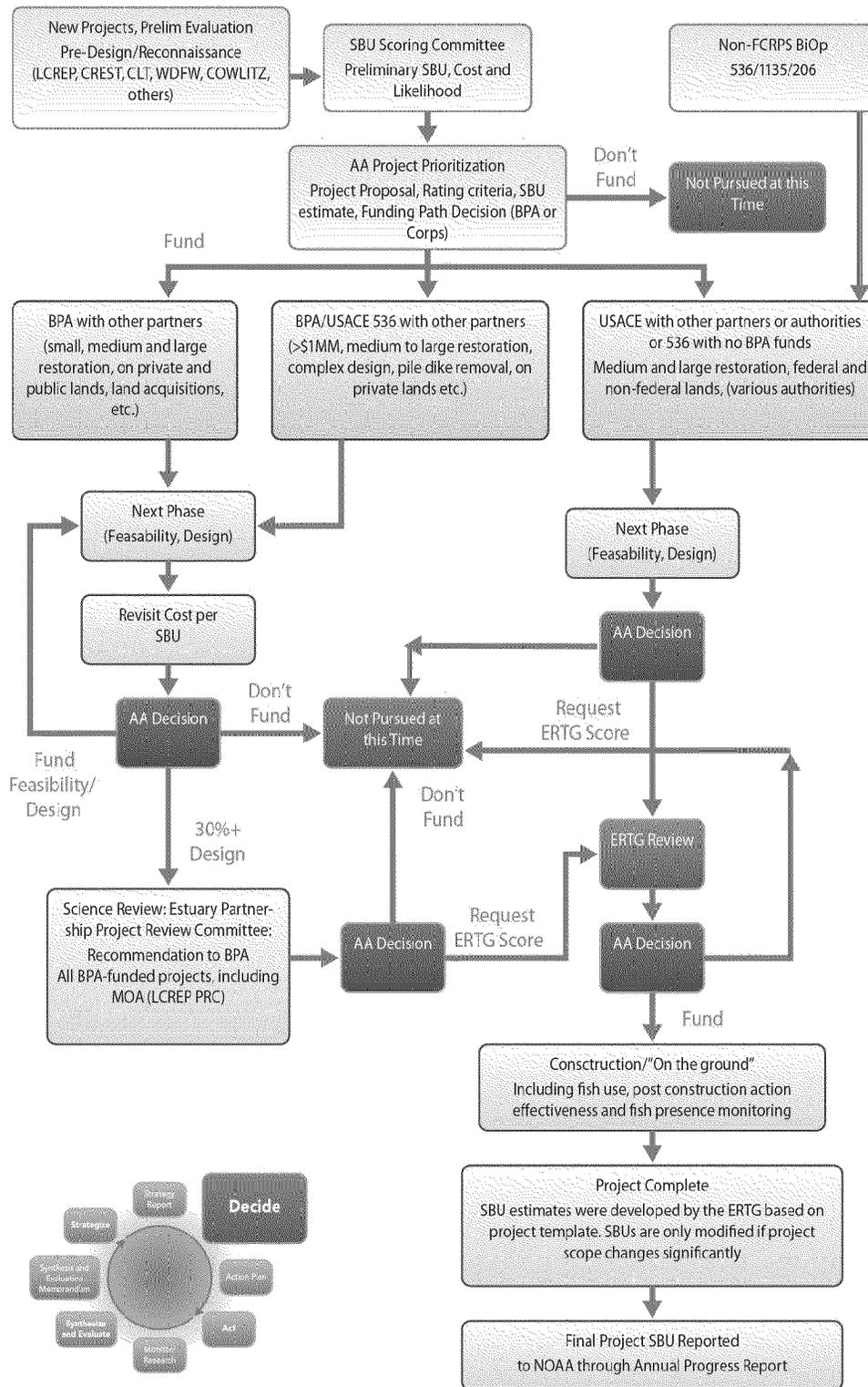


Figure 5. Decision-Making Process for CEERP Restoration Projects. This diagram depicts the process for an individual, on-the-ground restoration project. The ISRP reviews the BPA-funded restoration program projects, not individual restoration projects.

Three important review elements contribute information to CEERP stakeholders and decision-makers: the ISRP, EP's SWG, and ERTG. As part of the Council's periodic categorical reviews, the ISRP reviews the five Council Fish and Wildlife Program projects funded by BPA and conducted by the Columbia Land Trust (CLT), Columbia River Estuary Study Taskforce (CREST), Cowlitz Tribe (CT), EP, and Washington Department of Fish and Wildlife (WDFW) that serve as umbrella projects to implement numerous individual restoration projects. It is the intent of the BPA/Corps that the ISRP review the five BPA-funded umbrella projects. This review is important because it will address how well each umbrella project meets the goals and objectives of the Council's Fish and Wildlife Program for the LCRE; integrates with the overall LCRE restoration effort; implements a landscape-ecosystem-based strategy; institutes a robust project development and selection process; and uses a scientifically sound approach. That is, the ISRP reviews the programmatic framework for the umbrella projects, but not individual restoration projects. This approach involves ISRP and Council agreement. The SWG reviews and comments on individual projects using ecosystem-based project review criteria (available at www.lcrep.org/sites/) and a prioritization process (Evans et al. 2006; Estuary Partnership 2012) for individual restoration projects arising from the CLT, CREST, CT, EP, and WDFW projects in the Council's Fish and Wildlife Program. The ERTG, on the other hand, reviews and scores individual projects (ERTG 2010a) and assigns SBUs (ERTG 2010b, 2011) as requested by the BPA/Corps whether the project is part of the Council's Fish and Wildlife Program or the Corps' restoration authorities (Figure 5). BPA or the Corps, as the appropriate funding agency, uses the review comments to inform its final decision to fund a given project.

