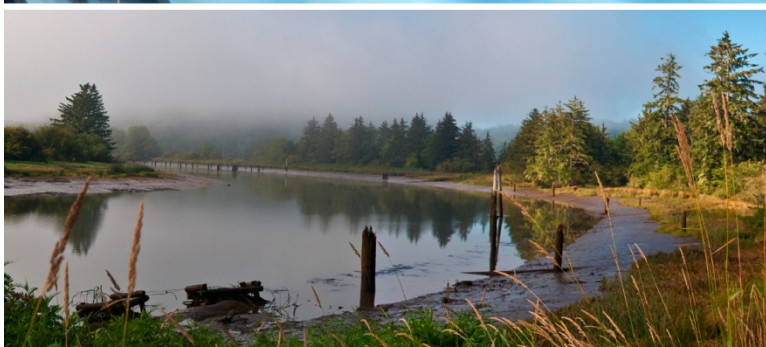




**Endangered Species Act
Federal Columbia River Power System**



**DRAFT 2014-2018
Implementation Plan**

Table of Contents

Introduction to the Implementation Plan.....	1
Reasonable and Prudent Alternative (RPA) Actions	4
ADAPTIVE MANAGEMENT ACTIONS.....	4
HYDRO ACTIONS	7
HABITAT ACTIONS	48
HATCHERY ACTIONS	67
PREDATION MANAGEMENT ACTIONS	78
RESEARCH, MONITORING, AND EVALUATION ACTIONS	84
Adaptive Management Implementation Plan (AMIP) Actions – RPA Action 1A.....	131
Appendix A: Project Lists	151
Hydro Projects	151
Tributary Habitat Projects.....	152
Estuary Habitat Projects.....	179
Hatchery Projects.....	222
Predation Management Projects	225
Research Monitoring and Evaluation Projects.....	227
Appendix B: Tributary Habitat Supplemental Projects	276
Appendix C: Tributary Habitat Adaptive Management Plan	281
Appendix D: Tributary Habitat Replacement Project Strategy	284
Appendix E: Assessments - A Foundation for Successful Tributary Habitat Improvement Projects	290
Appendix F: Hydrosystem Action Updates and Clarifications.....	293

Introduction to the Implementation Plan

This Implementation Plan describes the actions that the U.S. Army Corps of Engineers (Corps), Bureau of Reclamation (Reclamation), and Bonneville Power Administration (BPA), collectively referred to as the Action Agencies, will complete from 2014 through 2018 to improve survival of salmon and steelhead listed under the Endangered Species Act (ESA), as provided by the Biological Opinion (BiOp) for the Federal Columbia River Power System (FCRPS). The actions to be carried out by the Action Agencies in this Implementation Plan are subject to congressional authority and funding. The Administration has consistently sought and received, and continues to seek appropriations, and additional authorities. The Army is committed to seeking authority necessary for increasing the current limits under Section 511(a) of WRDA 1996, P.L. 104-303 and 536 of WRDA 2000, P.L. 106-53, under established Executive Branch processes, to allow the Corps to implement RPAs that rely on these authorities. The submission of this plan to NOAA satisfies the FCRPS BiOp requirement RPA Action 1. The plan builds upon and further refines the proposed action described in the 2007 FCRPS Biological Assessment.¹

Commitments under the BiOp and this plan include:

Hydro: Configuration and operational actions to promote safe passage of juvenile and adult fish through the FCRPS represent the core of the plan.

Predators: Management of birds, fish and marine mammals that prey on salmon and steelhead.

Habitat: Improvements in tributary streams and the estuary to promote salmon survival.

Hatcheries: Use of “safety net” hatcheries and reform of hatchery practices to minimize effects on wild fish.

Accountability: Performance standards, research and monitoring, progress reports, adaptive management, and regional collaboration.

This Implementation Plan reflects expanded requirements established by NOAA under what began as the 2008 BiOp for the FCRPS. A 2010 Supplemental BiOp incorporated an Adaptive Management Implementation Plan (AMIP), which included accelerated actions, additional research, and contingency plans in the event of unexpected fish declines. The 2008 Biological Opinion and 2010 Supplemental BiOp are now collectively referred to as the FCRPS BiOp.

In August 2011, the U.S. District Court for the District of Oregon held that the FCRPS BiOp contains positive mitigation measures that provide adequate protection to the listed species through 2013, and it held that the BiOp shall remain in place and be implemented through December 31, 2013. During this time, the Court also ordered that spring and summer spill operations be implemented in a manner consistent with prior orders that adopted the Corps’ annual Fish Operations Plan. The Court, however, remanded the BiOp to NOAA to reconsider the sufficiency of habitat mitigation actions beyond 2013, and it ordered NOAA to produce a new or supplemental BiOp by January 1, 2014.²

The federal agencies have continued to fund and implement the BiOp as directed, which has included a substantial increase in expenditures since 2008. The agencies have also continued their work with states, tribes, and other regional organizations that are essential partners in fulfilling several elements of the BiOp, including habitat improvements and monitoring. Research and monitoring has found positive results, including safer dam passage for juvenile fish as well as improved fish abundance and survival following habitat improvements.

This Implementation Plan (IP) represents a collaborative effort by the Action Agencies with states, tribes, community watershed groups, and others to better describe implementation actions from 2014

¹ <http://www.salmonrecovery.gov/BiologicalOpinions/FCRPSBiOp/2008FCRPSBiOp/2007BAandCA.aspx>

² Nat’l Wildlife Fed’n v. Nat’l Marine Fisheries Serv., 839 F.Supp.2d 1117 (D. Or. 2011).

Introduction to the Implementation Plan

through 2018, while continuing to execute, track, and learn from measures already underway.³ This Implementation Plan was originally expected to include actions for implementation over the next three years. In response to the Court Order, however, the Action Agencies, with NOAA's concurrence, have expanded the Implementation Plan to describe specific actions through 2018 to support NOAA's development of a supplemental BiOp. The purposes of this Implementation Plan include:

- Determine and document strategies, priorities, actions and timetables.
- Facilitate and measure agency progress toward performance standards and targets.
- Facilitate agency management of the program and progress reporting.
- Provide a flexible framework for adapting actions and achieving results.
- Provide an opportunity for the Regional Implementation Oversight Group (RIOG) and other stakeholders to review the Action Agencies' plans and actions.

Substantial research and extensive planning stand behind the actions described in this Implementation Plan. The BiOp includes measurable performance standards, targets, and timelines that the Action Agencies will use to track their progress and adjust direction if necessary; all these elements ensure transparency and that BiOp commitments will be met. NOAA may therefore reasonably rely on the benefits of the actions described in this Implementation Plan to conclude the suite of actions avoids the likelihood of jeopardizing listed salmon and steelhead or adversely modifying their designated critical habitat. The following Action Agency commitments further underscore the reliability of the mitigation program:

- The Action Agencies adopted records of decision to implement the BiOp, and BPA has included funding commitments in its rate case proceedings.
- Each agency has dedicated extensive staff and other resources to carrying out the BiOp.
- The Action Agencies have joined states and tribes in signing the Columbia Basin Fish Accords, which ensure funding for the duration of the BiOp and reinforce the common goal of delivering benefits for fish.

How the Implementation Plan is Organized

This Implementation Plan is broken into several sections:

- A brief introduction to the Implementation Plan (this section)
- A table arranged Reasonable and Prudent Alternative (RPA) Action by RPA Action
- Several appendices, including specific project lists.

The largest section of this document is the extended table "Reasonable and Prudent Alternative Implementation Plan," which covers the implementation of the 73 Actions, AMIP actions and 2010 BiOp amendments that make up the RPA. This table shows the reader how each RPA Action will be addressed through the remainder of the BiOp period. The table includes four columns: the RPA Action number from the 2008 BiOp, the description of the RPA Action verbatim from the 2008 BiOp, the description of 2014-2018 implementation actions, and finally, an adaptive management column that describes changes based on the best science available. As in the 2010-2013 Implementation Plan, some complex RPA Actions are discussed in parts so that the reader can see how each aspect of the RPA Action will be addressed.

Some RPA actions are complete, with no future actions described in the 2014-2018 Implementation Plan. Other actions are ongoing and some are very complex, so a full description of the 2014-2018 action is not possible in the table. For this reason, the reader is often referred (usually by a link) to a

³The implementation of the RPA includes regional collaboration through forums including the Regional Implementation Oversight Group (RIOG). As described in the FCRPS BiOp and related documents, the RIOG was established to provide a regional forum that includes federal, state and tribal policy representatives and other officials for discussion and coordination of the implementation of the FCRPS and related BiOps. This includes coordination of technical matters associated with implementation of the FCRPS BiOp (e.g. Technical Management Team (TMT) and System Configuration Team (SCT)).

Introduction to the Implementation Plan

collaboratively developed document that contains specifics related to the RPA Action, such as the annual Water Management Plan. Some of these reference documents are large, detailed, and have been a part of regularly scheduled sovereign coordination on annual operations for many years.

*Endangered Species Act
Federal Columbia River Power System
2014-2018 Implementation Plan*

Reasonable and Prudent Alternative (RPA) Actions

ADAPTIVE MANAGEMENT ACTIONS

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>The Action Agencies will continue collaboration with States and Tribes in the implementation of RPA actions, progress reporting, and adaptive management using regional forums such as the Regional Implementation Oversight Group, as described in their Biological Assessment, Section 2.1.</i>			
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	The 2014-2018 Implementation Plan identifies actions through the 2014-2018 period. An Implementation Plan update will be submitted in 2016 to provide additional detail, as appropriate, for remaining actions through 2018.	

Reasonable and Prudent Alternative (RPA) Actions – RPA Implementation Plan Summary

Action No.	Action Description	2014-2018 Actions	Adaptive Management
	in this Biological Opinion or if re-initiation triggers defined in 50 CFR 402.16 have been exceeded.		
2	<p>Annual Progress Reports</p> <p>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.</p>	The Action Agencies will submit Annual Progress Reports in September 2014, 2015, <i>PLACEHOLDER for out-year plan.</i>	Since 2010, NOAA Fisheries annually provides the Action Agencies with a scientific literature review regarding habitat and ocean conditions, habitat project priorities, and forecasting and modeling results to ensure that the latest scientific information on climate change is considered throughout implementation of the RPA actions. [Adaptive Management Implementation Plan (AMIP) p. 12]
3	<p>Comprehensive RPA Evaluations</p> <p>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</p>	<i>PLACEHOLDER per further discussion with NOAA</i>	

Reasonable and Prudent Alternative (RPA) Actions – RPA Implementation Plan Summary

Action No.	Action Description	2014-2018 Actions	Adaptive Management
	<p>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 reinitiation triggers defined.</p>		

HYDRO ACTIONS

The overall hydropower objective for all ESUs is to improve the survival of juvenile and adult fish as they pass through the hydrosystem. The Action Agencies will pursue four strategies to meet this overall objective:

- *Hydropower Strategy 1—Operate the FCRPS to provide flows and water quality to improve juvenile and adult fish survival*
- *Hydropower Strategy 2—Modify Columbia and Snake River dams to maximize juvenile and adult fish survival*
- *Hydropower Strategy 3—Implement spill and juvenile transportation improvements at Columbia River and Snake River dams*
- *Hydropower Strategy 4—Operate and maintain facilities at Corps mainstem projects to maintain biological performance*

Each strategy consists of one or more specific actions. These are summarized in the following sections.

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>Hydropower Strategy 1—Operate the FCRPS to Provide Flows and Water Quality to Improve Juvenile and Adult Fish Survival</i>			
4	Storage Project Operations The Action Agencies will operate the FCRPS storage projects (Libby, Hungry Horse, Albeni Falls, Grand Coulee and Dworshak projects) for flow management (see FCRPS Biological Assessment, Appendix B.2-1, for pertinent discussion and Table B.2.1-2 for a summary of seasonal flow objectives and planning dates for the mainstem Columbia and Snake rivers) to aid anadromous fish. Specific operations for each storage project are identified in Table 1 below. These storage project operations will be included in the Water Management Plan. These projects are operated for multiple purposes including fish and wildlife, flood control, irrigation, navigation, power, and recreation. Table 1 primarily identifies operations that are designed to benefit flow management specifically for listed species. For more detail on the operation of storage projects for other purposes see Appendix B.1.	The Action Agencies will continue to operate the FCRPS storage projects for flow management as set out in the annual Water Management Plan (WMP), which is available in draft form each December and final form each April. The plans for the operation of storage projects are described in the annual WMPs and will be posted to the Technical Management Team (TMT) website at http://www.nwd-wc.usace.army.mil/tmt . The WMP will also address hydro system priorities and clarify which operations take precedence when conflicts exist.	The Water Management Plan will continue to document adaptive management adjustments to the operation of the hydro system and implementation of the related RPA actions that have been coordinated regionally and with NOAA.

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>Hydropower Strategy 1—Operate the FCRPS to Provide Flows and Water Quality to Improve Juvenile and Adult Fish Survival</i>			
5	<p>Lower Columbia and Snake River Operations</p> <p>The Action Agencies will operate the FCRPS run-of-river mainstem lower Columbia River and Snake River projects (Bonneville, The Dalles, John Day, McNary, Ice Harbor, Lower Monumental, Little Goose, and Lower Granite projects) to minimize water travel time through the lower Columbia and Snake rivers to aid in juvenile fish passage as defined below. These projects are operated for multiple purposes including fish and wildlife, irrigation, navigation, power, recreation, and limited flood control. The following description primarily identifies operations that are designed to benefit listed anadromous species.</p>	<p>The Action Agencies will continue to operate the FCRPS storage projects for flow management as set out in the annual WMP. These plans for the operation of storage projects are described in the annual WMPs and will be posted to the TMT website at http://www.nwd-wc.usace.army.mil/tmt.</p> <p>The water management plan will also address hydro system priorities and clarify which operations take precedence when conflicts exist.</p>	
	<p>Lower Snake River projects (Ice Harbor, Lower Monumental, Little Goose and Lower Granite projects) will be operated at minimum operating pool (MOP) with a 1-foot operating range from April 3 until small numbers of juvenile migrants are present (approximately September 1) unless adjusted to meet authorized project purposes, primarily navigation. Lower Granite reservoir may be raised as needed after September 1, in order to operate the adult fish holding facilities to support brood stock collection.</p>	<p>Lower Snake River Projects will be operated at minimum operating pool (MOP) with a 1-foot operating range from April 3 to approximately September 1 as described in the annual WMP. Operations outside this range during this period will be coordinated with the appropriate agencies (the Corps' Reservoir Control Center [RCC] and the TMT) using procedures described within each annual WMP available at http://www.nwd-wc.usace.army.mil/tmt.</p>	<p>Since 2011, the Lower Granite pool has been operated from MOP up to MOP +2 ft., depending on river flow (variable MOP). This operation was implemented to provide additional depth and ensure safe navigation near the confluence of the Clearwater and lower Snake rivers where considerable silting has accumulated in the navigation channel. The Corps has developed a draft Programmatic Sediment Management Plan and a draft Environmental Impact</p>

Reasonable and Prudent Alternative (RPA) Actions – RPA Implementation Plan Summary

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>Hydropower Strategy 1—Operate the FCRPS to Provide Flows and Water Quality to Improve Juvenile and Adult Fish Survival</i>			
			Statement (EIS). It is anticipated that a Record of Decision will be issued in 2013. The draft Plan and EIS include alternatives that implement maintenance dredging in the near term. If maintenance dredging occurs, the Lower Granite pool will return to a MOP operation during the fish passage season.
	Except for the John Day Project, the Lower Columbia River projects (Bonneville, The Dalles, and McNary) will be operated at normal operating range for each project. John Day Reservoir will be operated at the lowest elevation (elevation 262.5 to 264.0) (with a 1.5-foot operating range) that continues to allow irrigation withdrawals from April 10 through September 30. Slight deviations from these levels, based on navigation needs, load following, and operational sensitivity, may be required on occasion.	Bonneville, The Dalles and McNary dams will be operated within normal operating ranges, and John Day Dam will continue to be operated at the lowest elevation (elevation 262.5 to 264.0) as described in the annual WMP. Operation outside of these prescribed ranges will be coordinated with the appropriate agencies (the Corps' RCC and the TMT) as described in the annual WMP available at http://www.nwdwc.usace.army.mil/tmt .	
	These run-of-river operations will be included in the annual WMP.	Included in the WMP as described above.	
6	In-Season Water Management Prioritization of the use of flow augmentation water is done through in-season management by the Regional Forum (see FCRPS BA Appendix B.2.1). Each fall, the Action Agencies will prepare an annual Water Management Plan (WMP) and seasonal updates that describe planned hydrosystem fish operations	The Action Agencies will continue to prioritize the use of flow augmentation water through in-season management by the Regional Forum. The annual WMP will be developed and submitted by the Action Agencies consistent with the schedule identified in the RPA and will be posted to the TMT website at http://www.nwdwc.usace.army.mil/tmt .	In coordination with TMT, it was decided in May 2010, that it was more effective to provide updates throughout the water year by providing ongoing WMP Seasonal Update documents that would be posted periodically throughout the water year as information

Reasonable and Prudent Alternative (RPA) Actions – RPA Implementation Plan Summary