2.2 Current Projects (CY 2013)

Twenty-four restoration projects are planned for implementation during CY 2013 (13) and CY 2014 (11) (Figure 6; Table 3). These projects have been developed by the BPA/Corps in collaboration with restoration project sponsors. Project stage ranges from feasibility to design to implementation. Three of the projects are land acquisitions.

The project stages in Table 3 represent work that is currently scheduled for funding in fiscal year (FY) 2013 in the LCRE by the BPA/Corps, although construction may be in 2014. As described above for the Decide Phase of adaptive management (Section 2.1), projects funded by BPA are selected by a combination of cost per SBU, total SBUs, and by social and technical complexity. Projects funded by the Corps are selected based on the Corps' economic analysis as well as considerations of the cost-share partner. At this time the BPA/Corps are focusing on a cost/benefit model for restoration projects because it provides clear direction on the types of projects that the BPA/Corps prefer and will help ensure that budgets are used in the most cost-effective manner possible.

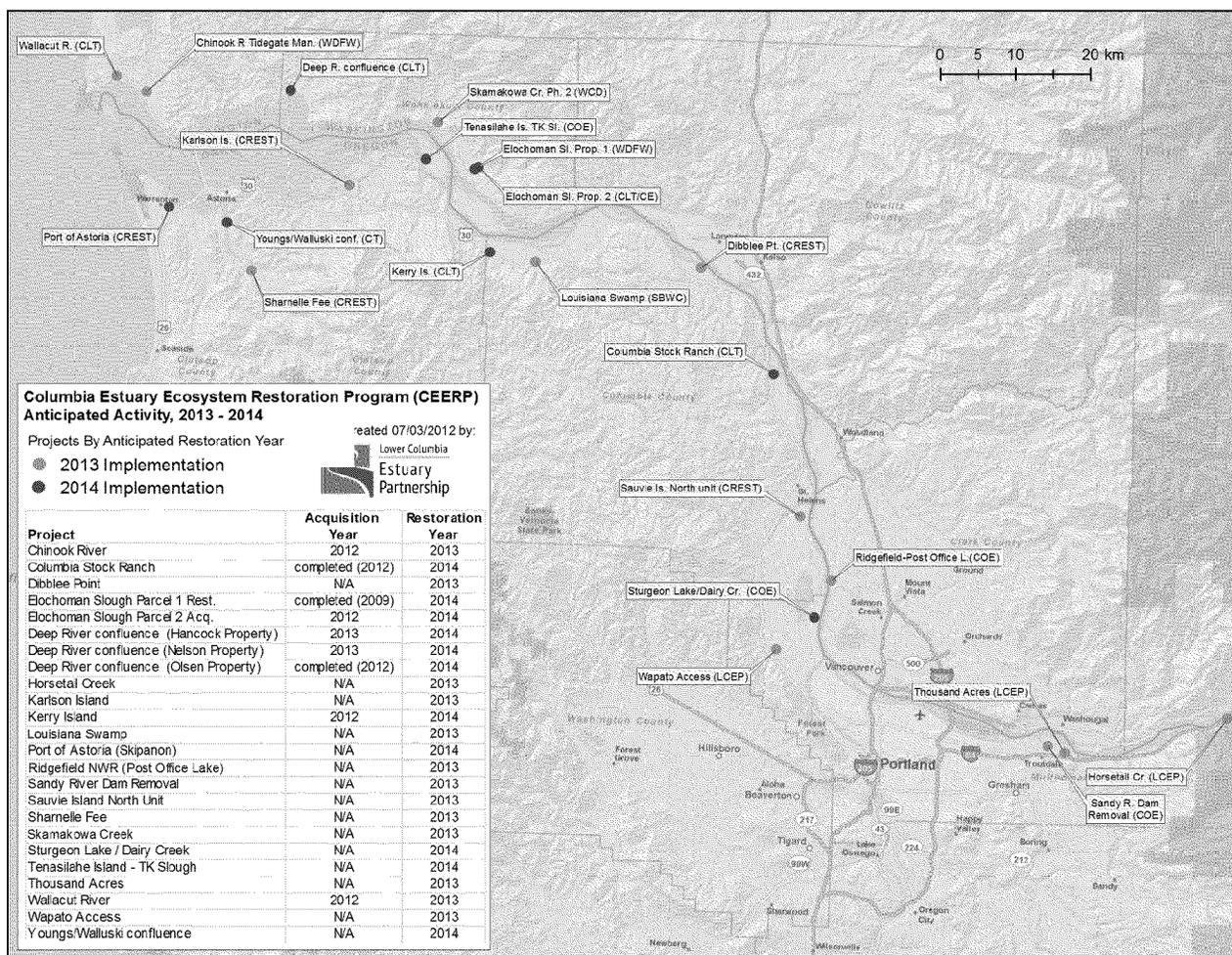


Figure 6. Map of the Inventory of Planned CEERP Projects with Project Activities Starting in 2013 with Planned On-the-Ground Implementation in 2013 and 2014.

Table 3. Inventory of Planned CEERP Projects with Project Activities Starting in 2012 with Planned On-the-Ground Implementation in 2012, 2013, and 2014. (This list is subject to change as new information becomes available.)

Restoration Project	Rkm	Construction Year(s)	Type of Restoration Action
Chinook	8*	2013	Acquisition and tide gate modification
Colewort Creek	19*	2012	Channel modification - off/side channel creation/enhancement
Columbia Stock Ranch	122	2013	Hydrologic reconnection
Dairy Creek/Sturgeon Lake	159	2013	Hydrologic reconnection
Dibblee Point	103	2013	Off/side channel creation/enhancement
East Fork Lewis	138*	2014	Culvert modification - woody debris placement

Restoration Project	Rkm	Construction Year(s)	Type of Restoration Action
Elochoman	60	2014	Culvert replacement
Gnat Creek	43*	2012	Hydrologic reconnection - dike breach/removal and dam removal
Grays Bay – Deep River Confluence	21*	2014	Hydrologic reconnection – dike breach
Honeyman Creek	140*	2012	Culvert removal
Horsetail Creek	222*	2013	Culvert modification - woody debris placement
Karlson Island	42	2013	Hydrologic reconnection - dike breach
Kerry Island	43	2014	TBD
Louisiana Swamp	77	2013	Hydrologic reconnection - dike breach
Liberty Lane (Tongue Point)	18	2012	Tide gate modification
Otter Point	19*	2012	Hydrologic reconnection - dike breach
Port of Astoria (Skipanon)	10	2014	TBD
Post Office Lake	151	2013	Hydrologic reconnection
Rinearson Slough	100	2014	Tide gate modification
Sandy River Delta	195	2012	Dam removal
Sauvie Island, North Unit 1 st Phase	143	2013	Hydrologic reconnection - remove water control structure
Sharnell Fee - Klaskanine River	19*	2013	Hydrologic reconnection - dike breach
Skamokawa Creek – Dead Slough	53*	2012	Culvert improvements
Thousand Acre	200	2013	Tide gate removal - off/side channel creation enhancement
Tenasillahe Island/ TK Slough	56	2013	Hydrologic reconnection
Wapato Access	163	2013	Off/side channel creation/enhancement
Youngs/Walluski Confluence – Restoration Phase	12	2014	TBD

3.0 RME Plan

Between 2004 and 2007, the BPA/Corps worked with the NMFS to develop a comprehensive plan for estuary RME (Johnson et al. 2008). Elements of the plan were incorporated as Reasonable and Prudent Alternatives (RPAs) 58 through 61 in the FCRPS BiOp (NMFS 2008). Today, estuary RME is conducted according to the CEERP's adaptive management process (Figure 2 and Figure 4) and is designed to provide relevant and time-critical research and monitoring information to the BPA/Corps and other CEERP stakeholders. A collaborative, adaptively managed process is used to conduct CEERP RME (Figure 7).

The BPA/Corps fund RME projects to deliver data and information to support program objectives, as explained in the 2013 CEERP Strategy (Section 2.1). Knowledge gained through RME efforts is used to

guide strategy development, management, and on-the-ground actions in the estuary. CEERP RME has specific objectives for action effectiveness monitoring and research (AEMR) and ecosystem function monitoring and research (EFMR). The RME component of the 2013 Action Plan describes RME activities in detail by RME category. This action plan specifically lists and describes the RME projects planned for CY 2013. This section closes with a description of plans for CEERP RME in 2014–2018.

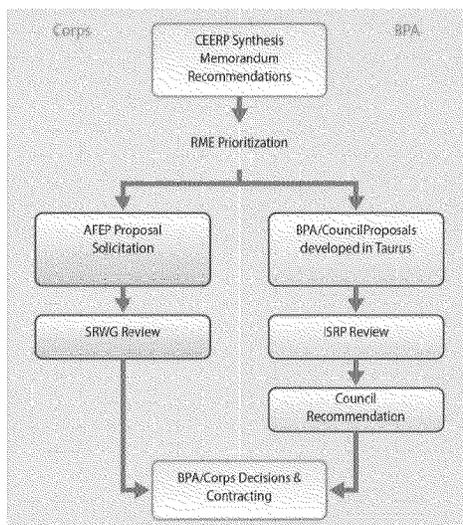


Figure 7. CEERP RME Decision Process. The Corps’ Anadromous Fish Evaluation Program process is annual and the BPA’s implementation of the Council’s Fish and Wildlife Program is on a 3-to 5-year review cycle.

3.1 Monitoring and Research Methods

The standard monitoring and research methods developed by Roegner et al. (2009) are an important component of programmatic AEMR and EFMR because they will provide a means to analyze data across space and time. The following methods by Roegner et al. (2009) cover the core indicators and are available at www.monitoringmethods.org:

- Hydrology: water-surface elevation, catchment area, tidal exchange volume, wetland delineation
- Water Quality: temperature, salinity, dissolved oxygen
- Topography/Bathymetry: elevation, sediment accretion rate, channel cross-sectional area
- Landscape: photo points, aerial photos
- Vegetation: percent cover, species composition, species richness, similarity index
- Fish: presence, abundance, species composition, size structure.

Johnson et al. (2008; Appendix C) provide information about methods for other more intensive indicators and indicators for EFMR. Material for each monitored indicator includes a description, the data collection method, and reference(s) for an example protocol. Project sponsors and AEMR practitioners will work together to identify the most appropriate methods given the specific monitored indicators and priorities for particular restoration project and programmatic objectives. Every effort will be made to use standard methodologies to facilitate synthesis and evaluation at the program-level.

3.2 2013 RME Projects

As stated in the CEERP 2013 Strategy Report, the CEERP's general RME strategies are to conduct AEMR and EFMR to support CEERP decision-making. The BPA/Corps plan to fund four RME projects during CY 2013 to contribute toward meeting these needs (Table 4).

CEERP RME projects for 2013 include one status and trends monitoring (STM) project (Ecosystem Monitoring), one critical uncertainties research (CUR) project (Contributions to Salmon Recovery), and two AEMR projects (Multi-Scale AEMR and Synthesis and Evaluation). The sampling sites for the projects are located throughout the LCRE. The RME projects have direct application to the CEERP objectives outlined in Section 1.1. This information illustrates the relationship of RME and outcomes to CEERP decision-making and program goals. The emphasis on synthesis is responsive to Council/ISRP concerns.

Table 4. 2013 CEERP RME Projects. (This list is subject to change.)