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>Hydropower Strategy 1—Operate the FCRPS to Provide Flows and Water Quality to Improve Juvenile and Adult Fish Survival</i>			
	for the upcoming fall and winter, and for the spring, and summer passage seasons. The annual WMP strives to achieve the best possible mainstem passage conditions, recognizing the priorities established in the FCRPS BA and the need to balance the limited water and storage resources available in the region. Fall/winter and spring/summer updates are prepared as more data is available on the water conditions for that year.	The WMP seasonal update document will also be posted a minimum of two times per water year with a goal of updating at a greater frequency as operations develop during the year. These changes to the updating mechanism to the WMP were coordinated with the TMT and implemented beginning in the 2011 water year.	<p>on conditions and operations becomes available. The seasonal update includes a table of WMP sections, elements and operations with the date of the most recent update.</p> <p>There are several FCRPS operation criteria that are based on “final” forecasted water supplies provided by the Northwest River Forecast Center (NWRFC) (see 2013 Water Management Plan dated December 31, 2012, Table 4). Prior to 2012, the NWRFC “final” forecast was prepared once each month. In 2012, NWRFC eliminated the distribution of their Multiple Linear Regression Water Supply Forecasts as their “official” forecast (monthly final forecasts). They changed to Ensemble Streamflow Prediction (ESP) forecast which use physical based equations to produce a collection of possible streamflows. The NWRFC now produces 3 ESP forecasts each week (or more often) that are differentiated by the number of days of deterministic weather forecasts. The ESP forecast for</p>

Reasonable and Prudent Alternative (RPA) Actions – RPA Implementation Plan Summary

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>Hydropower Strategy 1—Operate the FCRPS to Provide Flows and Water Quality to Improve Juvenile and Adult Fish Survival</i>			
			The Dalles and Lower Granite released closest to and/or prior to the 5th working day of the month will be used in place of what was previously used as the “Final” forecast for each month.
	A draft update of the WMP will be prepared by October 1 each year, with a final plan completed by January 1.	See above.	
	The fall/winter update to the WMP will be drafted by November 1 and finalized by January 1.	See above.	
7	Forecasting and Climate Change/Variability The Action Agencies will hold annual forecast performance reviews looking at in-place tools for seasonal volume forecasts and to report on the effectiveness of experimental or developing/emerging technologies and procedures. As new procedures and techniques become available and are identified to have significant potential to reduce forecast error and improve the reliability of a forecast, the Action Agencies will discuss the implementation possibilities with regional interests. The purpose is to improve upon achieving upper rule curve elevations by reducing forecasts errors and thereby providing for improved spring flows.	The Action Agencies, working through the Columbia River Forecast Group (CRFG), will continue to support the advancement of forecasting skill, products, and techniques in the Columbia River Basin for the purpose of improving reservoir operations. This includes both longer-term water supply, and shorter-term streamflow forecasting. The CRFG will: <ul style="list-style-type: none"> • Develop annual work plans to prioritize and focus the group efforts each year, • Review annual forecast performance and assess potential forecasting technique improvements and products, • Review new and emerging climate change science, and evaluate how this information may be used in developing forecasting products, and • Prepare and publicly share an annual 	The Corps of Engineers completed an updated Principle Components Regression (PCR) runoff volume forecast for Dworshak Reservoir in 2012. The objectives of the forecast update include: <ul style="list-style-type: none"> • Provide a more accurate forecast • Enhance basin coverage with increased number of Snow Water Equivalent (SWE) stations employed to capture an unusual snowpack distribution • Reduce maximum (extreme) forecast errors • Eliminate the use of prior month’s basin conditions to forecast the current

Reasonable and Prudent Alternative (RPA) Actions – RPA Implementation Plan Summary

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>Hydropower Strategy 1—Operate the FCRPS to Provide Flows and Water Quality to Improve Juvenile and Adult Fish Survival</i>			
		<p>summary of the group's activities, achievements and recommendations.</p> <ul style="list-style-type: none"> The use of particular forecast for system operations will be re-evaluated annually (See RPA Action 6, Adaptive Management). If biases or undesirable forecast trend emerge, or the forecast products issued by NWRFC change, the Action Agencies will collaborate with the CRFG and the Columbia River Treaty Hydromet Committee to determine which is the "best" forecast to use for system operations. 	<p>month. This means the forecast will better reflect changing basin conditions</p> <ul style="list-style-type: none"> Provide more consistency in snow stations employed during drawdown and refill periods. This allows forecasters to better evaluate month to month changes in the basin state Provide ability to make correction to the forecast when the official runoff volume forecast is not supported by basin conditions <p>Pending regional review of the updated volume forecast, the PCR volume forecast will be the official forecast for Dworshak Reservoir.</p>
	The Action Agencies will work collaboratively with other agencies and research institutions to investigate the impacts of possible climate change scenarios to the Pacific Northwest and listed salmon and steelhead. Focus areas will cover 1) modeling the hydrology and operations of the Columbia River system using possible future climate change scenarios, 2) investigating possible adaptation strategies for the system, 3) monitoring the hydrologic system for trends, cycles, and changes, and 4) staying abreast of research and studies that address climate cycles, trends, and modeling.	<p>The Action Agencies will continue to work with the climate change research community, particularly in the Pacific Northwest, and coordinate with other efforts to model reservoir conditions and responses to climate change to assess generation impacts, flood control issues and river flow management options across the FCRPS.</p> <p>As improved observational and forecast trends emerge, the Action Agencies will integrate the new climate change data into their ongoing modeling and planning efforts.</p>	

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>Hydropower Strategy 1—Operate the FCRPS to Provide Flows and Water Quality to Improve Juvenile and Adult Fish Survival</i>			
8	<p>Operational Emergencies</p> <p>The Action Agencies will manage interruptions or adjustments in water management actions, which may occur due to unforeseen power system, flood control, navigation, dam safety, or other emergencies. Such emergency actions will be viewed by the Action Agencies as a last resort and will not be used in place of operations outlined in the annual WMP. Emergency operations will be managed in accordance with TMT Emergency Protocols, the Fish Passage Plan (FPP) and other appropriate Action Agencies emergency procedures. The Action Agencies will take all reasonable steps to limit the duration of any emergency impacting fish.</p>	<p>The protocol for communication of all types of emergencies that affect fish protection measures is identified in the July 16, 2008, TMT Emergency Protocol which can be found at http://www.nwd-wc.usace.army.mil/tmt/.</p> <p>The Generation Emergency Action Plan (Appendix 1 of the TMT Emergency Protocols, dated May 27, 2009) identifies actions to be taken in a power system emergency.</p> <p>The Transmission Emergency Action Plan (Appendix 2 of the TMT Emergency Protocols, January 2010), identifies actions to be taken in a transmission system emergency.</p> <p>The Emergency Protocols and associated appendices will be reviewed and updated in coordination with the TMT as necessary to minimize the impact on fish protection measures. These appendices are available in the WMP at http://www.nwd-wc.usace.army.mil/tmt/documents/wmp/</p>	
9	<p>Fish Emergencies</p> <p>The Action Agencies will manage operations for fish passage and protection at FCRPS facilities. They may be modified for brief periods of time due to unexpected equipment failures or other conditions. These events can result in short periods when projects are operating outside normal specifications due to unexpected or emergency events. Where there are significant biological effects of more than short duration resulting from emergencies impacting fish, the</p>	<p>Where there are significant biological effects of more than short duration resulting from emergencies impacting fish, the Action Agencies will continue to address in coordination with the appropriate in-season management Regional Forum (TMT and/or Fish Passage Operations and Management (FPOM) Workgroup) and implement appropriate adaptive management actions to address the situation.</p>	

Reasonable and Prudent Alternative (RPA) Actions – RPA Implementation Plan Summary

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>Hydropower Strategy 1—Operate the FCRPS to Provide Flows and Water Quality to Improve Juvenile and Adult Fish Survival</i>			
	Action Agencies will develop (in coordination with the in-season management Regional Forum (see BA Appendix B.2.1) and implement appropriate adaptive management actions to address the situation. The Action Agencies will take all reasonable steps to limit the duration of any fish emergency.		
10	Columbia River Treaty Storage BPA and the Corps will pursue negotiations with Canada of annual agreements to provide 1 MAF of storage in Treaty space by April 15 consistent with: <ul style="list-style-type: none"> • Providing the greatest flexibility possible for releasing water to benefit U.S. fisheries May through July • Giving preference to meeting April 10 upper rule curve elevation or achieving refill at Grand Coulee Dam over flow augmentation storage in Canada in lower water supply conditions • Releasing flow augmentation storage to avoid causing damaging flow or excessive TDG in the United States or Canada 	BPA and the Corps will pursue negotiations annually with Canada in the fall of each year with the goal of timely completing an agreement in order to store 1 MAF in treaty storage by April 15.	
	BPA and the Corps will coordinate with Federal agencies, States and Tribes on Treaty operating plans.	BPA and the Corps will continue to hold these coordination meetings in the fall and spring of each year.	
11	Non-Treaty Storage (NTS) BPA, in concert with BC Hydro, will refill the remaining non-Treaty storage space by June 30, 2011, as required under the 1990 non-Treaty storage agreement. Refill will be accomplished with minimal adverse impact to fisheries operations.	Completed. No further action required.	

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>Hydropower Strategy 1—Operate the FCRPS to Provide Flows and Water Quality to Improve Juvenile and Adult Fish Survival</i>			
12	<p>Non-Treaty Long-Term Agreement BPA will seek to negotiate a new long-term agreement on use of non-Treaty space in Canada so long as such an agreement provides both power and non-power benefits for BC Hydro, BPA, and Canadian and U.S. interests. As part of these negotiations, BPA will seek opportunities to provide benefits to ESA-listed fish, consistent with the Treaty.</p>	BPA will coordinate with Canada and regional states and tribes to shape flows for fisheries benefits consistent with the 2012 Columbia River Non-Treaty Storage Agreement (NTSA).	BPA entered into a new Columbia River NTSA with BC Hydro on April 10, 2012. The 2012 NTSA runs through 2024, and allows for coordinated use of non-treaty storage in Canada to shape flows within the year for fisheries benefits, and provides up to an additional one-half million acre-feet (MAF) water to benefit fish in the lowest water conditions (lowest 20th percentile years based on the Northwest River Forecast Center's (NWRFC) averages for their statistical period of record).
	If a new long-term non-Treaty agreement is not in place, or does not address flows for fisheries purposes, BPA will approach BC Hydro about possibly negotiating an annual/seasonal agreement to provide U.S. fisheries benefits, consistent with the Treaty.	As explained above, BPA entered into the 2012 Columbia River NTSA with BC Hydro on April 10, 2012.	
13	<p>Non-Treaty Coordination with Federal Agencies, States, and Tribes Prior to negotiations of new long-term or annual non-Treaty storage agreements, BPA will coordinate with Federal agencies, States, and Tribes to obtain ideas and information on possible points of negotiation, and will report on major developments during negotiations.</p>	No additional non-treaty storage agreements are anticipated given the current 2012 NTSA (see RPA Action 12). If any such negotiations begin, BPA will coordinate with federal agencies, states and tribes as required by the RPA Action.	

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>Hydropower Strategy 1—Operate the FCRPS to Provide Flows and Water Quality to Improve Juvenile and Adult Fish Survival</i>			
14	<p>Dry Water Year Operations</p> <p>Flow management during dry years is often critical to maintaining and improving habitat conditions for ESA-listed species. A dry water year is defined as the lowest 20th percentile years based on the Northwest River Forecast Center's (NWRFC) averages for their statistical period of record (currently 1971 to 2000) using the May final water supply forecast for the April to August period as measured at The Dalles. The Action Agencies will complete the following activities to further the continuing efforts to address the dry flow years:</p> <ul style="list-style-type: none"> • Within the defined buckets of available water (reservoir draft limits identified in RPA Action 4), flexibility will be exercised in a dry water year to distribute available water across the expected migration season to optimize biological benefits and anadromous fish survival. The Action Agencies will coordinate use of this flexibility in the Regional Forum TMT. 	<p>Within the defined buckets of available water the Action Agencies will continue to exercise flexibility in dry water years to distribute available water across the expected migration season to optimize biological benefits and anadromous fish survival. The details of this operation can be found in the WMP: http://www.nwd-wc.usace.army.mil/tmt/documents/wmp/ Additionally, in-season operations are coordinated through TMT.</p>	<p>A dry year is still defined as the lowest 20th percentile years, but the NWRFC updated their statistical period of record to 1981-2010.</p>
	<ul style="list-style-type: none"> • In dry water years, operating plans developed under the Treaty may result in Treaty reservoirs being operated below their normal refill levels in the late spring and summer, therefore, increasing flows during that period relative to a standard refill operation. • Annual agreements between the U.S. and Canadian entities to provide flow augmentation storage in Canada for U.S. fisheries needs will include provisions that 	<p>See RPA Action 10 for details about Columbia River Treaty Storage.</p>	

Reasonable and Prudent Alternative (RPA) Actions – RPA Implementation Plan Summary

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>Hydropower Strategy 1—Operate the FCRPS to Provide Flows and Water Quality to Improve Juvenile and Adult Fish Survival</i>			
	allow flexibility for the release of any stored water to provide U.S. fisheries benefits in dry water years, to the extent possible.		
	<ul style="list-style-type: none"> BPA will explore opportunities in future long-term NTS storage agreements to develop mutually beneficial in-season agreements with BC Hydro to shape water releases using NTS space within the year and between years to improve flows in the lowest 20th percentile water years to the benefit of ESA-listed ESUs, considering their status. 	See RPA Action 12 on the 2012 Non-Treaty Storage Agreement.	
	<ul style="list-style-type: none"> Upon issuance of the FCRPS Biological Opinion, the Action Agencies will convene a technical workgroup to scope and initiate investigations of alternative dry water year flow strategies to enhance flows in dry years for the benefit of ESA-listed ESUs. 	Completed, no further action planned.	The workgroup was convened 2008-2012 and recommended inclusion of the dry year provision that was adopted in the long-term NTSA (see RPA Action 12).
	<ul style="list-style-type: none"> In very dry years, the Action Agencies will maximize transport for Snake River migrants in early spring, and will continue transport through May 31 (see RPA Action 30). 	See RPA Action 30 for details about juvenile fish transportation in the Columbia and Snake rivers.	There is no longer a presumptive maximize transport operation in dry years. The Action Agencies and NOAA will convene discussions annually with the regional sovereigns to determine whether a max. transport or a mixed strategy of both spill and transport will be implemented at Snake River collector projects based on a review of biological data from the previous year. See RPA

Reasonable and Prudent Alternative (RPA) Actions – RPA Implementation Plan Summary

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>Hydropower Strategy 1—Operate the FCRPS to Provide Flows and Water Quality to Improve Juvenile and Adult Fish Survival</i>			
			Action 30.
	<ul style="list-style-type: none"> BPA will implement, as appropriate, its Guide to Tools and Principles for a Dry Year Strategy to reduce the effect energy requirements may pose to fish operations and other project purposes. 	In dry years, BPA will continue to use the Guide to Tools and Principles for a Dry Year Strategy, available at http://www.bpa.gov/power/pgp/dryyear	
15	<p>Water Quality Plan for Total Dissolved Gas and Water Temperature in the Mainstem Columbia and Snake Rivers</p> <p>The Action Agencies will continue to update the Water Quality Plan for Total Dissolved Gas and Water Temperature in the Mainstem Columbia and Snake Rivers (WQP) and implement water quality measures to enhance ESA-listed juvenile and adult fish survival and mainstem spawning and rearing habitat. The WQP is a comprehensive document which contains water quality measures needed to meet both ESA and Clean Water Act responsibilities. For purposes of this RPA, the WQP will include the following measures to address TDG and water temperature to meet ESA responsibilities:</p>	<p>An updated Water Quality Plan (WQP) for Total Dissolved Gas (TDG) and Water Temperature in the Mainstem Columbia and Snake Rivers was completed in 2009 and is available at: http://www.nwd-wc.usace.army.mil/tmt/wq/studies/wq_plan/wq200814.pdf</p> <p>The 2009 plan is being updated again and will be complete by the end of 2014.</p>	
	Real-time monitoring and reporting of TDG and temperatures measured at fixed monitoring sites,	Water quality monitoring will continue, and an annual report will be prepared and posted at http://www.nwd-wc.usace.army.mil/tmt/wqnew .	
	Continued development of fish passage strategies with less production of TDG (e.g., removable spillway weirs [RSWs]) and update the SYSTDG model to reflect modifications to spillways or spill operations,	The Action Agencies will continue to update the System Total Dissolved Gas (SYSTDG) model to reflect changes in spillway configurations, operations, or other features that affect total dissolved gas (TDG) loading and dissipation.	

Reasonable and Prudent Alternative (RPA) Actions – RPA Implementation Plan Summary

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>Hydropower Strategy 1—Operate the FCRPS to Provide Flows and Water Quality to Improve Juvenile and Adult Fish Survival</i>			
	Continued development and use of SYSTDG model for estimating TDG production to assist in real-time decision making, including improved wind forecasting capabilities as appropriate,	Annual refinements and use of the SYSTDG Model will continue. Refinements will include a statistical analysis of predictive errors, including improved wind forecasting, where available.	
	Continued development of the CE-QUAL-W2 model for estimating river temperatures from Dworshak Dam on the Clearwater and Upper Snake River near confluence with the Grand Ronde River (USGS Anatone gage) through the lower Snake River (all four Corps lower Snake River projects) to assist in real-time decision making for Dworshak Dam operations.	The CE-QUAL-W2 model has been developed and is used annually for estimating river temperatures from Dworshak Dam on the Clearwater and upper Snake rivers to assist in real-time decision making for Dworshak Dam operations.	
	Expand water temperature modeling capabilities to include the Columbia River from Grand Coulee to Bonneville dams to better assess the effect of operations or flow depletions on summer temperatures.	The Action Agencies will continue to coordinate development of temperature models or modification of existing models for the Columbia River as the need arises and parameters are determined.	The CE-QUAL-W2 Model was completed by the Corps in 2012 for Chief Joseph Dam and its pool, and for the lower Columbia River from Pasco, Washington, to the tailwater of Bonneville Dam, including McNary, John Day and The Dalles reservoirs. Reclamation completed the model development for Lake Roosevelt and Grand Coulee in fall 2012.
	Investigate alternatives to reduce total mass loading of TDG at Bonneville Dam while maintaining juvenile survival performance, and	The Action Agencies are continuing to test juvenile Performance Standards.	
	Continued operation of lower Snake River projects at MOP.	See RPA Action 5 regarding Lower Granite Dam MOP.	