Project	RPA	Project No.	Lead Entity/ Collaborators	Status/Description	Deliverables/Products
Ecosystem Monitoring	58,59, 60	BPA 2003-007-00	EP/PNNL,USGS, NMFS, CREST, CT	Ongoing; ecological data at sentinel sites and rotational panel design; 2012 pre- & post-const. AEMR ^(a)	Trends in ecological conditions in LCRE wetlands; final Columbia River Estuary Ecosystem Classification System; AEMR data
Contributions to Salmon Recovery	61	AFEP EST-P-09-01	NMFS/UW,OSU, OHSU	Ongoing; synoptic determination of genetic stocks; fish/habitat assoc.	LCRE's contribution to salmon genetic and life-history diversity and implications for habitat restoration
Multi-scale AEMR	60	AFEP EST-P-11-01	PNNL/ODFW,UW, NMFS,USFWS	Ongoing; site-, landscape-, and estuary-scale data collection and analyses; in 2012 includes EST-P-05-07 (JBH)	Project-specific AER data, landscape-scale estimates of juvenile salmon density, associations between juvenile salmon density and habitat features, residence times, migration pathways, and estuary-wide analyses of AEMR
Synthesis and Evaluation	all	EST-P-12-01	PNNL	New project FY 2012; planned 3-year effort	Regional coordination; geospatial relational database for CEERP restoration and RME data

3.3 AEMR Sites

The ongoing and upcoming restoration projects are listed to provide the universe of potential sites for AEMR (Table 5; Figure 8). We plan to set AEMR prioritization levels for these projects using the criteria and priorities described in the 2013 Strategy Report (see Section 5.1.3).

Every restoration project will have a written plan for AEMR. Such plans can range from a paragraph describing pre- and post-restoration site conditions coupled with photo points to an intensive research design to be carried out over 5 to 10 years. AEMR plans will be restoration project-specific, depending on local conditions, type of restoration, available funding and time, and other factors. Johnson et al. (2012) provide a template for project-specific AEMR plans consistent with the adaptive management process and the project description templates (ERTG 2010a). The point is to document, coordinate, and

obtain management review and approval of the plan for site-specific AEMR before field work commences.

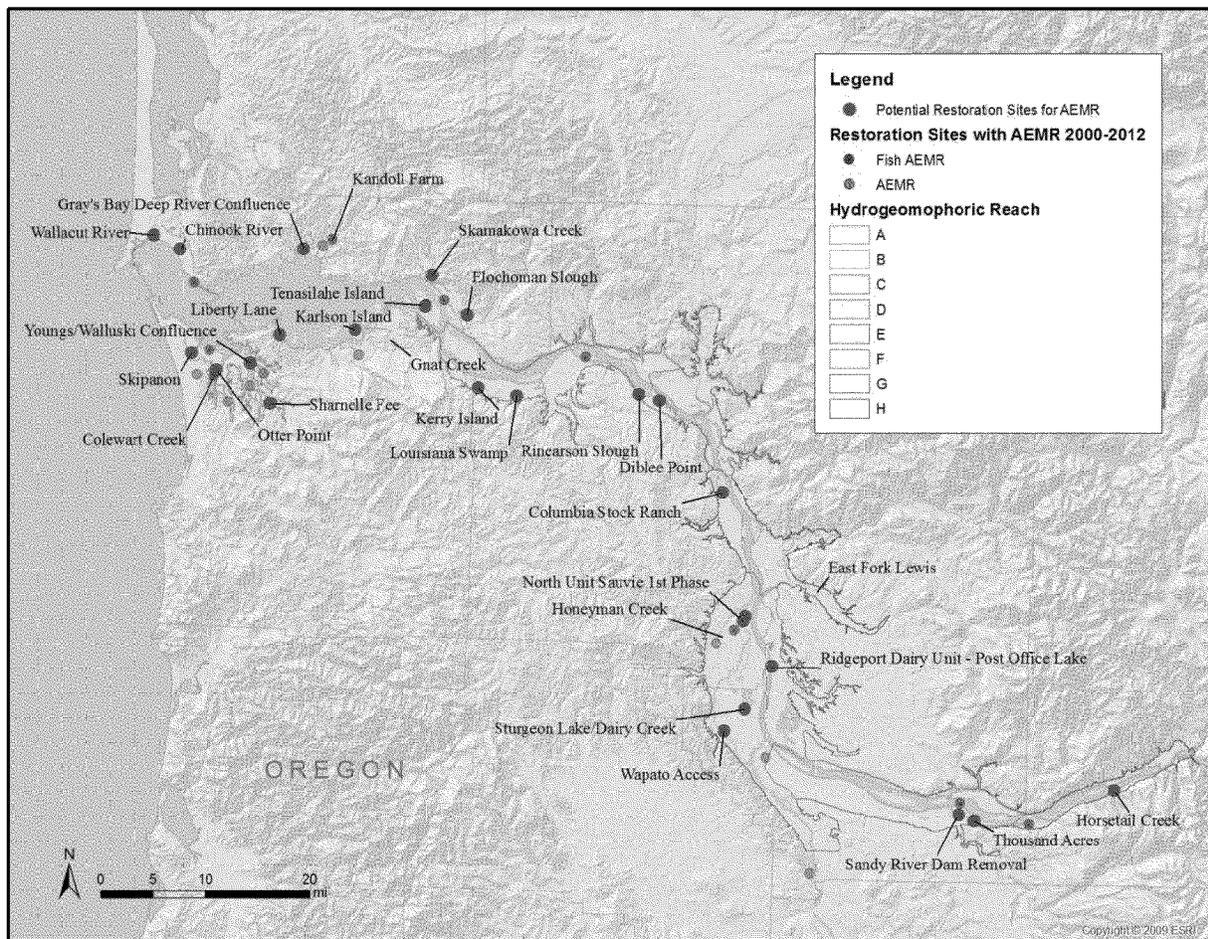


Figure 8. Map of Previous and Potential New AEMR Sites

Table 5. Prioritization of AEMR Level (Table 3) for Ongoing and Upcoming 2012–2014 Restoration Projects. *These sites are located up tributaries, therefore the distance from the Columbia River mouth represents the distance to the mouth of the tributary, not the distance up the tributary. Last two columns to be developed at a later date for use in FY 2014. Scheduled to be completed in fall 2012.

Restoration Project	Type of Restoration Action	AEMR Level	Priority Score
Chinook	Acquisition and tide gate modification		
Colewort Creek	Channel modification - off/side channel creation/ enhancement		
Columbia Stock Ranch	Hydrologic reconnection		
Dairy Creek/Strugeon Lake	Hydrologic reconnection		
Dibblee Point	Off/side channel creation/ enhancement		
East Fork Lewis	Culvert modification - woody debris placement		
Elochoman	Culvert replacement		
Gnat Creek	Hydrologic reconnection - dike breach/removal and dam removal		
Grays Bay – Deep River Confluence	Hydrologic reconnection – dike breach		
Honeyman Creek	Culvert removal		
Horsetail Creek	Culvert modification - woody debris placement		
Karlson Island	Hydrologic reconnection - dike breach		
Kerry Island	TBD		
Louisiana Swamp	Hydrologic reconnection - dike breach		
Liberty Lane (Tongue Point)	Tide gate modification		
Otter Point	Hydrologic reconnection - dike breach		
Port of Astoria (Skipanon)	TBD		
Post Office Lake	Hydrologic reconnection		
Rinearson Slough	Tide gate modification		
Sandy River Delta	Dam removal		
Sauvie Island, North Unit 1 st Phase	Hydrologic reconnection - remove water control structure		
Sharnell Fee - Klaskanine River	Hydrologic reconnection - dike breach		
Skamokawa Creek – Dead Slough	Culvert improvements		
Thousand Acre	Tide gate removal - off/side channel creation enhancement		
Tenasillahe Island/ TK Slough	Hydrologic reconnection		
Wapato Access	Off/side channel creation/enhancement		
Youngs/Walluski Confluence – Restoration Phase	TBD		

3.4 Out-Year (2014–2018) RME Projects

The CEERP has three projects tentatively scheduled through 2018: Ecosystem Monitoring, Contributions to Salmon Recovery, and Multi-Scale AEMR (Table 6). (All projects are reviewed and funded on an annual basis and, hence, are subject to change or cancellation.) The four projects ending in the next few years will produce important data and products that the BPA/Corps will synthesize, evaluate, and use to inform strategy in the CEERP adaptive management process. Prioritization of RME work will be necessary due to budget constraints.

Table 6. RME Project Inventory – Out-Year Plans (CY 2013–2018). (This list is subject to change.)

Project Name	2013	2014	2015	2016	2017	2018	Comment
Ecosystem Monitoring	EFMR, AEMR	EFMR, AEMR	EFMR, AEMR	EFMR, AEMR	EFMR, AEMR	EFMR, AEMR	Synthesis of status and trends of LCRE ecosystems
Contributions to Salmon Recovery	EFMR	EFMR	EFMR	EFMR	EFMR	EFMR	Culminates with recommendations for actions for salmon recovery; MOA project to end in 2018
Multi-Scale AEMR	AEMR	AEMR	AEMR	AEMR	AEMR	AEMR	MOA project to end in 2018; continue to emphasize AEMR
Synthesis and Evaluation	Database development; CEERP documents	Database development; CEERP documents	Final report for 2014 project				Project to be completed in 2015; new project to be considered for annual CEERP documents

4.0 Programmatic Infrastructure

This final section concerns a critical element of the CEERP Action Plan, a description of the programmatic infrastructure. An effective and useful program requires infrastructure. This entails an adaptive management framework (described above), coordination and peer-review processes, project-specific AEMR plans, centralized data management, reporting and communications mechanisms, and leadership. Most importantly, there must be a commitment from all stakeholders to participate and cooperate in the conduct of CEERP and its overall adaptive management framework to produce results that meet program goals and objectives.

4.1 Coordination and Peer-Review

Public engagement and stakeholder outreach are a fundamental part of the CEERP program. Examples of formal outreach include the biannual Columbia River Estuary Conference, the Estuary

Partnership's Science to Policy Forum, and Council's Geographic review process. Additionally, we fund sponsors to conduct outreach and coordination as part of their project development work. Columbia Land Trust, CREST, the Cowlitz Indian Tribe, WDFW, and the Estuary Partnership all have explicit landowner coordination tasks in their contracts. These partners often live and work in the same communities where restoration occurs, positioning them to effectively build support for our program. Also, BPA and the Corps are required to conduct public outreach as part of the NEPA process and have environmental compliance and public affairs staff that routinely coordinate with local officials and others. Additionally our restoration authorities require public outreach and involvement. Without the public support the goals and objective of the CEERP Program would be impossible.

CEERP coordination involves using existing processes whenever possible to provide efficiency. CEERP RME is funded by BPA through the Council's Fish and Wildlife Program and by the Corps through the AFEP. Both programs have well-defined coordination and review processes. For example, the annual AFEP review and coordination cycle involves identifying research priorities based on management needs, developing and reviewing preliminary research proposals, finalizing the research scopes of work, and disseminating results in reports and the annual AFEP review conference. The Estuary/Ocean Subgroup for federal RME coordinates overall estuary RME planning and implementation. In addition, the EP has its SWG, where CEERP activities are communicated and discussed and restoration projects are reviewed technically. The EP also convenes an annual coordination meeting of the BPA/Corps, NMFS, and other entities charged with research and monitoring in the estuary. Furthermore, the BPA/Corps coordinate CEERP RME with other basin-wide RME groups, other federal monitoring programs, interested parties, and state and local monitoring efforts. Finally, the BPA/Corps have cross-agency coordination meetings to ensure consistent estuary RME and CEERP implementation.

Peer review takes place during coordination meetings and reviews. For example, the SRWG provides peer-review of preliminary and final proposals and draft technical reports from the Corps' RME projects in the LCRE. Other important peer-review is provided by the Independent Scientific Advisory Board (ISAB) and the ISRP of the Council's Fish and Wildlife Program. During summer 2012, the ISAB is scheduled to review the CEERP 2012 Synthesis Memorandum. And, during fall 2012, the ISRP is slated to review the BPA's LCRE habitat restoration projects, whose strategies and designs will be informed by CEERP strategies and RME findings.