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>Hydropower Strategy 1—Operate the FCRPS to Provide Flows and Water Quality to Improve Juvenile and Adult Fish Survival</i>			
16	Tributary Projects The tributary projects that have not yet completed ESA Section 7 consultation are located in the Yakima, Okanogan, and Tualatin river basins. Reclamation will, as appropriate, work with NOAA Fisheries in a timely manner to complete supplemental, project-specific consultations for these tributary projects. These supplemental consultations will address effects on tributary habitat and tributary water quality, as well as direct effects on salmon survival in the tributaries. The supplemental consultations will address effects on mainstem flows only to the extent to which they reveal additional effects on the in-stream flow regime not considered in the FCRPS and Upper Snake River BA/Comprehensive Analysis.	<p>Reclamation submitted a Biological Assessment (BA) to NOAA for the future operation and maintenance of the Tualatin Project in 2009. At that time, NOAA accepted the BA as being sufficient for initiating consultation. Currently, NOAA is developing a draft BiOp.</p> <p>Reclamation submitted a BA for the future operation and maintenance of the Okanogan Project in 2008. Since 2009, Reclamation has been collecting data in the Okanogan Basin to determine if the proposed action can be modified to address concerns raised by NOAA. It is anticipated that Reclamation will reinitiate consultation with NOAA in the 2014 through 2015 time period. For the 2014-2018 period, the objective will be to provide an updated proposed action to NOAA and to conclude Section 7 consultation with NOAA.</p> <p>Reclamation and NOAA re-initiated consultation on the Yakima Project at the end of 2012 in order to work within the context of the Yakima River Basin Integrated Water Resource Management Plan that was finalized in 2012. Currently, Reclamation and NOAA are revising the 2003 BA, the 2008 BA Supplement, and integrating new information obtained from the 2012 Integrated Water Resource Management Planning effort into a new BA and engaging in the consultation process. While the consultations have been underway, actions to protect ESA-listed species have been implemented.</p>	
17	Chum Spawning Flows Provide adequate conditions for chum spawning in the mainstem Columbia River in	The Action Agencies will continue to provide adequate conditions for chum spawning and egg incubation in the mainstem Columbia River in the	

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>Hydropower Strategy 1—Operate the FCRPS to Provide Flows and Water Quality to Improve Juvenile and Adult Fish Survival</i>			
	<p>the area of the Ives Island complex and/or access to the Hamilton and Hardy Creeks for this spawning population:</p> <ul style="list-style-type: none"> • Provide a tailwater elevation below Bonneville Dam of approximately 11.5 feet beginning the first week of November (or when chum arrive) and ending by December 31, if reservoir elevations and climate forecasts indicate this operation can be maintained through incubation and emergence. • Through TMT, if water supply is deemed insufficient to provide adequate mainstem spawning or continuous tributary access, provide, as appropriate, mainstem flow intermittently to allow fish access to tributary spawning sites if adequate spawning habitat is available in the tributaries. • Make adjustments to the tailwater elevation through the TMT process consistent with the size of the spawning population and water supply forecasts. • After the completion of spawning, use the TMT process to establish the tailwater elevation needed to provide protection for mainstem chum redds through incubation and the end of emergence. • If the emergence period extends beyond April 10th and the decision is made to maintain the tailwater, TMT will discuss the impacts of TDG associated with spill for fish in the gravel. Bonneville Dam typically starts its spring spill around April 10, but a delay in the start of spill may be 	<p>area of the Ives Island complex as described in the annual WMP (http://www.nwd-wc.usace.army.mil/tmt/documents/wmp) and coordinated through the TMT.</p>	

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>Hydropower Strategy 1—Operate the FCRPS to Provide Flows and Water Quality to Improve Juvenile and Adult Fish Survival</i>			
	<p>needed.</p> <ul style="list-style-type: none"> Revisit the chum protection level decision at least monthly through the TMT process to assure it is consistent with the need to provide spring flows for listed Columbia and Snake River stocks. 		

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>Hydropower Strategy 2—Modify Columbia and Snake River Dams to Maximize Juvenile and Adult Fish Survival</i>			
<i>Once the Action Agencies meet hydrosystem performance standards, they will ensure overall system performance through appropriate monitoring and maintenance activities. The Action Agencies will decide on the tools needed to maintain performance after coordinating with NOAA Fisheries and the regional forum.</i>			
18	Configuration and Operational Plan for Bonneville Project The Corps will consider all relevant biological criteria and prepare, in cooperation with NOAA Fisheries and the co-managing agencies, a Configuration and Operational Plan for the Bonneville Project (2008). As part of the first phase of modifications, the Corps will investigate, and implement the following reasonable and effective measures to reduce passage delay and increase survival of fish passing through the forebay, dam, and tailrace as warranted. Initial modifications will likely include:	The Bonneville Configuration and Operation Plan (COP) was completed in May 2008. Phase I actions expected to achieve the performance standards have been completed. The COP includes these completed actions, as well as potential Phase II actions that may be considered if the performance standards are not met as discussed in the AMIP. Through 2018, the Corps will complete Performance Standard Testing. If the performance standards are not met, the Corps will proceed with identifying appropriate Phase II actions outlined in the COP and implement as necessary to achieve the performance standards. See the discussion at the end of Hydropower Strategy 2 (i.e., between RPA Actions 28 and 29) for further information on scheduled performance standard testing and the process for reviewing and obtaining concurrence on testing results.	
	Bonneville Powerhouse I: <ul style="list-style-type: none"> Sluiceway modifications to optimize surface flow outlet to improve fish passage efficiency (FPE) and reduce forebay delay (2009) 	Completed in 2010.	
	<ul style="list-style-type: none"> Minimum-gap turbine runner installation to improve survival of fish passing through turbines (2009) 	Completed in 2010.	
	Bonneville Powerhouse II: <ul style="list-style-type: none"> Screened bypass system modification 	Complete design, construction, and evaluation of additional gateway and orifice improvements. Also,	The original bypass system modifications, while diverting

Reasonable and Prudent Alternative (RPA) Actions – RPA Implementation Plan Summary

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>Hydropower Strategy 2—Modify Columbia and Snake River Dams to Maximize Juvenile and Adult Fish Survival</i>			
	to improve fish guidance efficiency (FGE) and reduce gateway residence time (2008)	design and construction of turbine intake trash rack debris removal system if warranted to reduce injury.	more fish away from the turbines, also resulted in increased gateway turbulence and descaling. Additional modifications are being pursued to remedy that effect.
	<ul style="list-style-type: none"> Shallow BGS installation to increase Corner Collector efficiency and reduce forebay delay (prototype 2008) 	Completed in 2010.	The behavioral guidance structure (BGS) was installed in 2008 and tested in 2008, 2009, and 2010. Due to lower-than-expected guidance to the corner collector and high operation and maintenance costs, the BGS was removed during the winter 2010-2011 in-water work window with NOAA and regional consensus.
	Bonneville Dam Spillway: Spillway operation or structure (e.g., spillway deflectors) modification to reduce injury and improve survival of spillway passed fish; and to improve conditions for upstream migrants (2013)	A new spill pattern was developed and spill level was adjusted and tested in 2007 and 2008. Development of structural improvements is on hold pending results of performance testing. For additional information about spill operations see RPA Action 29.	
	The COP will be updated periodically and modifications may be made as new biological and engineering information is gathered. The COP and modifications will be coordinated through the Regional Forum. Comments developed by NOAA Fisheries on the draft COPs shall be reconciled by the Corps in writing to NOAA Fisheries' satisfaction before release of the	Pending Performance Standard Testing results, the COP will be updated if warranted.	

Reasonable and Prudent Alternative (RPA) Actions – RPA Implementation Plan Summary

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>Hydropower Strategy 2—Modify Columbia and Snake River Dams to Maximize Juvenile and Adult Fish Survival</i>			
	final COP. If Phase I actions fail to meet the intended biological targets, the COP will be updated to identify additional Phase II actions for further implementation.		
19	Configuration and Operational Plan for the Dalles Project The Corps will consider all relevant biological criteria and prepare, in cooperation with NOAA Fisheries and the co-managing agencies, a Configuration and Operational Plan for The Dalles Project (2008). As part of the first phase of modifications, the Corps will investigate, and implement the following reasonable and effective measures to reduce passage delay and increase survival of fish passing through the forebay, dam, and tailrace as warranted. Initial modifications will likely include:	The Dalles COP was completed in December, 2009. Phase I actions expected to achieve the performance standards have been completed. The COP includes these completed actions, as well as potential Phase II actions that may be considered if the performance standards are not met as discussed in the AMIP. Through 2018 the Corps will complete Performance Standard Testing. If the performance standards are not met, the Corps will proceed with identifying appropriate Phase II actions outlined in the COP and implement as necessary to achieve the performance standards. See the discussion at the end of Hydropower Strategy 2 (i.e., between RPA Actions 28 and 29) for further information on scheduled performance standard testing and the process for reviewing and obtaining concurrence on testing results.	
	<ul style="list-style-type: none"> Turbine operation optimization to improve overall dam survival (2011) 	Based on coordination with regional forums (e.g., FPOM and Fish Facility Design Review Work Group (FFDRWG)), no additional action is planned. See RPA Action 27 for planned turbine unit operations.	
	<ul style="list-style-type: none"> Extended tailrace spill wall to increase direct and indirect survival of spillway passed fish (2010) 	Completed in 2010.	
	The COP will be updated periodically and modifications may be altered as new biological and engineering information is	The COP will be updated as necessary pending Performance Standard Testing results.	

Reasonable and Prudent Alternative (RPA) Actions – RPA Implementation Plan Summary

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>Hydropower Strategy 2—Modify Columbia and Snake River Dams to Maximize Juvenile and Adult Fish Survival</i>			
	gathered. The COP and modifications will be coordinated through the Regional Forum. Comments developed by NOAA Fisheries on the draft COPs shall be reconciled by the Corps in writing to NOAA Fisheries' satisfaction before release of the final COP. If Phase I actions fail to meet the intended biological targets, Phase II actions, as described in the FCRPS BA—Appendix B.2.1 will be considered for further implementation.		
20	<p>Configuration and Operational Plan for John Day Project</p> <p>The Corps will consider all relevant biological criteria and prepare, in cooperation with NOAA Fisheries and the co-managing agencies, a Configuration and Operational Plan for the John Day Project (2008). As part of the first phase of modifications, the Corps will investigate, and implement the following reasonable and effective measures to reduce passage delay and increase survival of fish passing through the forebay, dam, and tailrace as warranted. Initial modifications will likely include:</p>	<p>The John Day COP was completed in 2007 and updated in 2010. Phase I actions expected to achieve the performance standards have been completed. The COP includes these completed actions, as well as potential Phase II actions that may be considered if the performance standards are not met as discussed in the AMIP.</p> <p>Through 2018 the Corps will complete Performance Standard Testing. If the performance standards are not met, the Corps will proceed with identifying appropriate Phase II actions outlined in the COP and implement as necessary to achieve the performance standards.</p> <p>See the discussion at the end of Hydropower Strategy 2 (i.e., between RPA Actions 28 and 29) for further information on scheduled performance standard testing and the process for reviewing and obtaining concurrence on testing results.</p>	
	<ul style="list-style-type: none"> Full-flow bypass and PIT-tag detection installation to reduce handling stress of bypassed fish (2007) 	Completed in 2008.	
	<ul style="list-style-type: none"> Turbine operation optimization to 	Based on coordination with regional forums (e.g.,	

Reasonable and Prudent Alternative (RPA) Actions – RPA Implementation Plan Summary

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>Hydropower Strategy 2—Modify Columbia and Snake River Dams to Maximize Juvenile and Adult Fish Survival</i>			
	improve overall dam survival (2011)	FPOM and FFDRWG) the Action Agencies at this time do not intend to implement this action.	
	<ul style="list-style-type: none"> Surface flow outlet(s) construction to increase FPE, reduce forebay delay and improve direct and indirect survival (prototype 2008 with final installation by 2013), and improve tailrace egress conditions 	Installed in 2008 and modified in 2010.	Spillway weirs were installed in spillbays 15 and 16 in 2008. After testing, they were moved to spillbays 18 and 19 and tested again.
	The COP will be updated periodically and modifications may be altered as new biological and engineering information is gathered. The COP and modifications will be coordinated through the Regional Forum. Comments developed by NOAA Fisheries on the draft COPs shall be reconciled by the Corps in writing to NOAA Fisheries' satisfaction before release of the final COP. If Phase I actions fail to meet the intended biological targets, Phase II actions, as described in the FCRPS BA – Appendix B.2.1, will be considered for further implementation.	COP scheduled to be updated following 2014 Performance Standard Testing.	
21	Configuration and Operational Plan for McNary Project The Corps will consider all relevant biological criteria and prepare, in cooperation with NOAA Fisheries and the co-managing agencies, a Configuration and Operational Plan for the McNary Project (2009). As part of the first phase of modifications, the Corps will investigate, and implement the following reasonable and effective measures to reduce passage	The COP is scheduled for completion in 2013. Phase I actions expected to achieve the performance standards have been completed. The COP will include these completed actions, as well as potential Phase II actions that may be considered if the performance standards are not met as discussed in the AMIP. Through 2018, the Corps will complete Performance Standard Testing. If the performance standards are not met, the Corps will proceed with identifying appropriate Phase II actions outlined in the COP and	

Reasonable and Prudent Alternative (RPA) Actions – RPA Implementation Plan Summary

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>Hydropower Strategy 2—Modify Columbia and Snake River Dams to Maximize Juvenile and Adult Fish Survival</i>			
	delay and increase survival of fish passing through the forebay, dam, and tailrace as warranted. Initial modifications will likely include:	implement as necessary to achieve the performance standards. See the discussion at the end of Hydropower Strategy 2 (i.e., between RPA Actions 28 and 29) for further information on scheduled Performance Standard Testing and the process for reviewing and obtaining concurrence on testing results.	
	<ul style="list-style-type: none"> • Turbine operation optimization to improve survival of fish passing through turbines (2013) 	Based on coordination with regional forums (e.g., FPOM and FFDRWG), the Action Agencies at this time do not intend to implement this action.	
	<ul style="list-style-type: none"> • Improve debris management to reduce injury of bypass and turbine passed fish (2011) 	Increase frequency of trash raking to once monthly.	
	<ul style="list-style-type: none"> • Relocate juvenile bypass outfall to improve egress, direct, and indirect survival on bypassed fish (2011) 	Construction of the new juvenile bypass outfall began in 2011 and was completed in 2012, prior to the start of the juvenile migration season. Additional modifications to the juvenile migrant collection channel (installation of bulkheads) will occur.	
	<ul style="list-style-type: none"> • Surface flow outlet installation to increase FPE, reduce forebay delay, and improve direct and indirect survival (temporary structure testing in 2007 and 2008 to develop a permanent system) 	Installation of two temporary spillway weirs was completed in 2007. Convert prototype or temporary fish passage spillway weirs to permanent installation, which requires design and construction of a feature integral to spillway weirs (upstream boat barrier) to prevent boats from passing over the dam from the forebay to the tailrace via the fish passage spillway weirs.	
	The COP will be updated periodically and modifications may be altered as new biological and engineering information is	The COP will be updated as necessary pending Performance Standard Testing results.	

Reasonable and Prudent Alternative (RPA) Actions – RPA Implementation Plan Summary

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>Hydropower Strategy 2—Modify Columbia and Snake River Dams to Maximize Juvenile and Adult Fish Survival</i>			
	gathered. The COP and modifications will be coordinated through the Regional Forum. Comments developed by NOAA Fisheries on the draft COPs shall be reconciled by the Corps in writing to NOAA Fisheries' satisfaction before release of the final COP. If Phase I actions fail to meet the intended biological targets, Phase II actions, as described in the FCRPS BA—Appendix B.2.1, will be considered for further implementation.		
22	<p>Configuration and Operational Plan for Ice Harbor Project</p> <p>The Corps will consider all relevant biological criteria and prepare, in cooperation with NOAA Fisheries and the co-managing agencies, a Configuration and Operational Plan for the Ice Harbor Project (2008). As part of the first phase of modifications, the Corps will investigate, and implement the following reasonable and effective measures to reduce passage delay and increase survival of fish passing through the forebay, dam, and tailrace as warranted. Initial modifications will likely include:</p>	<p>The COP is scheduled for completion in 2013. Phase I actions expected to achieve the performance standards have been completed. The COP will include these completed actions, as well as potential Phase II actions that may be considered if the performance standards are not met as discussed in the AMIP.</p> <p>Through 2018, the Corps will complete Performance Standard Testing. If the performance standards are not met, the Corps will proceed with identifying appropriate Phase II actions outlined in the COP and implement as necessary to achieve the performance standards.</p> <p>See the discussion at the end of Hydropower Strategy 2 (i.e., between RPA Actions 28 and 29) for further information on scheduled Performance Standard Testing and the process for reviewing and obtaining concurrence on testing results.</p>	
	<ul style="list-style-type: none"> Guidance screen modification to improve FGE (2010) 	Based on coordination with regional forums (e.g., FPOM and FFDRWG), the Action Agencies do not intend to implement this action at this time.	

Reasonable and Prudent Alternative (RPA) Actions – RPA Implementation Plan Summary

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>Hydropower Strategy 2—Modify Columbia and Snake River Dams to Maximize Juvenile and Adult Fish Survival</i>			
	<ul style="list-style-type: none"> Turbine operation optimization to improve survival of turbine passed fish (2011) 	Based on coordination with regional forums (e.g., FPOM and FFDRWG) the Action Agencies do not intend to implement this action at this time.	
	<ul style="list-style-type: none"> Spillway chute and/or deflector modification to reduce injury and improve survival of spillway passed fish through the RSW (2009) 	Based on coordination with regional forums (e.g., FPOM and FFDRWG) the Action Agencies plan to implement this action starting in 2013 with planned completion by spring 2014.	Injury and mortality rates for fish passing over the spillway weir are higher than expected. The Corps has reviewed and developed a spillway chute modification that will remedy the injury and mortality problem. It is anticipated that the modification will be completed prior to the 2014 fish passage season and prior to any further performance standard testing.
	<ul style="list-style-type: none"> Turbine unit 2 replacement to improve the survival of fish passing through turbines and reduce oil spill potential (2012) 	New turbine runners are planned to be installed in Units 2 and 3 beginning in 2015. Complete biological evaluations of new turbine runner designs once installation is complete.	
	The COP will be updated periodically and modifications may be altered as new biological and engineering information is gathered. The COP and modifications will be coordinated through the Regional Forum. Comments developed by NOAA Fisheries on the draft COPs shall be reconciled by the Corps in writing to NOAA Fisheries' satisfaction before release of the final COP. If Phase I actions fail to meet the intended biological targets, Phase II actions, as described in the FCRPS BA—Appendix B.2.1, will be considered for	The COP will be updated as necessary pending the results of Performance Standard Testing and evaluations of the new turbine units.	

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>Hydropower Strategy 2—Modify Columbia and Snake River Dams to Maximize Juvenile and Adult Fish Survival</i>			
	further implementation.		
23	<p>Configuration and Operational Plan for Lower Monumental Project</p> <p>The Corps will consider all relevant biological criteria and prepare, in cooperation with NOAA Fisheries and the co-managing agencies, a Configuration and Operational Plan for the Lower Monumental Project (2010). As part of the first phase of modifications, the Corps will investigate, and implement the following reasonable and effective measures to reduce passage delay and increase survival of fish passing through the forebay, dam, and tailrace as warranted. Initial modifications will likely include:</p>	<p>The COP is scheduled for completion in 2013. Phase I actions expected to achieve the performance standards have been completed. The COP will include these completed actions, as well as potential Phase II actions that may be considered if the performance standards are not met as discussed in the AMIP.</p> <p>Through 2018, the Corps will complete Performance Standard Testing. If the performance standards are not met, the Corps will proceed with identifying appropriate Phase II actions outlined in the COP and implement as necessary to achieve the performance standards.</p> <p>See the discussion at the end of Hydropower Strategy 2 (i.e., between RPA Actions 28 and 29) for further information on scheduled Performance Standard Testing and the process for reviewing and obtaining concurrence on testing results.</p>	
	<ul style="list-style-type: none"> Primary bypass operations with PIT-tag detection installation to reduce handling stress of bypassed fish (2007) 	Completed in 2007	
	<ul style="list-style-type: none"> Juvenile bypass system outfall relocation to improve egress, direct and indirect survival on bypassed fish (2011) 	Completed in 2012	
	<ul style="list-style-type: none"> Turbine operation optimization to improve the survival of fish passing through turbines (2013) 	Based on coordination with regional forums (e.g., FPOM and FFDRWG), the Action Agencies at this time do not intend to implement this action.	
	<ul style="list-style-type: none"> RSW installation to improve FPE, 	Completed in 2008.	

Reasonable and Prudent Alternative (RPA) Actions – RPA Implementation Plan Summary

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>Hydropower Strategy 2—Modify Columbia and Snake River Dams to Maximize Juvenile and Adult Fish Survival</i>			
	reduce forebay delay, and improve direct and indirect survival (2008)	Convert prototype or temporary fish passage spillway weir to permanent installation, which requires design and construction of a feature integral to the spillway weir (upstream boat barrier) to prevent boats from passing over the dam from the forebay to the tailrace via the fish passage spillway weir.	
	The COP will be updated periodically and modifications may be altered as new biological and engineering information is gathered. The COP and modifications will be coordinated through the Regional Forum. Comments developed by NOAA Fisheries on the draft COPs shall be reconciled by the Corps in writing to NOAA Fisheries' satisfaction before release of the final COP. If Phase I actions fail to meet the intended biological targets, Phase II actions, as described in the FCRPS BA—Appendix B.2.1, will be considered for further implementation.	The COP will be updated as necessary pending the results of performance standard testing.	
24	Configuration and Operational Plan for Little Goose Project The Corps will consider all relevant biological criteria and prepare, in cooperation with NOAA Fisheries and the co-managing agencies, a Configuration and Operational Plan for the Little Goose Project (2009). As part of the first phase of modifications, the Corps will investigate, and implement the following reasonable and effective measures to reduce passage delay and increase survival of fish passing through the forebay, dam, and tailrace as	The COP is scheduled for completion in 2013. Phase I actions expected to achieve the performance standards have been completed. The COP will include these completed actions, as well as potential Phase II actions that may be considered if the performance standards are not met as discussed in the AMIP. Through 2018, the Corps will complete Performance Standard Testing. If the performance standards are not met, the Corps will proceed with identifying appropriate Phase II actions outlined in the COP and implement as necessary to achieve the performance standards.	

Reasonable and Prudent Alternative (RPA) Actions – RPA Implementation Plan Summary

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>Hydropower Strategy 2—Modify Columbia and Snake River Dams to Maximize Juvenile and Adult Fish Survival</i>			
	warranted. Initial modifications will likely include:	See the discussion at the end of Hydropower Strategy 2 (i.e., between RPA Actions 28 and 29) for further information on scheduled performance standard testing and the process for reviewing and obtaining concurrence on testing results.	
	<ul style="list-style-type: none"> Turbine operation optimization to improve the survival of fish passing through turbines (2014) 	Based on coordination with regional forums (e.g., FPOM and FFDRWG) the Action Agencies at this time do not intend to implement this action.	
	<ul style="list-style-type: none"> Primary bypass operations with PIT-tag detection installation to reduce handling stress of bypassed fish (2008) 	Completed in 2009.	
	<ul style="list-style-type: none"> Primary bypass outfall relocation to improve egress, direct and indirect survival on bypassed fish (2009) 	Completed in 2010.	
	<ul style="list-style-type: none"> Surface spillway weir and deflector installation to improve FPE, reduce forebay delay and improve direct and indirect survival (2009) 	<p>Completed installation of the spillway weir in spillbay 8 and flow deflectors in spillbays 1 and 8 in 2009.</p> <p>Convert prototype or temporary fish passage spillway weir to permanent installation, which requires design and construction of a feature integral to the spillway weir (upstream boat barrier) to prevent boats from passing over the dam from the forebay to the tailrace via the fish passage spillway weir.</p>	
	The COP will be updated periodically and modifications may be altered as new biological and engineering information is gathered. The COP and modifications will be coordinated through the Regional Forum. Comments developed by NOAA	The COP will be updated as necessary pending the results of Performance Standard Testing.	

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>Hydropower Strategy 2—Modify Columbia and Snake River Dams to Maximize Juvenile and Adult Fish Survival</i>			
	Fisheries on the draft COPs shall be reconciled by the Corps in writing to NOAA Fisheries' satisfaction before release of the final COP. If Phase I actions fail to meet the intended biological targets, Phase II actions as described in the FCRPS BA—Appendix B.2.1 will be considered for further implementation.		
25	Configuration and Operational Plan for Lower Granite Project The Corps will consider all relevant biological criteria and prepare, in cooperation with NOAA Fisheries and the co-managing agencies, a Configuration and Operational Plan for Lower Granite Project (2009). As part of the first phase of modifications, the Corps will investigate, and implement the following reasonable and effective measures to reduce passage delay and increase survival of fish passing through the forebay, dam, and tailrace as warranted. Initial modifications will likely include:	A draft COP will be distributed in 2013. The COP will include actions expected to meet the performance standards, as well as potential Phase II actions that may be considered if the performance standards are not met as discussed in the AMIP. Through 2018, the Corps will complete Performance Standard Testing. If the performance standards are not met, the Corps will proceed with identifying appropriate Phase II actions outlined in the COP and implement as necessary to achieve the performance standards. See the discussion at the end of Hydropower Strategy 2 (i.e., between RPA Actions 28 and 29) for further information on scheduled performance standard testing and the process for reviewing and obtaining concurrence on testing results.	
	<ul style="list-style-type: none"> New juvenile fish facility including orifice configuration changes, primary dewatering, holding for transport, and primary bypass to improve direct and indirect survival of all collected fish (2012) 	Testing of prototype overflow weirs and enlarged orifices in 2013. Continuing design in 2014-2015. Construction depending upon COP recommendations.	
	<ul style="list-style-type: none"> Turbine operation optimization to improve survival of turbine passed fish 	Based on coordination with regional forums (e.g., FPOM and FFDRWG) the Action Agencies at this time	

Reasonable and Prudent Alternative (RPA) Actions – RPA Implementation Plan Summary

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>Hydropower Strategy 2—Modify Columbia and Snake River Dams to Maximize Juvenile and Adult Fish Survival</i>			
	(2014). The COP will be updated periodically and modifications may be altered as new biological and engineering information is gathered. The COP and modifications will be coordinated through the Regional Forum. Comments developed by NOAA Fisheries on the draft COPs shall be reconciled by the Corps in writing to NOAA Fisheries' satisfaction before release of the final COP. If Phase I actions fail to meet the intended biological targets, Phase II actions as described in the FCRPS BA—Appendix B.2.1 will be considered for further implementation.	do not intend to implement this action. The COP will be updated as necessary pending the results of performance standard testing. Convert prototype or temporary fish passage spillway weir to permanent installation, which requires design and construction of a feature integral to the spillway weir (upstream boat barrier) to prevent boats from passing over the dam from the forebay to the tailrace via the fish passage spillway weir.	
26	Chief Joseph Dam Flow Deflector The Corps will complete the flow deflector construction at Chief Joseph Dam by 2009. Deflector construction was initiated in 2005 in response to RPA Action 136 in the 2000 Biological Opinion and previous discussions on the importance of these deflectors. Chief Joseph Dam does not have spill for fish passage, but water is spilled at this project and Grand Coulee in order to pass high flows. Investigations by the Corps concluded that installation of flow deflectors at Chief Joseph Dam, which is immediately downstream of Grand Coulee, and shifting spill and power generation between the projects is the most cost-effective alternative for gas abatement at these two dams.	Construction was completed in 2008. A successful spill test was carried out in the spring of 2009.	

Reasonable and Prudent Alternative (RPA) Actions – RPA Implementation Plan Summary

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>Hydropower Strategy 2—Modify Columbia and Snake River Dams to Maximize Juvenile and Adult Fish Survival</i>			
27	Turbine Unit Operations The Action Agencies will operate turbine units to achieve best fish passage survival (currently within 1% of best efficiency at mainstem dams on the Lower Columbia and Lower Snake rivers from April 1 – October 31 (hard constraint) and from November 1 – March 31 (soft constraint) each year. Continue turbine operations evaluations and apply adaptive management to operate units in their optimum configuration for safe fish passage.	Continue turbine operations within 1% of best efficiency, consistent with Appendix C of the annual Fish Passage Plan (FFP) at http://www.nwdwc.usace.army.mil/tmt . Turbine operations are reviewed annually and adapted for fish passage as needed.	
28	Columbia and Snake River Project Adult Passage Improvements The Corps will implement the following structural improvements to adult passage at the mainstem Columbia and Snake river projects:		
	Bonneville Dam: <ul style="list-style-type: none"> Improve the Bradford Island ladder system to reduce stress and improve reliability of upstream adult passage (2013) 	Repair or replace features of the Bradford Island fishway according to priorities established in the Phase II Fishway Assessment Report.	A number of repairs were carried out in 2008 – 2012. A project to fully assess fishway condition (the Phase II Fishway Assessment Report) was completed in 2012.
	The Dalles Dam: <ul style="list-style-type: none"> East ladder emergency auxiliary water supply system and/or modifications that return adult salmon and steelhead use of the North ladder to pre-spillwall conditions to improve reliability of upstream adult passage (2013) 	Design of the east ladder auxiliary water supply (AWS) will occur in 2013-2014. Construction is scheduled for the winter of 2014-2015. For the north ladder, a radio telemetry study is scheduled for 2013 and 2014 to determine whether post-spillwall hydraulic conditions are causing delays in adult migration. Design and construction of east	A design alternatives report for the east ladder AWS was completed in 2012 and, in coordination with regional salmon managers, a design alternative was selected. Using results from that study

Reasonable and Prudent Alternative (RPA) Actions – RPA Implementation Plan Summary

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>Hydropower Strategy 2—Modify Columbia and Snake River Dams to Maximize Juvenile and Adult Fish Survival</i>			
		ladder AWS to improve reliability of the east ladder will occur prior to 2018. Installation of a permanent adult PIT-tag monitoring system is scheduled for 2015. (A temporary system was installed in 2013.)	as well as ladder counts, the Corps will work with regional stakeholders to determine whether additional improvements are warranted.
	John Day Dam: <ul style="list-style-type: none"> Adult ladder systems modifications to improve upstream adult passage conditions (2011) 	Initial structural improvements to the upper section of the ladder were completed in 2010. From effectiveness monitoring it appears the improvements resolved the problems previously observed in that section of the ladder. Remaining of the ladder improvements are planned for completion in 2015-2016.	
	Ice Harbor Dam: <ul style="list-style-type: none"> Repair or replace north shore fishway auxiliary water supply (AWS) equipment as needed so that any two of the three pumps can meet flow criteria 	Repairs to all three pumps were completed in the winter of 2009-2010.	
	Little Goose Dam: <ul style="list-style-type: none"> Investigate adult passage and determine whether structural, operational, or tailrace modifications can alleviate adult passage delays or blockages during spill operations for optimum juvenile passage (See RM&E Action 54) 	Spillway weir hoist design is under way with installation planned to begin the winter of 2013-2014 with a planned completion prior to the start of the 2015 migration season. This hoist will allow the surface weir to be closed quickly should its operation cause delays to adult passage. <ul style="list-style-type: none"> A temporary adult PIT-tag detection system will be installed at Little Goose Dam (scheduled for 2014). It will be operated for two to four years to assess adult fallback, delay and travel times. The system will then be removed. 	Operation of the surface weir caused tailrace hydraulic conditions that could, during high flows, make it difficult for adults to find the ladder entrance. Analysis and physical modeling at the Corps' Engineering Research and Development Center resulted in spill pattern revisions in 2011 and 2012. No delays of adult fish were noted during high flow periods in 2012. However, an automated hoist is being designed and installed

Reasonable and Prudent Alternative (RPA) Actions – RPA Implementation Plan Summary

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>Hydropower Strategy 2—Modify Columbia and Snake River Dams to Maximize Juvenile and Adult Fish Survival</i>			
			to allow more rapid closure of the surface weir should delays occur in the future.
	Lower Granite Dam: <ul style="list-style-type: none"> Investigate and if necessary provide additional auxiliary water supply for the new adult trap at lower Granite so that it can operate at full capacity when the forebay is operated at MOP without affecting the fishway AWS (2012) 	Completed, no further action planned.	A valve was replaced in November 2010. With this replacement, full auxiliary water supply from the forebay to all the troughs of the adult trap is possible at MOP.
	<ul style="list-style-type: none"> Adult fishway modification to improve upstream adult passage conditions impaired by temperature differentials (need will be determined by results of further research) (prototype 2011) 	Alternative designs were developed but were not judged to be practical or cost effective by the FFDRWG. The Corps will continue to monitor and evaluate the Issue.	

Performance Standards – Documenting Achievement of Performance Standards

The following steps lay out a process for reviewing Performance Standard test results (and past results that satisfy criteria in the Performance Standard document, see <http://www.salmonrecovery.gov/Files/BiologicalOpinions/2012/Performancestandardspaper.pdf>) and documenting the results of testing where the Performance Standards have been achieved. Once a draft report of Performance Standard test results is available, the Corps will initiate regional review and documentation as follows:

Regional (Studies Review Work Group [SRWG]) review of Performance Standard test (or retrospective) results

- SRWG reviews study aspects and results for consistency and adherence to:
 - Survival model assumptions,
 - Criteria specified in the Performance Standards document⁴, and
 - Accord metrics (review with Accord partners).
- The Corps documents the outcome of the review (meeting minutes).