Periodic calls, meetings, and events to coordinate, plan, and exchange information and conduct peer-review relevant to the CEERP include the following, organized by periodicity (points of contact are in parentheses):

Weekly or Bi-Weekly

- BPA/Corps Coordination Committee (Zelinsky/Ebberts)
- ERTG Steering Committee (Zelinsky/Ebberts)
- BPA/Corps/WDFW for the Washington MOA (Karnezis, Ebberts, and Vigg)

Monthly

- ERTG with region or Steering Committee (Zelinsky/Ebberts)
- BPA/Corps/Restoration Project Sponsors (Zelinsky, Ebberts, Corbett, McEwen, Salakory, Van Ess, Vigg)
- EP SWG (Corbett)

Quarterly

- AFEP RME coordination (Studebaker)

Semi-Annually

- EP/BPA/Corps/RME Researchers (Corbett, Studebaker, Doumbia, etc.)

Annually

- Columbia River Estuary Conference (Corbett)
- AFEP SRWG (special estuary focus; Studebaker)
- AFEP Annual Review (Studebaker)

As Needed

- Estuary/Ocean Subgroup for Federal RME (Johnson)
- ISRP/ISAB (Merrill)
- BPA/Corps Policy Executives (Maslen and Brice).

4.2 Data Management and Dissemination

Data management and dissemination are receiving increased attention because of the need to efficiently and effectively apply data in decision-making across the Columbia River basin. Data repository specifications for regional RME are being managed by the Pacific Northwest Aquatic Monitoring Partnership (PNAMP) in the www.monitoringmethods.org tool and tracked in BPA's Pisces contracting tool and the BPA Fish and Wildlife Program's Taurus reporting system at www.cbfish.org. Standardized methods for RME data have been developed to facilitate comparison of results over time for selected parameters and are documented at www.monitoringmethods.org (Johnson et al. 2008; Roegner et al. 2009). Work is underway through the EP SWG and the new Corps Synthesis and Evaluation project to coordinate data sharing and dissemination.

A database is being developed by the Corps under the Synthesis and Evaluation project (EST-P-12-01) that will include a central, web-accessible repository for LCRE data and a publicly accessible website with links to a networked system of databases. The ultimate goal of this project is a web-based, geospatial database system to be implemented within CEERP's existing adaptive management framework and used by CEERP stakeholders estuary-wide. During 2012 and 2013, data reduction protocols, data access and sharing policies, and uploading procedures will be drafted for the LCRE database. The overall objectives of this 2012–2014 project are as follows:

- Coordinate with CEERP funding agencies and regional stakeholders to ensure the database system will meet management's needs for ecosystem restoration throughout the floodplain study area of the LCRE.
- Develop and populate a web-based, publicly accessible geospatial database management and analysis system to support CEERP action planning, RME, synthesis and evaluation, strategy development, reporting, public communication, regional and basin review processes, information dissemination, and decision-making.
- Apply data and information within the CEERP adaptive management process.

Data are currently being disseminated through several avenues. Results or preliminary findings are reported for CEERP RME actions in the FCRPS BiOp annual progress reports. In addition, an annual Columbia River Estuary Conference (www.cerc.labworks.org) is convened to evaluate the CEERP RME effort, to exchange information, and to update managers regarding the status of RME efforts, as appropriate. The annual CEERP Synthesis Memorandum includes data summaries and provides adaptive management recommendations at the program level for consideration by the BPA/Corps, restoration sponsors, and other related entities. The BPA/Corps and their partners are working to schedule meetings and workshops between decision-makers and RME researchers in a manner that will facilitate basin-wide adaptive management. This step is part of the CEERP adaptive management process.

CEERP data management and dissemination are a priority for BPA/Corps. In coordination with existing data repositories managers, CEERP provides guidance and stewardship to implement data management and analysis through development of data-exchange templates and regional data repositories for fish and habitat data. The intent is improved efficiency in data management and reformatting through use of data-exchange templates and management of regional data repositories. Many monitored indicators will be included; e.g., Roegner et al. (2009) metrics and indicators. Two specific deliverables/products are anticipated: data-exchange templates for specific protocols and a regional estuarine database. The leads will be project/contract sponsors with PNAMP's and BPA/Corps' support to manage monitoring methods and the Corps for the CEERP database. Data coordination will occur in various ways, including the following as appropriate:

- monitoring protocols (www.monitoringmethods.org)
- PNAMP's STM Databank for the Integrated Status and Effectiveness Monitoring Program (<http://webapps.nwfsc.noaa.gov/>)
- Columbia Habitat Monitoring Program (CHAMP; www.champmonitoring.org/)
- The BPA Fish and Wildlife Program project tracking system (cbfish.org)
- National Oceanic and Atmospheric Administration/BPA/Corps data repositories to coordinate genetics information (<http://www.nwfsc.noaa.gov/research/divisions/cbd/standardization.cfm>)
- collaboration with PNNL for the new database development project (EST-P-12-01)
- EP's project tracking database (<http://maps.lcrep.org/>).

4.3 Reporting and Communication Mechanisms

The Synthesis Memorandum is one of three inter-related, annual CEERP deliverables; the others are the Strategy Report and Action Plan. The Synthesis Memorandum, which is informed by the site evaluation cards (SECs) and various AEMR reports, synthesizes the state of the science on salmon ecology in the LCRE and what was learned from AEMR. It provides a scientific basis for the restoration strategies described in the Strategy Report, which in turn is used to implement restoration and RME actions outlined in the companion Action Plan. Further AEMR is conducted and the results are synthesized in the next Synthesis Memorandum. The Synthesis Memorandum reports AEMR results and management applications that managers can use to make decisions.

The biennial Columbia River Estuary Conference (every even-numbered year) is a useful forum to report and communicate CEERP developments and RME findings to a wide range of participants.