The Corps' determination and NOAA's concurrence of meeting Performance Standards

- Following the SRWG's review of study results, the Corps, in coordination with NOAA and the other Action Agencies, will consider the information gained from the review, and then determine whether or not the standards were met and whether the associated study metrics adequately comply with the Performance Standards document.
 - After two consecutive acceptable tests have been completed at a project, the Corps will prepare a decision memo with rationale and determination that the standards have been met.
- The Corps will provide the memo to the SRWG and RIOG as notification of their determination that the Performance Standard test results should apply towards satisfying the BiOp performance standards for juvenile dam passage survival.
 - RIOG members may raise issues to RIOG for dispute resolution if there is disagreement with the Corps' conclusion.
 - RIOG may request review of the Corps' determination by the Senior Hydro Technical Team.
 - i. If requested, the Senior Hydro Technical Team would review and prepare an issue paper for RIOG's consideration.
- The Corps and NOAA, in coordination with the other Action Agencies, will consider the input from RIOG members and make a final determination whether the performance standards have been met.

An example using The Dalles Dam spring testing results to step through the process is as follows:

⁴ Federal Columbia River Power System Juvenile Dam Passage Performance Standard and Metrics, August 2012.

Reasonable and Prudent Alternative (RPA) Actions – RPA Implementation Plan Summary

- Two years of spring PS testing complete – 2010, 2011
- SRWG review two years' worth of study results – spring 2013
- Corps prepares decision memo – summer/fall 2013
 - Release memo to SRWG and RIOG – winter 2013/14
 - RIOG review – early 2014
- Final determination – spring 2014 prior to the start of spring spill operations

A tentative schedule for completing Performance Standard testing and performance standard test results review and documentation of meeting performance standards at each project is included below (Table 1).

Table 1. Tentative planned testing and performance standard determination schedule, 2013-2018.

Project	Spring Test Schedule	Spring PS Results		Summer Test Schedule	Summer PS Results	
		Review	Decision		Review	Decision
Bonneville	2016 ¹ , 2017 ¹	2013, 2018 ¹	2014 or 2018	2016, 2017 ¹	2013, 2017, 2018 ¹	2018
The Dalles	Complete ²	2013	Early 2014	Complete ²	2013	Early 2014
John Day	Complete ²	2013	Late 2014	2014	2015	2016
McNary	2014	2015	2016	2014, 2015	2016	2017
Ice Harbor	2015 ²	2016	2017	2015, 2016	2017	2018
Lower Monumental	Complete ²	2013	Early 2014	2013	2014	2015
Little Goose	Complete ²	2013	Early 2014	2013	2014	2015
Lower Granite	2016, 2017	2018	2018	2016, 2017	2018	2018

¹ As needed

² Pending further regional review

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>Hydropower Strategy 3—Implement Spill and Juvenile Transportation Improvements at Columbia River and Snake River Dams</i>			
29	<p>Spill Operations to Improve Juvenile Passage</p> <p>The Corps and BPA will provide spill to improve juvenile fish passage while avoiding high TDG supersaturation levels or adult fallback problems. Specific spill levels will be provided for juvenile fish passage at each project, not to exceed established TDG levels (either 110 percent TDG standard, or as modified by state water quality waivers, currently up to 115 percent TDG in the dam forebay and up to 120 percent TDG in the project tailwater, or if spill to these levels would compromise the likelihood of meeting performance standards (see RPA Table, RM&E Strategy 2). The dates and levels for spill may be modified through the implementation planning process and adaptive management decisions. The initial levels and dates for spill operations are identified in Table 2 below. Future Water Management Plans will contain the annual work plans for these operations and spill programs, and will be coordinated through the TMT. The Corps and BPA will continue to evaluate and optimize spill passage survival to meet both hydrosystem performance standards and requirements of the Clean Water Act (CWA).</p>	<p>Spill operations will be updated annually and reported in the FPP developed with regional input. Spill operations at individual dams will be determined in the future in the context of hydro Performance Standards.</p> <p>Table 2 below identifies the proposed initial spill operations for spring and summer. No changes in spring spill levels are anticipated at Bonneville, the Dalles, McNary, Lower Monumental, Little Goose, or Lower Granite through 2018. In addition, no changes in summer spill levels are anticipated The Dalles, McNary, Little Goose, or Lower Granite through 2018⁵. Changes in spill or the selection of a single spill operation at a project where two operations are currently being implemented may occur either for testing purposes or after performance standard testing confirms that the performance standards are being achieved (see Documenting Achievement of Performance Standards for a description of the process described above).</p>	

⁵ The proposed spill levels at these projects have either met or are expected to meet the performance standards.

Action No.	Action Description	2014-2018 Actions	Adaptive Management
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Hydropower Strategy 3—Implement Spill and Juvenile Transportation Improvements at Columbia River and Snake River Dams

Table 2. Proposed spring and summer project spill operations¹.

Project	Proposed 2014 BiOp Spring Spill	Spring Planning Dates	Proposed 2014 BiOp Summer Spill	Summer Planning Dates
Bonneville	100 kcfs	4/10 - 6/15	95 kcfs and 85 kcfs/121 kcfs	6/16 ² -8/31
The Dalles	40%	4/10 - 6/15	40%	6/16 ² -8/31
John Day	April 10-April 27: 30% April 27-June 15: 30% and 40%	4/10 - 6/15	June 16-July 20: 30% and 40% July 20-August 31: 30%	6/16 ² -8/31
McNary	40%	4/10 - 6/15	50%	6/16 ² -8/31
Ice Harbor	April 3-April 28: 45 kcfs/Gas Cap April 28-May 30: 30% and 45 kcfs/Gas Cap	4/3 - 5/31	June 1-July 13: 30% and 45 kcfs/Gas Cap July 13-August 31: 45 kcfs/Gas Cap	6/1 ³ -8/31 ⁴
Lower Monumental	Gas Cap (~27 kcfs) (bulk pattern)	4/3 - 5/31	17 kcfs	6/1 ³ -8/31 ⁴
Little Goose	30%	4/3 - 5/31	30%	6/1 ³ -8/31 ⁴
Lower Granite	20 kcfs	4/3 - 5/31	18 kcfs	6/1 ³ -8/31 ⁴

¹ Voluntary spill operations and planning dates may be adjusted (increased or decreased) for research purposes or through the adaptive management process (to better match juvenile outmigration timing, and/or to achieve or maintain performance standards).

² Transitions from spring to summer spill has changed from July 1 to June 16 based on updated run timing of subyearling fall Chinook salmon. For further information see the 2007 FCRPS BA, Appendix B.2.1.1, paragraph 3.5.

³ The actual start of summer spill will be initiated when subyearling Chinook exceed 50% of the collection for a 3 day period for each Snake River project after June 1. NOAA to develop 95% passage of spring fish criteria language if warranted.

⁴ Beginning August 1, curtailment of summer spill may occur first at Lower Granite Dam if subyearling Chinook collection counts fall below 300 fish per day for 3 consecutive days (beginning July 29, 30, and 31 for August 1 curtailment). Using the same 300 fish criterion, the curtailed spill would then progress downstream with each successive dam on the Snake River, with spill at Little Goose Dam (LGS) ending no earlier than 3 days after the termination of spill at Lower Granite Dam (LGR), and ending at Lower Monumental Dam (LMN) no earlier than 3 days after the termination of spill at LGS assuming the 300 fish criterion has been met at those projects. Spill would be curtailed at Ice Harbor Dam (IHR) no earlier than 2 days after LMN, without use of the 300 fish criterion. Spill will end at 0600 hours on the day after the necessary curtailment criteria are met. If after cessation of spill at any one of the Snake River projects on or after August 1, subyearling Chinook collection counts again exceed 500 fish per day for two consecutive days, spill will resume at that project only. Thereafter, fish collection count numbers will be reevaluated daily to determine if spill should continue using the criteria above (300 fish per day) until August 31.

Additionally, in any year where natural-origin adult returns of Snake River fall Chinook salmon are equal to or less than 400 fish, summer spill in the following year would continue at Snake River projects through August 31, even in years where subyearling Chinook counts fall below the 300 fish per day for three consecutive days as stated above.

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>Hydropower Strategy 3—Implement Spill and Juvenile Transportation Improvements at Columbia River and Snake River Dams</i>			
30	<p>Juvenile Fish Transportation in the Columbia and Snake Rivers</p> <p>The Corps and BPA will continue the juvenile fish transportation program toward meeting system survival performance metrics of Snake and Columbia River salmon and steelhead (see RPA, RM&E Strategy 2) with some adaptive management modifications based on results of RM&E. The Corps and BPA will continue to collect and transport juvenile fish at Lower Granite, Little Goose, Lower Monumental, and McNary dams, although under a modified operation as described in Table 3 and Table 4 below. While the dates mentioned in this section should be considered firm planning dates, if in-season information or results of ongoing RM&E indicates a need for adaptive management (for example, if modifying these dates are likely to increase in-river or system survival and would be likely to provide equivalent or increased SARs of the species transported), the Action Agencies will consider revising the dates and operations through the Regional Forum.</p>	<p>The Action Agencies will continue transport operations at Snake River collector dams according to the following criteria and schedule:</p> <ul style="list-style-type: none"> • <i>Annual review of information</i> <ul style="list-style-type: none"> ○ Data on fish survival, adult returns, current year in-river conditions, and water supply forecast will be reviewed with RIOG each year to determine the best operation for the fish. • <i>Transport start date</i> <ul style="list-style-type: none"> ○ Initiate transport at Lower Granite Dam (LGR) on April 21 to more closely achieve a 50/50 split of in-river migration vs. transport for Snake River steelhead to the extent this start date is supported by research data indicating an April 21 start date will benefit listed wild ESUs. If recent years' estimates of percent of fish transported suggest a later start date would likely achieve this goal, then an alternative date may be recommended and coordinated through the TMT. ▪ Transport will begin up to 4 days and up to 7 days after the LGR start date at LGS and LMN dams, respectively. ▪ Transport will continue until approximately September 30 at LMN and through October 31 at LGS and LGS dams. 	<p>Consistent with the ISAB recommendation and the Adaptive Management Implementation Plan there will be an annual review of transport/in-river information by RIOG to discuss the next year's operation. There is no longer a presumptive operation for the May 7-20 time period or during low flow years as described in the 2008 BiOp RPA Action 30 Table 3.</p> <p>In 2012 the juvenile bypass outfall at McNary Dam was relocated to reduce predation on bypassed fish. Testing in 2012 showed higher survival of bypassed summer migrants than had been observed prior to the outfall relocation. Subsequently, in 2013, NOAA and other State and tribal fish managers submitted a System Operations Request (SOR) requesting that summer migrants that were collected in the juvenile bypass system be allowed to migrate in-river, rather than be transported as in previous years. The rationale being that the survival of bypassed fish had improved with the outfall relocation and</p>

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>Hydropower Strategy 3—Implement Spill and Juvenile Transportation Improvements at Columbia River and Snake River Dams</i>			
			that the benefit to summer migrants from transport did not warrant the continuation of summer transport from McNary Dam. The Corps agreed and did not transport from McNary in 2013. Furthermore, the Corps does not plan to continue transport activities from McNary Dam in 2014-2018.
31	<p>Configuration and Operational Plan Transportation Strategy</p> <p>The Corps, in coordination with the Regional Forum, will initiate a Configuration Operational Plan in 2009. The plan will be completed in 2010 and will present a strategy for prioritizing and carrying out further transportation actions at each dam. Comments developed by NOAA Fisheries on the draft COPs shall be reconciled by the Corps in writing to NOAA Fisheries' satisfaction before release of the final COP. Construction actions for transportation are primarily in the context of changes to juvenile bypass systems. Changes meant to increase adult salmon returns through the juvenile fish transportation process are being evaluated. Some changes include additional barges, a new juvenile fish facility at Lower Granite Dam and modifications to the juvenile fish facilities at Little Goose, Lower Monumental and McNary dams.</p>	The Corps will complete a transportation COP with input from the Regional Forum using the best available data. This plan will prioritize transport actions and make recommendations for each collector project.	

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>Hydropower Strategy 4—Operate and Maintain Facilities at Corps’ Mainstem Projects to Maintain Biological Performance</i>			
32	<p>Fish Passage Plan</p> <p>The Corps will annually prepare a FPP in coordination with NOAA Fisheries and the Regional Forum through the FPOM. The Corps will operate its projects (including juvenile and adult fish passage facilities) year-round in accordance with the criteria in the FPP. Comments developed by NOAA Fisheries on the draft FPP shall be reconciled by the Corps in writing to NOAA Fisheries’ satisfaction before release of the final FPP. Key elements of the plan include:</p> <ul style="list-style-type: none"> • Operate according to project-specific criteria and dates to operate and maintain fish facilities, turbine operating priorities, and spill patterns • Operate according to fish transportation criteria • Maintain turbine operations within the 1% of best efficiency range • Maintain spillway discharge levels and dates to provide project spill for fish passage • Implement TDG monitoring plan • Operate according to protocols for fish trapping and handling • Take advantage of low river conditions, low reservoir elevations or periods outside the juvenile migration season to accomplish repairs, maintenance, or inspections so there is little or no effect on juvenile fish • Coordinate routine and non-routine 	<p>The Corps will continue to operate its projects (including juvenile and adult fish passage facilities) in accordance with the criteria in the FPP, which will be reviewed and updated annually by a regional coordination team and posted at http://www.nwdwc.usace.army.mil/tmt.</p>	

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>Hydropower Strategy 3—Implement Spill and Juvenile Transportation Improvements at Columbia River and Snake River Dams</i>			
	<p>maintenance that affects fish operations or structures to eliminate and/or minimize fish operation impacts;</p> <ul style="list-style-type: none"> • Schedule routine maintenance during non-fish passage periods • Conduct non-routine maintenance activities as needed; and Coordinate criteria changes and emergency operations with FPOM. 		
	<p>Operations and Maintenance Provide redundancy or contingency plans, developed in coordination with NOAA Fisheries and the Regional Forum, which will assure that key adult fish passage facility equipment operates as necessary to minimize long-term adult passage delays.</p>	Evaluate the condition of items for fish passage annually and include a prioritized list of maintenance items in the annual budgeting process.	
	Evaluate the condition of items necessary (e.g., spillway hoist systems, cranes, turbine units, AWS systems, etc.) to provide safe and effective fish passage and develop a prioritized list of these items that are likely to require maintenance now or within the term of this opinion.	Continue to develop, revise, and prioritize lists repair and maintenance needs, in coordination with FPOM.	

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>Hydropower Strategy 5—Develop and Implement a Kelt Management Plan</i>			
33	<p>Snake River Steelhead Kelt Management Plan</p> <p>The BPA and Corps will prepare a Snake River Kelt Management Plan in coordination with NOAA Fisheries and the Regional Forum. The BPA and Corps will implement the plan to improve the productivity of interior basin B-run steelhead populations as identified in Sections 8.5. Key considerations in the development and implementation of the plan should include:</p> <ul style="list-style-type: none"> • Measures to increase the in-river survival of migrating kelts • Potential for the collection and transport (either with or without short-term reconditioning) of kelts to areas below Bonneville Dam • Potential for long-term reconditioning as a tool to increase the number of viable females on the spawning grounds • Research as necessary to accomplish the elements of this plan 	<p>The Action Agencies will review and update the existing Kelt Management Plan (KMP) annually, building on data and analysis of previous efforts. The Action Agencies will implement actions identified in the annual KMP, as warranted to meet Snake River B-run steelhead goal.</p> <p>The Action Agencies will continue to extend the operating season of the ice and trash sluiceway at The Dalles Dam and are actively investigating operational opportunities to provide safer fallback opportunity for over wintering steelhead at McNary Dam, which could yield additional benefits towards Snake River B-run steelhead goal.</p> <p>Recent advances in research directed at improving reconditioning techniques, infrastructural improvements at the holding and hatchery facilities and plans to increase kelt collection is expected to enable the Action Agencies to meet the FCRPS BiOp goal of 6 percent by 2018.</p>	<p>Research findings to date:</p> <p>Benefits associated with extending sluiceway operation at The Dalles are contributing towards meeting the B-run goal.</p> <p>Kelts transported have shown little to no increase in return rates compared to fish left in the river; therefore, efforts are directed at evaluating strategies other than transport.</p> <p>Results to date support that Snake River B-run steelhead kelts can survive through reconditioning to spawn again.</p>

HABITAT ACTIONS

The overall habitat objective for all ESUs is to protect and improve tributary and estuary habitat to improve fish survival. The Action Agencies will pursue two broad strategies to meet this objective:

- *Habitat Strategy 1—Protect and improve tributary habitat based on biological needs and prioritized actions*
- *Habitat Strategy 2—Improve juvenile and adult fish survival in estuary habitat.*

Each strategy consists of one or more specific actions. These are summarized in the following sections.