Conference organizers encourage substantial exchange of new data and information among researchers, policy-makers, resource managers, and the public.

For AEMR, SECs have been designed (Johnson et al. 2012), and recently refined by the EP, so that information in the project template and the AEMR plan can be copied and pasted directly into the SEC document. SECs were first proposed by Thom et al. (2008) as a mechanism for systematically recording AEMR data from restoration projects. The intent was and still is to use the SECs to synthesize AEMR data in periodic meta-analyses. The SEC template was designed such that its utility and value depend on the ability and ease with which it can be accurately completed by a wide range of restoration personnel. If the SEC were too large, too demanding, or too complicated it would decrease the chances of its being completed. However, without the SEC, the ability to systematically capture AEMR data and use the data to respond to reporting requirements is diminished. SECs will be required for regular reporting by AEMR practitioners and will be archived in the LCRE Database.

RME projects conducting AEMR produce progress reports, technical memoranda, annual reports, and SECs. These reporting documents will be categorized and housed in an electronic library in the central LCRE Database. AEMR practitioners will strive to provide timely reporting of findings to facilitate synthesis and evaluation.

Communications that contextualize and summarize the management applications of CEERP RME findings are essential to foster program support among policy-makers and the public. For example, communication pieces from restoration program managers to a wider, non-technical audience might entail notices of key findings or accomplishments, and what they mean to society.

4.4 Schedule

Under the CEERP, project-specific restoration and RME actions take place continuously, day-to-day, nearly 365 days per year. Different projects typically have different schedules and no single annual cycle of events will fit all projects. Therefore, CEERP participants meet regularly and move projects through the project-development process. This will ensure that the adaptive management process that includes checkpoints, deliverables, and work products is fixed in time that program stakeholders can access the process for guidance and decision-making (see Section 2.1 for details about the project prioritization process). Another scheduling factor for the CEERP timeline is that it needs to meet the BPA/Corps' reporting requirements for the 2013 and 2016 comprehensive analyses for BiOp reporting (NMFS 2008).

During 2013, the schedule for the main CEERP deliverables is as follows:

- August 2013 – 2013 Synthesis Memorandum
- August 2013 – draft 2014 Strategy Report and draft 2014 Action Plan
- October 2013 – 2014 Strategy Report
- October 2013 – 2014 Action Plan.

4.5 Summary

The CEERP 2013 Action Plan is based on the BPA/Corps' fundamental strategy for estuary habitat actions and RME. That is, apply an ecosystem-based approach to restore, enhance, or create ecosystem

structures, processes, and functions in the estuary, and perform RME to assess the effectiveness of these actions, while building basic understanding of LCRE ecosystems. This strategy builds on and is consistent with the Council's Fish and Wildlife Program. The Action Plan details the approach the BPA/Corps use to develop and prioritize projects. The BPA/Corps plan to implement 16 CEERP restoration projects throughout the LCRE during CY 2013. The restoration effort will be closely coordinated with ongoing CEERP RME. Seven RME projects are queued for CY 2012, including one STM, one CUR, and five AEMR projects. CEERP uses an integrated strategy for restoration and RME, as described in the 2013 Strategy Report. Data and coordination are focus areas for CEERP managers. Periodic coordination meetings of various kinds of CEERP-related activities are scheduled. The 2013 schedule for the main CEERP deliverables is as follows: 2013 Synthesis Memorandum (August); 2014 Strategy Report (October); and 2014 Action Plan (October).

5.0 References

Action Agencies/NOBPA/Corps/NPCC RM&E Workgroup. 2010. *Recommendations for Implementing Research, Monitoring and Evaluation for the 2008 NOBPA/Corps Fisheries FCRPS BiOp*. Bonneville Power Administration, Portland, Oregon.

BPA/Corps (Bonneville Power Administration and U.S. Army Corps of Engineers). 2012a. *Columbia Estuary Ecosystem Restoration Program: 2012 Strategy Report*. Final report, Bonneville Power Administration and U.S. Army Corps of Engineers, Portland, Oregon.

BPA/Corps (Bonneville Power Administration and U.S. Army Corps of Engineers). 2012b. *Columbia Estuary Ecosystem Restoration Program: 2012 Action Plan*. Final report, Bonneville Power Administration and U.S. Army Corps of Engineers, Portland, Oregon.

Busch, D.E., Trexler, J.C., eds., 2003. *Monitoring Ecosystems-Interdisciplinary Approaches for Evaluating Ecoregional Initiatives*. Washington, D.C., Island Press, 447 p.

Council (Northwest Power and Conservation Council). 2005. "Lower Columbia Subbasin Plan." In *Columbia River Basin Fish and Wildlife Program*. Portland, Oregon.

Council (Northwest Power and Conservation Council). 2009. *Columbia River Basin Fish and Wildlife Program*. Council Document 2009-09, Portland, Oregon. Available at <http://www.nwcouncil.org/library/2009/2009-09/>.

Diefenderfer HL, GE Johnson, NK Sather, JR Skalski, EM Dawley, AM Coleman, KG Ostrand, KC Hanson, DL Woodruff, EE Donley, Y Ke, KE Buenau, and AJ Bryson. 2011. *Evaluation of Life History Diversity, Habitat Connectivity, and Survival Benefits Associated with Habitat Restoration Actions in the Lower Columbia River and Estuary, Annual Report 2010*. PNNL-20295, prepared for the U.S. Army Corps of Engineers, Portland District, Portland, Oregon, by the Pacific Northwest National Laboratory, U.S. Fish and Wildlife Service, and University of Washington, Richland, Washington.

Endangered Species Act of 1973. 7 USC § 136; 16 USC § 1531 et seq.

ERTG (Expert Regional Technical Group). 2010a. *ERTG Template for LCRE Habitat Restoration*

Project Summary. Document # ERTG 2010-01, available from Bonneville Power Administration or the U.S. Army Corps of Engineers, Portland, Oregon.