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>Habitat Strategy 1—Protect and Improve Tributary Habitat Based on Biological Needs and Prioritized Actions</i>			
34	<p>Tributary Habitat Implementation 2007 to 2009 – Progress Toward 2018 Habitat Quality Improvement Targets</p> <p>The Action Agencies will provide funding and technical assistance necessary to implement the specific projects identified for implementation in 2007 to 2009 (FCRPS BA, Attachment B.2.2-2, Tables 1-5a) as part of a tributary habitat program to achieve the population-specific overall habitat quality improvement identified in Table 5.</p> <p>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 maintain estimated habitat quality improvements to achieve equivalent survival commitments at the population level, or alternatively at the major population group (MPG) or ESU level. Habitat and population-specific survival benefits in each implementation plan cycle must also compensate for not meeting estimated benefits in the previous implementation plan cycle. Replacement project selection will follow Action 35.</p>	<p>This RPA Action is complete. Please refer to the 2013 Draft CE for a description of projects and metrics completed during 2007-2009 (CE, Section 3, Attachment 2).</p> <p>Additionally, as part of the “look back” function of the expert panel process, the 2010 Expert Panels estimated changes in habitat function associated with projects completed in the 2007-2009 implementation cycle. This information is also available in the 2013 Draft CE (Section 2, Table 35).</p> <p>Projects scheduled for completion in 2007-2009 that had implementation delays were carried forward to a later evaluation period. Any 2007-2009 projects that proved infeasible were replaced with new projects and included under RPA Action 35. Benefits for delayed or replaced 2007-2009 projects were evaluated by expert panels for the period in which they were completed and contributed to the population Habitat Quality Improvements (HQIs) depicted in Table 35 of the 2013 Draft CE.</p>	

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>Habitat Strategy 1—Protect and Improve Tributary Habitat Based on Biological Needs and Prioritized Actions</i>			
35	<p>Tributary Habitat Implementation 2010-2018 – Achieving Habitat Quality and Survival Improvement Targets.</p> <p>The Action Agencies will identify additional habitat projects for implementation based on the population-specific overall habitat quality improvement still remaining in Table 5 below. Projects will identify location, treatment of limiting factor, targeted population or populations, appropriate reporting metrics, and estimated biological benefits based on achieving those metrics. Pertinent new information on climate change and potential effects of that information on limiting factors will be considered.</p> <p>During 2010 to 2018, the Action Agencies will provide funding and/or technical assistance to implement specific habitat projects to achieve the specified habitat quality improvements listed in Table 5. Habitat quality improvements associated with projects will be estimated in advance of project selection by expert panels. The Action Agencies will convene expert panels to estimate changes in habitat limiting factors from the implementation of Action Agency habitat actions.</p> <ul style="list-style-type: none"> The Action Agencies shall convene an 	<p>Past progress is described in the 2013 Draft CE (Section 2, Table 35) and represents substantial advancement toward the 2018 BiOp goals. The tributary habitat program is very well developed: projects have been identified for the full BiOp period that achieve the goals; partnerships and infrastructure are in place, and momentum has been built around implementation; funding and contracting mechanisms are in place; sophisticated technical tools guide project selection and implementation; and state-of-the-art monitoring tracks fish status, habitat status, and project effectiveness.</p> <p>During the remaining BiOp period, the Action Agencies will provide funding and technical assistance for implementation of projects, as needed, to achieve the 2008/2010 FCRPS BiOp HQIs by 2018.</p> <p>For the 2014-2018⁶ implementation period, the Action Agencies have identified projects to meet the HQIs for the populations of salmon and steelhead described in the 2008/2010 FCRPS BiOp (RPA Action 35 Table 5)⁷. These projects can be found in Appendices A and B of this Implementation Plan.</p> <p>If any of these projects prove infeasible, the Action Agencies will ensure that the projects implemented will collectively reach the BiOp HQIs.</p> <p>The IP Appendix A Tributary Habitat table presents</p>	<p>In the 2013 CE analysis, the Action Agencies found that results from the expert panel evaluations of tributary habitat improvements indicated that HQIs would be met or exceeded for all RPA Action 35 Table 5 populations by 2018, except for six priority populations. In order to ensure that all priority population HQIs are met by 2018 the Action Agencies assembled the following:</p> <ul style="list-style-type: none"> <i>Habitat projects reviewed for benefits by the 2012 expert panels</i> (IP Appendix A, Tributary Habitat Table). <i>Supplemental habitat projects developed in collaboration with Fish Accord and other partners for the six priority populations where 2012 expert panel results were not projected to reach Table 5 HQIs</i> (IP Appendix B)¹⁰. <i>A “replacement project</i>

⁶ This IP actually includes tributary habitat projects for 2013-2018 because of the expert panel schedule.

⁷ The single exception to this is the Catherine Creek population of Snake River spring Chinook where projects have been identified to achieve a significant portion of the HQIs and a strategy for achieving the complete target by 2018 has been adopted (see IP Appendix C).

¹⁰ A detailed plan that links project lists with other strategies to ensure the HQI's are met can be found in Appendix C.

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>Habitat Strategy 1—Protect and Improve Tributary Habitat Based on Biological Needs and Prioritized Actions</i>			
	<p>expert panel to evaluate the percent change in overall habitat quality at the population scale from projects implemented previously (if quantitative objectives not met) and projects proposed for the implementation until the next check-in.</p> <ul style="list-style-type: none"> The expert panel will use methods consistent with the NWR v. NMFS Remand Collaboration Habitat Workgroup process. 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. 	<p>the complete menu of 2013 to 2018 tributary habitat improvement projects evaluated by expert panels and provides web links to allow readers to access more detailed project information. Consistent with the requirements of this RPA Action, the IP Appendix A Tributary Habitat table also contains input from the expert panels addressing:</p> <ul style="list-style-type: none"> Target population(s) Location of action(s) Limiting factors treated Description of actions Reporting metrics Expected HQIs <p>Momentum to support implementation of on-the-ground actions has been built over the preceding years and will support implementation in the coming years.</p> <p>The Action Agencies and regional partners are applying the following implementation strategies to deliver high value tributary habitat improvement actions:</p> <ul style="list-style-type: none"> Continued strong coordination with Fish Accord partners. The Fish Accord partners continue to reliably put habitat projects on-the-ground. Tributary and reach assessments have been completed or initiated in a number of areas to identify viable habitat actions that address the most important limiting factors in areas where they will provide the most benefit for anadromous fish. These assessments help focus planning and implementation activities to achieve HQIs by 2018. See Draft CE, Section 3, Attachment 3 and 	<p><i>strategy”</i> (IP Appendix D).</p> <p>The Action Agencies also utilize ongoing adaptive management to guide implementation of the tributary habitat program as a whole. Thus the Action Agencies and regional partners will continue to adjust and tailor planned actions in the future. By evaluating completed actions to determine how to improve on what worked and modify what didn't work, the approach will facilitate delivery of effective outcomes. The Action Agencies and partners will bring this new information to the attention of expert panels for their evaluation of completed and planned projects. The Action Agencies will continue to enhance the expert panel process and document details of expert panel deliberations (e.g., technical discussions and key decisions) as feasible and as appropriate.</p> <p>For more information about the tributary habitat adaptive management plan see IP Appendix C.</p>

Reasonable and Prudent Alternative (RPA) Actions

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<i>Habitat Strategy 1—Protect and Improve Tributary Habitat Based on Biological Needs and Prioritized Actions</i>			
		<p>http://www.usbr.gov/pn/programs/fcrps/thp/index.html.</p> <p>In some cases, e.g., Entiat River Subbasin, the tributary and reach assessments will be used to develop Project Map Books. Project Map Books identify geomorphologically appropriate actions suitable for addressing impacts and maximizing habitat potential based on a sites intrinsic habitat potential (Reclamation 2013a⁸, 2013b⁹).</p> <ul style="list-style-type: none"> • Limiting Factor pie maps developed by the Action Agencies were introduced in 2012. The pie maps illustrate the status of tributary habitat limiting factors estimated by the expert panels over the last two evaluation periods and will capture and include updated information on the status of limiting factors through the end of the 2008/2010 FCRPS BiOp. These maps help focus planning and implementation of habitat improvement actions on key limiting factors in areas where they will provide the most benefit for anadromous fish. • Throughout the region the Action Agencies are partnering with local entities to implement actions on the ground. The approach allows for prioritization of funding to address key limiting factors and comprehensive planning to ensure the best actions are selected for 	

⁸ Reclamation. 2013a. *Stormy Reach Project Map Book. Draft. Entiat River Subbasin in Chelan County, Washington. Prepared by the U.S. Bureau of Reclamation, Pacific Northwest Region in partnership with Bonneville Power Administration, Yakama Nation, U.S. Fish and Wildlife Service, Natural Resources Conservation Service, Interfluve Inc., and Upper Columbian Salmon Recovery Board. 20 pp.*

⁹ Reclamation. 2013b. *Gray Reach Project Map Book. Draft. Entiat River Subbasin in Chelan County, Washington. Prepared by the U.S. Bureau of Reclamation, Pacific Northwest Region in partnership with Bonneville Power Administration, Yakama Nation, U.S. Fish and Wildlife Service, Natural Resources Conservation Service, Interfluve Inc., and Upper Columbian Salmon Recovery Board. 20 pp.*

Reasonable and Prudent Alternative (RPA) Actions

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<i>Habitat Strategy 1—Protect and Improve Tributary Habitat Based on Biological Needs and Prioritized Actions</i>			
		<p>implementation each year. The approach provides the opportunity for multi-year funding to address large-scale and complex actions, and sustains implementation through multi-year funding and project solicitation cycles. This approach is expected to deliver high priority actions and associated benefits necessary to achieve the Table 5 HQIs by 2018.</p> <p><u>2014</u> The Action Agencies will convene technical work groups prior to the 2015 Expert Panel workshops to evaluate the status and importance of population limiting factors based on recovery plans, new or updated information included in tributary and reach assessments, project completion reports, results from research, monitoring, and evaluation activities, and any other relevant information.</p>	
	<ul style="list-style-type: none"> The Action Agencies will use the expert panels to provide input on changes in habitat quality and function as a result of limiting factor improvements from project actions for the priority population areas and this information will be used to assess improvements to salmon and steelhead survival. 	<p>This 2014-2018 Implementation Plan includes a menu of projects that summarizes actions evaluated by expert panels during the 2012 workshops. Workshops will be convened in 2015: (1) to evaluate actions <u>completed</u> during the period from 2012 to 2015, and (2) to refine the details and corresponding evaluations of the menu of actions for the period from 2015-to 2018 that were originally evaluated by the 2012 expert panels.</p> <p><u>2014</u></p> <ul style="list-style-type: none"> Initiate planning for tributary expert panel workshops. <p><u>2015</u></p> <ul style="list-style-type: none"> Convene expert panels to address RPA Action 	<p>The Action Agencies will continue to maintain the expert panel website (http://www.usbr.gov/pn/fcrps/habitat/panels/index.html), The website includes background on the 2007 BA and CA, 2008 and 2010 BiOps and SCA, HCW methodology, and Action Agency and NOAA orientation presentations. The background material on this website provides a consistent basis for expert panel evaluations of assessment units, limiting factors, and habitat</p>

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>Habitat Strategy 1—Protect and Improve Tributary Habitat Based on Biological Needs and Prioritized Actions</i>			
		<p>35, Table 5 priority and other populations in the same MPG. Using methods described in the 2007 CA¹¹ (Appendix C, Attachment C1), the 2013 Draft CE (Section 2, RPA Action 35), the expert panel website maintained by the Action Agencies at (http://www.usbr.gov/pn/fcrps/habitat/panels/index.html), and other relevant information, the expert panels will:</p> <ul style="list-style-type: none"> ○ Review progress on 2012 to 2018 actions evaluated by the 2012 expert panels. ○ Adjust estimated changes in habitat function if there are any differences (substitutions, decreases, or increases) between 2012 to 2018 actions evaluated in 2012 and actions implemented from 2012 to 2015. ○ Refine evaluation of remaining 2012 to 2018 actions by identifying those actions no longer feasible, substituting or adding actions pursued as part of adaptive management, and adjusting the associated changes in habitat function estimates accordingly. <ul style="list-style-type: none"> • Based on information from expert panels, the Action Agencies will: <ul style="list-style-type: none"> ○ Calculate estimates of past and future progress toward FCRPS BiOp RPA Action 35 Table 5 population HQIs using methods established by the Remand Collaboration Habitat Workgroup (see 2007 CA, 	<p>improvement projects. The website also is updated with climate change, invasive species, and available scientific reports and information (including RME and model results procured through this BiOp) to inform expert panel evaluations.</p>

¹¹ <http://www.salmonrecovery.gov/BiologicalOpinions/FCRPSBiOp/2008FCRPSBiOp/2007BAandCA.aspx>

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>Habitat Strategy 1—Protect and Improve Tributary Habitat Based on Biological Needs and Prioritized Actions</i>			
		<p>Appendix C, Attachment C1).</p> <ul style="list-style-type: none"> ○ Apply adaptive management strategies that use updated pie maps, available tributary and reach assessments, project map books, and current results from tributary habitat research, monitoring and evaluation. This input will be used to refine 2015 to 2018 projects to address the most important limiting factors for anadromous fish. 	
	<ul style="list-style-type: none"> • If actions from the previous cycle prove infeasible, in whole or in part, the Action Agencies will ensure implementation of comparable replacement projects in the next implementation plan cycle to maintain estimated habitat quality improvements at the population level and achieve equivalent survival benefits. If infeasible at the population level, then alternatively replacement projects will be found to provide benefits at the MPG or ESU/DPS level. 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. 	<p>Using methods described in the 2007 CA (Appendix C, Attachment C1), and described on the expert panel website maintained by the Action Agencies (http://www.usbr.gov/pn/fcrps/habitat/panels/reference/2H-GuidanceForEvaluatingLimitingFactorsForTheFCRPSBiOp.pdf), the expert panels will re-evaluate changes in habitat function where actions that were relied upon to estimate HQIs are not implemented as expected.</p> <ul style="list-style-type: none"> • The Action Agencies will recalculate population-specific HQIs based on all actions implemented between 2012 and 2018, including any expanded or substituted actions. • The expert panels will refine 2015 to 2018 actions and estimate associated changes in habitat function. • The Action Agencies will use the expert panel estimates to calculate the population-specific habitat quality and survival improvements and determine whether they are sufficient to achieve RPA Action 35 Table 5 HQIs. • The Action Agencies and regional partners will 	

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>Habitat Strategy 1—Protect and Improve Tributary Habitat Based on Biological Needs and Prioritized Actions</i>			
		<p>make every effort to reach Table 5 HQIs using the 2012 to 2018 habitat improvement projects evaluated by the expert panels in 2012 (IP Appendix A) and the adaptive management strategies presented in Section 2 of the 2013 Comprehensive Evaluation. The adaptive management strategies include supplemental projects (IP Appendix B) and estimated benefits that will contribute to meet or exceed RPA Action 35 Table 5 HQIs for all priority populations. Progress in meeting or exceeding HQIs will be assessed during the 2015 expert panel workshops. If estimated improvements are insufficient for meeting the Table 5 HQIs, the supplemental projects and updated 2012 to 2018 projects evaluated by the expert panels in 2012 will be reviewed. These review results, tributary and reach assessments, project map books, limiting factor pie maps, and results from tributary habitat research, monitoring and evaluation will be used to refine a list of 2015 to 2018 projects that will meet or exceed 2018 Table 5 HQIs.</p> <p><u>2016</u></p> <ul style="list-style-type: none"> • If appropriate, demonstrate FCRPS BiOp RPA Action 35 Table 5 achievements using metrics obtained from replacement projects at the MPG or ESU/DPS level (IP Appendix D). 	
	<ul style="list-style-type: none"> • The Action Agencies will continue to work cooperatively with the Council to identify priorities and obtain ISRP review of projects proposed for BPA funding. 	The Action Agencies will continue to cooperate with the Council to identify priorities and obtain ISRP review of projects.	

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>Habitat Strategy 1—Protect and Improve Tributary Habitat Based on Biological Needs and Prioritized Actions</i>			
	<ul style="list-style-type: none"> RM&E will inform the relationship between actions, habitat quality, and salmon productivity for use in a model developed through the FCRPS RM&E Strategy 3, Action 57 and new scientific information will be applied to estimate benefits for future implementation. 	Monitoring and effectiveness studies in the Entiat, Lemhi, Wenatchee, and Methow subbasins will produce information that will be applied to estimate future benefits when it becomes available. See RPA Action 57 action plan for descriptions of specific tributary habitat research, monitoring, and evaluation activities.	With the majority of the access and entrainment issues addressed, habitat complexity treatments are expected to provide increased benefits for salmon and steelhead growth and survival in the future. While streamflow, access, entrainment, and riparian projects will continue to be planned and implemented, the majority of the upcoming projects affect habitat complexity, including stream channel and side channel conditions and floodplain connection treatments. Effects of flow, screen and access improvement projects on fish response are direct, and biologists can logically evaluate benefits for these project types from available monitoring information and personal observation. However, habitat complexity projects require monitoring and assessment in order to draw informed conclusions regarding benefits. Studies describing results of effectiveness monitoring of complexity projects are coming

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>Habitat Strategy 1—Protect and Improve Tributary Habitat Based on Biological Needs and Prioritized Actions</i>			
			<p>on line. For example, Polivka (2013)¹² observed more and larger juvenile Chinook salmon in pools treated with large wood than in untreated pools. With the implementation of more complexity projects and related results from monitoring and evaluation, the Action Agencies expect that complexity projects will reduce density dependence issues and improve salmon and steelhead growth and survival in this and many other ways.</p> <p>The Action Agencies and regional partners will continue to incorporate RME results to develop and refine habitat improvement projects that address the most important limiting factors where they will provide the most benefit for anadromous fish. See for example “Benefits of Tributary Habitat Improvement in the Columbia River Basin; Results of Research, Monitoring, and Evaluation, 2007-2012” for a summary of information that has been shared with the</p>

¹² Polivka, K. M. 2013. Research Fisheries Biologist. USDA Forest Service, Research Station PNW-Wenatchee. Presentation for the Bureau of Reclamation Tributary Habitat Meeting. January 17, 2013.