ERTG (Expert Regional Technical Group). 2010b. *ERTG Scoring Criteria.* Document # ERTG 2010-02, Available from the Bonneville Power Administration or the U.S. Army Corps of Engineers, Portland District, Portland, Oregon.

ERTG (Expert Regional Technical Group). 2010c. *History and Development of a Method To Assign Survival Benefit Units Scoring Criteria.* Document # ERTG 2010-03, Available from the Bonneville Power Administration or the U.S. Army Corps of Engineers, Portland District, Portland, Oregon.

ERTG (Expert Regional Technical Group). 2011. *Feedback on Inputs to the Calculator to Assign Survival Benefit Units.* Document # ERTG 2011-01, Available from the Bonneville Power Administration or the U.S. Army Corps of Engineers, Portland District, Portland, Oregon.

Estuary Partnership (Lower Columbia Estuary Partnership). 2012. *A Guide to the Lower Columbia River Ecosystem Restoration Program.* Technical review draft, Lower Columbia Estuary Partnership, Portland, Oregon.

Evans NR, RM Thom, GD Williams, J Vavrinec, KL Sobocinski, LM Miller, AB Borde, VI Cullinan, JA Ward, CW May, and C Allen. 2006. *Lower Columbia River Restoration Prioritization Framework.* Prepared for the Lower Columbia River Estuary Partnership by Battelle-Pacific Northwest Division, Richland, Washington.

ISRP (Independent Scientific Review Panel). 2010. *Final RME and Artificial Production Categorical Review Report.* Document ISRP 2010-44, submitted to the Northwest Power and Planning Council, Portland, Oregon.

Johnson GE, HL Diefenderfer, BD Ebberts, C Tortorici, T Yerxa, J Leary, and J Skalski. 2008. *Research Monitoring and Evaluation for the Federal Columbia River Estuary Program.* PNNL-17300, final report for the Bonneville Power Administration, Portland, Oregon, by Pacific Northwest National Laboratory, Richland, Washington.

Johnson GE, JR Skalski, and J Tagestad. 2012. "Statistical and Other Considerations for Restoration Action-Effectiveness Monitoring and Research," pp. F.1-F.23, in: *Evaluation of Cumulative Ecosystem Response to Restoration Projects in the Lower Columbia River and Estuary*, Johnson et al. PNNL-20296, prepared for the U.S. Army Corps of Engineers, Portland District, Portland, Oregon, by Pacific Northwest National Laboratory, Richland, Washington.

Lower Columbia Fish Recovery Board. 2010. *2010 Lower Columbia Salmon Recovery and Fish & Wildlife Subbasin Plan.* Revision of the 2006 interim recovery plan for the Washington portion of the lower Columbia River recovery domain. Available at www.lcrfb.org.

National Marine Fisheries Service (NMFS). 2008. *Biological Opinion – Consultation on Remand for Operation of the Federal Columbia River Power System, 11 Bureau of Reclamation Projects in the Columbia Basin and ESA Section 10(a)(1)(A) Permit for Juvenile Fish Transportation Program.* NMFS (National Oceanic and Atmospheric Administration Fisheries) – Northwest Region, Seattle, Washington.

National Marine Fisheries Service (NMFS). 2011. Columbia River Estuary ESA Recovery Plan Module for Salmon & Steelhead. NMFS (National Oceanic and Atmospheric Administration Fisheries)–Northwest Region, Seattle, Washington.

Northwest Power Act of 1980. Public Law 96-501.

Roegner GC, HL Diefenderfer, AB Borde, RM Thom, EM Dawley, AH Whiting, SA Zimmerman, and GE Johnson. 2009. *Protocols for Monitoring Habitat Restoration Projects in the Lower Columbia River and Estuary*. NOBPA/Corps Technical Memorandum NMFS-NWFSC-97, prepared for the U.S. Army Corps of Engineers, Portland District, by NOBPA/Corps Fisheries and Pacific Northwest National Laboratory, Seattle, Washington.

Simenstad CA and JR Cordell. 2000. “Ecological Assessment Criteria for Restoring Anadromous Salmonid Habitat in Pacific Northwest Estuaries.” *Ecological Engineering* 15:283–302.

Thom RM. 2000. “Adaptive management of coastal ecosystem restoration projects.” *Ecological Engineering* 15(3–4):365–372.

Thom RM, HL Diefenderfer, BD Ebberts, GE Johnson, DA Putman, and JR Skalski. 2008. “Adaptive Management.” Chapter 3.0, in *Evaluating Cumulative Ecosystem Response to Restoration Projects in the Columbia River Estuary, Annual Report 2007*, GE Johnson and HL Diefenderfer (eds.). PNNL-17437, prepared for the U.S. Army Corps of Engineers, Portland District, Portland, Oregon, by Pacific Northwest National Laboratory, Richland, Washington, and the National Marine Fisheries Service, Seattle, Washington.

Thom RM, GE Johnson, BD Ebberts, CL Studebaker, HL Diefenderfer, and C Corbett. 2012. “Adaptive Management of Ecosystem Restoration in the Lower Columbia River and Estuary.” Pp. 3.1–3.23, in: *Evaluation of Cumulative Ecosystem Response to Restoration Projects in the Lower Columbia River and Estuary*, Johnson et al., PNNL-20296, prepared for the U.S. Army Corps of Engineers, Portland District, Portland, Oregon, by Pacific Northwest National Laboratory, Richland, Washington.

U.S. District Court. 2011. Opinion and Order, National Wildlife Federation et al. v National Marine Fisheries Service *et al.* Case 3:01-cv-00640-RE Document 1855 Filed 08/02/11. (Available at <http://www.salmonrecovery.gov/>.)

Washington-Action Agencies. 2009. *Estuary Habitat MOA*. Memorandum of Agreement on Columbia River Estuary Habitat Actions Between the State of Washington, the Bonneville Power Administration, U.S. Army Corps of Engineers, and U.S. Bureau of Reclamation. Available at www.salmonrecovery.gov/.