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>Habitat Strategy 1—Protect and Improve Tributary Habitat Based on Biological Needs and Prioritized Actions</i>			
			region.
	<ul style="list-style-type: none"> If new scientific or other information (except incomplete implementation or project modifications) 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 finds that habitat quality improvement benefits were significantly overstated, the Action Agencies will implement replacement projects (selected as per Action 35 above) to provide benefits sufficient to achieve the habitat quality improvement and population-or MPG-specific survival benefit estimated for the original project or projects. <p>During 2010-2018, for non-bolded populations in Table 5, the Action Agencies may provide funding and/or technical assistance for replacement projects should they become necessary for the Action Agencies to achieve equivalent MPG or ESU survival benefits.</p> <p>For those lower Columbia populations above Bonneville Dam that have been significantly</p>	<p>The Action Agencies, with NOAA Fisheries, will examine any new science findings or information suggesting that HQIs are or have been in error. Relevant findings will be considered in the next round of expert panel workshops and evaluated in the 2016 Comprehensive Evaluation.</p> <p>The Action Agencies provide funding and technical assistance for priority and other (non-bolded) populations within the same MPG that are included in IP Appendix A and are evaluated by expert panels.</p> <p>For lower Columbia populations above Bonneville Dam that have been significantly affected by the FCRPS, the Action Agencies may provide funding and/or technical assistance for the habitat improvement projects identified in IP Appendix A.</p>	

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>Habitat Strategy 1—Protect and Improve Tributary Habitat Based on Biological Needs and Prioritized Actions</i>			
	impacted by the FCRPS (CR chum, LCR coho, LCR Chinook, and LCR steelhead) the Action Agencies may provide funding and/or technical assistance for habitat improvement projects consistent with basin wide criteria for prioritizing projects, including Recovery Plan priorities.		

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>Habitat Strategy 2—Improve Juvenile and Adult Fish Survival in Estuary Habitat</i>			
36	<p>Estuary Habitat Implementation 2007 to 2009</p> <p>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 10 year 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 stage 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</p>	<p>This Action is complete. Please refer to the 2009 FCRPS Annual Progress Report for description of the projects completed during 2007-2009.</p> <p>During the 2007-2009 implementation period, some projects scheduled for completion were delayed and carried forward to the 2010-2018 period. The benefits associated with those projects are included in 2010-2013 (Draft CE Sec 3) and 2014-2018 (IP Appendix A) implementation cycles. During the 2007-2009 period some projects also proved infeasible. The Action Agencies are implementing additional projects through 2018 to provide survival benefits equivalent to those of the infeasible projects. These additional projects are being selected and implemented in accordance with RPA Action 37.</p>	<p>RPA Action 36 called for the Action Agencies to fund implementation of the specific actions shown for the 2007-2009 period in Attachment D-1 of the Comprehensive Analysis. As described in RPA Action 36, the Action Agencies will achieve the full increment of benefits anticipated from 2007-2009 actions.</p>

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>Habitat Strategy 2—Improve Juvenile and Adult Fish Survival in Estuary Habitat</i>			
	benefits. Replacement projects will be selected per Action 37.		
37	<p>Estuary Habitat Implementation 2010-2018—Achieving Habitat Quality and Survival Improvement Targets</p> <p>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.</p>	<p>Progress in 2010-2013 is described in the Draft CE. In 2014-2018 the Action Agencies will provide funding for implementation of projects as needed to achieve the total FCRPS BiOp estuary survival benefits by 2018.</p> <p>For the 2014-2018 implementation period, the Action Agencies have identified projects to meet the BiOp's survival benefit targets for stream- and ocean-type salmon and steelhead. A list of these projects can be found in IP Appendix A of this Implementation Plan.</p> <p>If any of these individual projects prove infeasible, the Action Agencies will ensure that the total sum of projects implemented, including any replacement projects, will collectively reach the BiOp estuary habitat survival benefit targets.</p>	<p>The Action Agencies have developed a strategy of pursuing and completing the list of high priority projects expected to meet our ocean-type requirements. The Action Agencies are targeting large and complex project(s) to allow us to meet the stream-type requirements.</p> <p>These efforts will result in the Action Agencies delivering almost twice the required ocean-type SBUs. Stream SBUs are more challenging to obtain for a number of reasons. The original targets based on the BiOp's relative percent survival improvement targets (9% for ocean type and 6% for stream type) assume that habitat projects will deliver roughly 0.66 stream SBUs for every ocean SBU (30/45). The actual results from the ERTG Scores to date correspond to 0.33 stream SBUs for every ocean SBU, roughly half the ratio found in the BiOp targets.</p>
	Action Agencies will actively engage the LCREP Science workgroup to identify project benefits in coordination with other	The Action Agencies will continue to actively engage the Lower Columbia Estuary Partnership (LCEP) science work group, whose criteria are considered in	For example, the Action Agencies are exploring potential projects where

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>Habitat Strategy 2—Improve Juvenile and Adult Fish Survival in Estuary Habitat</i>			
	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.	the selection of restoration projects in the lower Columbia River and estuary.	dredged material could be used to create, restore, or enhance shallow-water estuary habitat.
	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.	The ERTG will continue to estimate survival benefit units for the Action Agencies restoration projects for the 2014-2018 period. The ERTG provides final SBU calculations for all projects. They also provide preliminary SBU estimates for a subset of projects where either the potential budget is very high or where the type of restoration treatment has not yet been reviewed. The ERTG will continue to incorporate new information into the scoring process and the Action Agencies will provide the ERTG with new RM&E findings as they become available. The CEERP process requires the Action Agencies to synthesize RM&E results periodically from across the estuary. Updated versions of the synthesis memo will be provided to the ERTG to inform their review of habitat projects.	In addition to the ERTG process, the Action Agencies will continue to use and refine the Joint Action Agency selection criteria which consider cost-benefit, social and technical complexities, and SBU assessment. The criteria will continue to guide selection of habitat projects to more effectively meet estuary targets/goals in the 2008 FCRPS BiOp more effectively. Additional details on the Action Agency project prioritization process can be found in the Draft CE Section 2.
	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.	In 2009, the ERTG and the Action Agencies began development of a template for the data needed for submission of proposed projects to ERTG. That template requires clearly described habitat metrics for each aspect of the project. In 2011 the ERTG solicited feedback from project partners on the ERTG Project Template to streamline the scoring process. This feedback was incorporated into the template in 2012. All actions pursued during the 2014-2018 period will collect the standard metrics required in the ERTG template.	
	If actions from the previous cycle prove	The Action Agencies will implement projects to	The results of both the ERTG

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>Habitat Strategy 2—Improve Juvenile and Adult Fish Survival in Estuary Habitat</i>			
	<p>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.</p>	<p>achieve survival units equivalent to the total estimated benefits of those 2010-2013 projects that proved infeasible.</p>	<p>process and action effectiveness monitoring continue to inform our restoration strategy. This strategy includes the following principles: a landscape scale is better than narrow site-specific perspective; natural processes are preferred over engineered processes; a larger area is better than smaller area; close to the main stem is preferred to farther away; and restoring remnant channels is better than excavating new ones. Based on this guidance, the BPA and Corps approach has been modified to focus on floodplain reconnections and wetland channel improvements that have a significant footprint in tidally-influenced areas relatively close to the main stem. As a result, some projects described in past IPs are no longer a priority and have been replaced by projects more in line with our current strategy. The Action Agencies expect to meet the SBU targets by 2018.</p>

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>Habitat Strategy 2—Improve Juvenile and Adult Fish Survival in Estuary Habitat</i>			
	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.	<p>The Action Agencies will continue to participate in groups such as the Estuary/Ocean RM&E Subgroup (EOS) in determining future estuary RM&E needs.</p> <p>The Action Agencies will continue to consider both research and project action effectiveness monitoring and other new scientific information in project selection.</p> <p>The Action Agencies will continue to use the Columbia Estuary Ecosystem Restoration Program (CEERP) to apply RM&E results to our restoration strategy. The CEERP adaptive management process involves five phases - decisions, actions, monitoring/research, synthesis and evaluation, and strategy (Thom 2000¹³). The CEERP adaptively proceeds through each of these phases, based on the results from the preceding phase(s). The adaptive management process informs management decisions that are aligned with the long-term CEERP goals and objectives. As management questions are informed by RM&E results, program objectives and strategies will be revised as necessary and inform future restoration and RM&E actions. At the Action Agencies' request, the ERTG developed a list of uncertainties related to the current state of restoration science. These uncertainties are used to prioritize action effectiveness monitoring, which in turn ensures that RM&E results improve the SBU scoring process over time.</p>	
	If new scientific or other information (except incomplete implementation of project modification) suggests that habitat	<p>The Action Agencies will continue to integrate the best available science into habitat quality estimates.</p> <p>The Action Agencies will continue to investigate the</p>	Findings reported in the 2013 Draft CE corroborated the benefits estimated for

¹³ Thom RM. 2000. "Adaptive management of coastal ecosystem restoration projects." Ecological Engineering 15(3-4): 365-372.

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>Habitat Strategy 2—Improve Juvenile and Adult Fish Survival in Estuary Habitat</i>			
	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 reviews 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.	degree to which reconnected floodplain wetlands produce and export macrodetritus and associated prey that fish feed on. Present ERTG benefit methodology may not take this production and export fully into account, meaning current SBU assessments may be conservatively low and potentially could be higher in the future.	<p>completed habitat actions. For example:</p> <p><i>Juvenile salmon and steelhead are using restored habitat.</i></p> <p>Monitoring demonstrates that fish are quickly making use of reopened and restored wetlands. Reconnecting floodplain habitat is a key element of our program and research has found that doing so improves habitat availability and use by specific genetic stock groups of juvenile fish. Floodplain reconnection also improves thermal conditions. Research now underway is exploring fish responses to estuary habitat actions at an even finer scale by examining salmon and steelhead residence time, prey availability, salmon and steelhead growth, and other factors.</p> <p><i>Habitat improvements benefit salmon and steelhead even if they do not directly use the habitat.</i> Research has found that tidal wetland habitats provide much of the prey and related food available to fish migrating in the mainstem Columbia River as far as seven kilometers away. Most salmon and steelhead sampled in the</p>

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>Habitat Strategy 2—Improve Juvenile and Adult Fish Survival in Estuary Habitat</i>			
			mainstem, including stream-type salmon and steelhead, had consumed prey items produced in the kind of estuary wetland habitats targeted for restoration by our program. Research indicates that juvenile salmon and steelhead prefer prey directly linked to tidal wetland habitats, further underscoring the relationship between habitat restoration and fish growth and survival.
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.	After research was conducted to assess potential survival benefits to juvenile salmon and steelhead, the Action Agencies, with NOAA Fisheries concurrence, have determined implementation of the Piling and Piling Dike Removal Program will not occur. All survival benefit units attributed to this program in the Action Agencies' 2007 Biological Assessment will now be acquired by implementing additional projects under RPA Action 37.	From research available to date, it is not possible to determine whether the removal of pile structures would actually provide survival benefits to juvenile salmon and steelhead.
	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.	Completed in 2009.	A final draft pile structure program plan was presented to NOAA in November 2008, and was reviewed in early 2009.
	Beginning in 2008 and 2009, the Action Agencies will begin implementation. Implementation will continue through	No further actions to be taken – see above.	In 2009, LCREP implemented a NOAA Fisheries-funded pile removal pilot project at Coal

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>Habitat Strategy 2—Improve Juvenile and Adult Fish Survival in Estuary Habitat</i>			
	2018.		<p>Creek Slough, near Longview. Pre- and post-project monitoring for that effort was provided by the Corps.</p> <p>In 2011 the Corps completed a survey of its existing pile structures and their structural, hydraulic and environmental characteristics.</p>

HATCHERY ACTIONS

The overall hatchery objective for all ESUs is to fund FCRPS mitigation hatchery programs in a way that contributes to reversing the decline of downward-trending ESUs. The Action Agencies will pursue two strategies to meet this overall objective:

- *Hatchery Strategy 1—Ensure that hatchery programs funded by the FCRPS Action Agencies as mitigation for the FCRPS are not impeding recovery of ESUs or steelhead DPSs.*
- *Hatchery Strategy 2—Preserve and rebuild the genetic resources through safety-net and conservation actions to reduce short-term extinction risk and promote recovery.*

Each strategy consists of two specific actions. These are summarized in the following sections.

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>Hatchery Strategy 1—Ensure that Hatchery Programs Funded by the FCRPS Action Agencies as Mitigation for the FCRPS are not Impeding Recovery of ESUs or steelhead DPSs</i>			
39	FCRPS Funding of Mitigation Hatcheries – Programmatic The FCRPS Action Agencies will continue funding hatcheries in accordance with existing programs, and will adopt programmatic criteria for funding decisions on mitigation programs for the FCRPS that incorporate BMPs. The Hatchery Effects Report, the August 2006 NOAA Fisheries paper to the PWG and the NOAA Fisheries 2007 Guidance Paper should be considered in developing these criteria in addition to the BMPs in the Action Agency's BA. Site specific application of BMPs will be defined in ESA Section 7, Section 10, or Section 4(d) consultations with NOAA Fisheries to be initiated and conducted by hatchery operators with the Action Agencies as cooperating agencies.	The FCRPS Action Agencies will continue to support existing hatchery programs in order to meet Best Management Practices (BMPs) set forth in Hatchery Genetic and Management Plans (HGMPs) and the Terms and Conditions (T&Cs) included in hatchery program Biological Opinions (BiOps). The Action Agencies will continue to fund hatchery programs consistent with existing programs and funding criteria, see http://www.salmonrecovery.gov/Hatchery/HatcheryRef orm.aspx . The criteria are intended to ensure that hatchery programs that receive FCRPS funding do not impede—and where possible enhance—the recovery of ESA-listed salmon and steelhead.	HGMPs for all Action Agency funded hatchery mitigation programs have been submitted for ESA consultation. The Action Agencies will continue to work with hatchery operators and NOAA Fisheries to complete ESA Section 7 or Section 10 consultations for programs still awaiting formal ESA review.
40	Reform FCRPS Hatchery Operations to Reduce Genetic and Ecological Effects on ESA-Listed Salmon and Steelhead The Action Agencies will undertake/fund	Hatchery Scientific Review Group (HSRG) reforms and other scientific information were considered in HGMP development and continue to inform ongoing NOAA Fisheries ESA consultations. Actions are	The Action Agencies are developing a streamlined RME approach for a framework for identification and assessment

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>Hatchery Strategy 1—Ensure that Hatchery Programs Funded by the FCRPS Action Agencies as Mitigation for the FCRPS are not Impeding Recovery of ESUs or steelhead DPSs</i>			
	reforms to ensure that hatchery programs funded by the Action Agencies as mitigation for the FCRPS are not impeding recovery. The Action Agencies will work with FCRPS mitigation hatchery operators to cost effectively address needed reforms of current hatchery programs while continuing to meet mitigation responsibilities. Specific reforms to be implemented under this action (following any necessary regulatory approval) are listed in Table 6. Other reforms will be identified and implemented following the conclusion of the Columbia River Hatchery Scientific Review Group process.	described in more detail below.	of successful hatchery reforms.
	<ul style="list-style-type: none"> • For Lower Columbia Chinook: The COE will review the John Day Hatchery Mitigation Program. 	The Corps is currently doing a study to evaluate alternative strategies to minimize any adverse effects of the John Day project on ESA-listed species. Potential funding to implement any future action resulting from this study would be a separate John Day project cost and budgetary decision. The study is planned for completion in 2014.	In 2012, the Corps, in collaboration with the <i>U.S. v Oregon</i> Production Advisory Committee, adopted a new methodology for determining the number and type of smolts necessary for this mitigation program. An analysis of alternative means of meeting the proposed new program goals was completed in late 2012. A draft Environmental Assessment was released for public comment in March 2013. The Corps is currently developing a decision document to document the need and justification for modification of the current program, and to determine

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>Hatchery Strategy 1—Ensure that Hatchery Programs Funded by the FCRPS Action Agencies as Mitigation for the FCRPS are not Impeding Recovery of ESUs or steelhead DPSs</i>			
			whether that modified program would fit within the current authorizing language.
	<ul style="list-style-type: none"> • For Snake River Steelhead: Fund the Tucannon River steelhead supplementation program to transition to local broodstock using BMPs. 	Transitioning to local broodstock will continue to be funded by BPA and implemented by the Lower Snake River Compensation Plan (LSRCP) program office and WDFW, the LSRCP hatchery program operator for the Tucannon River steelhead supplementation program.	To implement the transition to local broodstock, the current Tucannon River endemic (local) broodstock summer steelhead smolt production was increased from 50,000 to 75,000 fish annually (beginning with Brood Year (BY) 2010 production for release in 2011), and may expand up to 100,000 by 2013/2014. This increase in local broodstock production coincides with a decrease in production of Lyons Ferry captive broodstock.
	<ul style="list-style-type: none"> • For Middle Columbia Steelhead: Fund the Touchet River steelhead supplementation program to transition to local broodstock using BMPs. 	BPA will continue to fund LSRCP and WDFW to implement this action. The co-managers (WDFW and Confederated Tribes of the Umatilla Indian Reservation) and NOAA Fisheries need to re-assess the future goals of the supplementation program.	Per the August 2012 Annual Operations Plan (AOP) meeting with the co-managers (Washington Department of Fish and Wildlife and Confederated Tribes of the Umatilla Indian Reservation), technical representatives agreed to move forward for formal policy level discussion/review for a potential change in the endemic program in 2013 as part of the AOP process. After 12 years of testing, RM&E data for the endemic program

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>Hatchery Strategy 1—Ensure that Hatchery Programs Funded by the FCRPS Action Agencies as Mitigation for the FCRPS are not Impeding Recovery of ESUs or steelhead DPSs</i>			
			indicates the program as it exists may pose a risk to the long-term health of the native Touchet River population. Future goals of this program will be re-assessed.
	<ul style="list-style-type: none"> • For Upper Columbia Steelhead: For the Winthrop NFH steelhead program, implement measures to transition to local broodstock and to manage the number of Winthrop NFH-produced steelhead on the spawning grounds. Such broodstock and adult escapement reform measures, including capital construction, would be identified through development of an updated HGMP and ESA consultation. Implementation of reform measures is contingent on a finding, in consultation with NOAA, that the measures are biologically and economically feasible and effective. Implementation of reforms will be prioritized and sequenced. 	<p>This action is being funded by Reclamation and implemented by USFWS, hatchery operator for Winthrop NFH. The program will continue the use of local broodstock as outlined in the revised HGMP submitted to NOAA in November 2012 and incorporate the use of recently constructed adult holding facilities. Hatchery steelhead management will be enhanced through recommendations from the Project Alternatives Solutions Study report (Reclamation 2011) using a combination of non-structural and temporary structure methods to capture broodstock and remove excess returning hatchery adults. The report can be found at: http://www.salmonrecovery.gov/Files/2011%20APR%20files/Corrections/Reclamation_2012_Winthrop_PASS_Rpt_Fnl.pdf</p> <p>Success of these measures will be monitored and additional reforms will be developed, if necessary, through formal consultation with NOAA.</p>	<p>The program transitioned to local broodstock from 2008-2012, requiring a two-year rearing strategy compared to a program using Wells Dam stock. Preliminary results indicate the success of this strategy, with better survival and migratory performance under the two-year rearing regime. Additionally, hatchery upgrades included a project to remove and replace outdated structures and install new holding and rearing ponds for sorting and spawning adult fish at Winthrop NFH. This project was considered by the technical evaluation team and bids were solicited in 2010, a contract was awarded in 2011, and construction was completed in 2012.</p>

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>Hatchery Strategy 2—Preserve and Rebuild Genetic Resources Through Safety-net and Conservation Actions to Reduce Short-term Extinction Risk and Promote Recovery</i>			
41	Implement Safety Net Programs to Preserve Genetic Resources and Reduce Short-term Extinction Risk The Action Agencies will continue to fund the operation of on-going safety net programs that are providing benefits to ESA-listed stocks at high risk of extinction by increasing genetic resources and will identify and plan for additional safety-net programs, as needed. Specific safety-net programs to be implemented under this action are listed in Table 7 (of the BiOp).	Ongoing safety-net programs and new or modified safety-net programs that are being planned or implemented are listed in Appendix A. Actions are described in more detail below.	
	<ul style="list-style-type: none"> • For Snake River sockeye: Continue to fund the safety net program to achieve the interim goal of annual releases of 150,000 smolts while also continuing to implement other release strategies in nursery lakes such as fry and parr releases, eyed-egg incubation boxes, and adult releases for volitional spawning (see Action 42 for expansion of the program for building genetic resources and assisting in promoting recovery). 	BPA will continue to fund the Snake River Sockeye Salmon Captive Broodstock Program (to preserve this species, in accordance with the ESA Section 10 Permit issued by NOAA Fisheries. The Stanley Basin Technical Oversight Committee will continue to provide guidance on the program. (See Action 42 for expansion of the program for building genetic resources and assisting in promoting recovery).	The program has produced millions of progeny from remnants of the wild stock. The progeny are raised in carefully managed hatcheries and released into their natural habitats using multiple release strategies, including smolt, fry, and parr releases; eyed-egg incubation boxes; and adult releases for volitional spawning.
	<ul style="list-style-type: none"> • For Snake River Spring/Summer Chinook: For the Tucannon River spring/summer Chinook safety-net supplementation program fund capital construction, operation and monitoring and evaluation costs to implement a program that builds genetic diversity using local broodstock and a sliding scale for managing the composition of natural 	Tucannon River Spring Chinook Captive Brood, a one-generation safety-net program, was completed as planned in 2010. BPA will continue to fund a supplementation hatchery program for Tucannon River spring/summer Chinook salmon through the LSRCP Direct Funding Agreement.	The captive brood program was not successful in meeting its adult return goals, so the co-managers (Washington Dept. of Fish and Wildlife and Confederated Tribes of the Umatilla Indian Reservation) decided to use a conventional hatchery supplementation program to help rebuild the

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>Hatchery Strategy 2—Preserve and Rebuild Genetic Resources Through Safety-net and Conservation Actions to Reduce Short-term Extinction Risk and Promote Recovery</i>			
	spawners comprised of hatchery-origin fish.		Tucannon River spring/summer Chinook salmon population.
	<ul style="list-style-type: none"> • For Snake River Spring/Summer Chinook: For the Upper Grande Ronde and Catherine Creek safety net supplementation programs fund capital construction, operation and monitoring and evaluation costs to implement a program that builds genetic diversity using local broodstock, and a sliding scale for managing the composition of natural spawners comprised of hatchery origin fish. 	BPA will continue to fund the Oregon Spring Chinook Captive Propagation safety-net program. Adult return goals have not been met for the upper Grande Ronde stock; this safety-net work will continue to be funded as needed to reduce short-term extinction risk and promote recovery of the population.	The Catherine Creek and Lostine River have met adult return goals of 150 spawning adults in nature, therefore these two safety-net programs were phased out.
	<ul style="list-style-type: none"> • For Snake River Spring/Summer Chinook: Fund the Johnson Creek / South Fork Salmon River safety net supplementation program, as described in the existing Section 10 permit. 	BPA will continue to fund this safety-net program through the Johnson Creek Artificial Propagation Enhancement project as described in the ESA Section 10 Permit issued by NOAA Fisheries.	
	<ul style="list-style-type: none"> • For Snake River Spring/Summer Chinook: Fund the experimental captive rearing program for East Fork and West Fork Yankee Fork Salmon River (until phased out by IDFG). 	BPA will continue to fund the Idaho Snake River spring Chinook experimental captive rearing program until completion in 2015.	All captive-rearing ended in 2010 when the last remaining brood year (BY05) was released as mature adults to spawn in their natal waters. Monitoring and evaluation of the contribution of released captive-reared Chinook to natural adult returns is ongoing for this project, one critical field evaluation remains. Complete evaluation of captive-reared production

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>Hatchery Strategy 2—Preserve and Rebuild Genetic Resources Through Safety-net and Conservation Actions to Reduce Short-term Extinction Risk and Promote Recovery</i>			
			(adult-to-adult) via genetic parentage analysis. The highest likelihood of observing captive-reared contribution to adult returns is during adult return years 2010-2014, since the greatest number of captive-reared redds were produced during 2006-2009. In 2015, upon completion of these last remaining tasks and analyses, IDFG will then write a completion report on the efficacy of captive rearing for Chinook salmon.
	<ul style="list-style-type: none"> For Snake River Steelhead, as a project to benefit primarily B-run steelhead, the Action Agencies will work with NOAA Fisheries to develop a trigger for future artificial propagation safety-net planning or to identify populations for immediate safety-net planning. 	BPA will work with NOAA Fisheries to develop a trigger for safety-net planning once sufficient data are available (as determined by NOAA Fisheries) through the enhanced Snake River B-run steelhead population productivity and abundance monitoring implemented through RPA Subaction 50.5.	At this time, it is not feasible to implement this action because of a lack of adequate B-run steelhead population viability data.
42	Implement Conservation Programs to Build Genetic Resources and Assist in Promoting Recovery The Action Agencies will implement conservation programs for ESA-listed stocks where the programs assist in recovery. Specific conservation programs to be implemented under this action are listed in Table 8 (of the 2008 FCRPS BiOp RPA) and shown below.	Ongoing conservation programs and new or modified conservation programs that are being planned or implemented are listed in IP Appendix A. Actions are described in more detail below.	

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>Hatchery Strategy 2—Preserve and Rebuild Genetic Resources Through Safety-net and Conservation Actions to Reduce Short-term Extinction Risk and Promote Recovery</i>			
	<ul style="list-style-type: none"> For Upper Columbia Spring Chinook: Fund reintroduction of spring Chinook salmon into the Okanogan Basin consistent with the Upper Columbia Salmon Recovery Plan including capital construction, operation and monitoring, and evaluation costs to implement a transition to local broodstock and a sliding scale for managing the composition of natural spawners comprised of hatchery-origin fish. Reintroduction will be coordinated with the restoration and improvement of spring Chinook habitat in the Okanogan Basin and will be contingent on the availability of within ESU broodstock from the Methow Basin. 	The Chief Joseph Hatchery is expected to serve as the artificial production facility needed for this spring Chinook reintroduction program. Completion of construction is expected in May 2013 and production of spring Chinook will begin after the hatchery is fully operational, expected in late 2013. This production will initially be contingent on the availability of within-ESU spring Chinook broodstock from the Methow River Basin.	
	<ul style="list-style-type: none"> For Upper Columbia Steelhead: Fund a program to recondition natural-origin kelts for the Entiat, Methow, and Okanogan Basin including capital construction, operation and monitoring and evaluation costs. 	BPA will continue to fund operation and maintenance of the Upper Columbia reconditioning program.	In 2012, the BPA funded the Yakama Nation to complete construction of a steelhead kelt reconditioning facility at Winthrop NFH. Eight kelts were being reconditioned at the end of 2012, the first year of facility operation.
	<ul style="list-style-type: none"> For Upper Columbia Steelhead: Fund a program that builds genetic diversity using local broodstock and accelerates steelhead recovery in the Okanogan Basin as steelhead habitat is restored and improved, including capital construction, operation, and 	This action is being implemented by the Confederated Tribes of the Colville Reservation (CTCR). A contract to complete the Master Plan (Step 1 of the Council's 3-Step Process) is in place. Steps 2 & 3 are expected to be completed in 2014-2016.	

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>Hatchery Strategy 2—Preserve and Rebuild Genetic Resources Through Safety-net and Conservation Actions to Reduce Short-term Extinction Risk and Promote Recovery</i>			
	monitoring and evaluation costs.		
	<ul style="list-style-type: none"> For Middle Columbia Steelhead: Fund a program to recondition natural-origin kelts in the Yakima River Basin including capital construction, implementation, and monitoring and evaluation costs. 	BPA will continue to support this program.	The associated project collects steelhead kelts from Mid-Columbia DPS populations (e.g., Satus Creek, Toppenish Creek, Upper Yakima River, and Naches River) at Prosser Dam on the Yakima River for reconditioning.
	<ul style="list-style-type: none"> For Snake River Steelhead: For the East Fork Salmon River, fund a small-scale program (no more than 50,000 smolts) including trapping locally returning steelhead in the East Fork Salmon River for broodstock, and follow BMPs for rearing, release, and adult management strategies. Fund capital construction, operation and monitoring, and evaluation costs to implement a program that builds genetic diversity using local broodstock and a sliding scale for managing the composition of natural spawners comprised of hatchery-origin fish. 	The East Fork Salmon River Steelhead program will continue to be funded by BPA through the Lower Snake River Compensation Program (LSRCP).	Upon completion of the RPA Action 39 ESA consultation, the hatchery program BiOp may require modifications to the current program.
	<ul style="list-style-type: none"> For Snake River Spring/Summer Chinook Salmon: For the Lostine and Imnaha rivers, contingent on a NOAA approved HGMP, fund these hatchery programs including capital construction, operation and monitoring and evaluation costs to implement supplementation programs 	Once ESA consultation is completed by NOAA Fisheries, BPA will plan for construction of the Northeast Oregon Hatchery Lostine and Imnaha spring/summer Chinook propagation facilities when capital funds are available.	

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>Hatchery Strategy 2—Preserve and Rebuild Genetic Resources Through Safety-net and Conservation Actions to Reduce Short-term Extinction Risk and Promote Recovery</i>			
	using local broodstock and following a sliding scale for managing the composition of natural spawners comprised of hatchery-origin fish.		
	<ul style="list-style-type: none"> For Snake River Sockeye: Fund further expansion of the sockeye program to increase total smolt releases to between 500,000 and 1 million fish. 	BPA will continue to fund operation and maintenance of the facility and implementation of this action through the Snake River Sockeye Captive Broodstock Program.	BPA funded construction of the Springfield Sockeye Hatchery near Pocatello, ID, in 2013 to increase production to the 500,000 to 1 million smolts needed to implement this action.
	<ul style="list-style-type: none"> For Snake River Sockeye: The Action Agencies will work with appropriate parties to investigate feasibility and potentially develop a plan for ground transport of adult sockeye from LGR Dam to Sawtooth Valley lakes or artificial propagation facilities. 	The Corps is funding an analysis of adult sockeye PIT-tag data to develop an adult transport plan. The study will utilize existing PIT-tag data for 2008 through 2013 and will estimate travel times, fallback/reascension rates, migration timing and environmental variables. Those variables will be correlated with adult conversion rates from Lower Granite Dam to the spawning grounds, with the goal of determining which factors most influence adult sockeye survival through the FCRPS. Results will be used to define any further research that may be needed, and to inform development of an adult sockeye transport plan.	The Action Agencies, together with state and federal fishery agencies, implemented a highly successful pilot project in 2010 to evaluate feasibility of ground transport from the Lower Granite Dam adult trap to IDFG's Eagle Hatchery. Ground transport would be a feasible option if future river conditions and low return numbers warrant its use, and if NOAA Fisheries and the fishery co-managers, in coordination with the Action Agencies, decide to implement this option.
	<ul style="list-style-type: none"> For Columbia River Chum: Fund a hatchery program to re-introduce chum salmon in Duncan Creek including capital construction, implementation and monitoring and 	BPA will continue to fund the reintroduction of chum through the development of an Integrated Strategy for Chum Salmon Restoration in the Tributaries Below Bonneville Dam program.	

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>Hatchery Strategy 2—Preserve and Rebuild Genetic Resources Through Safety-net and Conservation Actions to Reduce Short-term Extinction Risk and Promote Recovery</i>			
	evaluation costs as long as NOAA Fisheries considers it beneficial to recovery and necessary to reduce extinction risk of the target population.		
	<ul style="list-style-type: none"> For Columbia River Chum: Fund assessment of habitat potential, development of reintroduction strategies, and implementation of pilot supplementation projects in selected Lower Columbia River tributaries below Bonneville Dam. 	BPA will continue to fund the development of an Integrated Strategy for Chum salmon Restoration in the Tributaries below Bonneville Dam to implement this action as well as the action to reintroduce chum salmon in Duncan Creek.	Chum salmon supplementation efforts are expected to begin following completion of the NPPC's Three-Step Review process for artificial production projects in 2013.

PREDATION MANAGEMENT ACTIONS

The overall predation management objective for all ESUs is to improve the survival of juvenile and adult fish as they pass through the hydrosystem. The Action Agencies will pursue three strategies to meet this overall objective:

- *Predation Management Strategy 1—Implement piscivorous predation control measures to increase survival of juvenile salmon and steelhead in the lower Snake and Columbia rivers*
- *Predation Management Strategy 2—Implement avian predation control measures to increase survival of juvenile salmon and steelhead in the lower Snake and Columbia rivers*
- *Predation Management Strategy 3—Implement marine mammal control measures to increase survival of adult salmon and steelhead at Bonneville Dam*

Each strategy consists of two specific actions. These are summarized in the following sections.

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>Predation Management Strategy 1—Implement Piscivorous Predation Control Measures to Increase Survival of Juvenile Salmon and steelhead in the lower Snake and Columbia Rivers</i>			
43	<p>Northern Pikeminnow Management Program (NPMP)</p> <p>Action Agencies will continue to annually implement the base program and continue the general increase in the reward structure in the northern pikeminnow sport-reward fishery consistent with the increase starting in 2004. To better evaluate the effects of the NPMP, BPA will increase the number of tagged fish.</p> <p>The Action Agencies will evaluate the effectiveness of focused removals of pikeminnow at The Dalles and John Day Dams and implement as warranted. Additional scoping of other mainstem dams will be based upon evaluations and adaptive management principles with input from NOAA Fisheries, and other regional fisheries managers.</p>	<p>The Northern Pikeminnow Management Program (NPMP) will continue implementation into the future, including the 2014-2018 performance period.</p> <p>The general increase in the Sport Reward fishery was made permanent in 2005; it will continue during the 2014-2018 performance period.</p> <p>The NPMP has continued success in increasing the number of tagged northern pikeminnow to increase the precision of the evaluation of the removal fisheries.</p> <p>The NPMP will continue implementation of a Dam Angling fishery with focus upon removals at The Dalles and John Day dams.</p>	<p>The NPMP continues to implement removal fisheries in the most cost-effective manner.</p> <p>In 2010 The NPMP reinstated a Dam Angling program component to remove pikeminnow from the forebay and tailrace areas of the Dalles and John Day dams. Dam-caught pikeminnow average larger and older than in the general reward fishery. As a result their consumption of juvenile salmon is higher. The NPMP will continue implementation of the Dam Angling program component, based on monitoring results.</p> <p>Catches in the Dam Angling fishery have increased since reinstatement.</p>

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>Predation Management Strategy 1—Implement Piscivorous Predation Control Measures to Increase Survival of Juvenile Salmon and steelhead in the lower Snake and Columbia Rivers</i>			
44	<p>Develop strategies to reduce non-indigenous fish</p> <p>The Action Agencies will work with NOAA Fisheries, states, and tribes to coordinate to review, evaluate, and develop strategies to reduce non-indigenous piscivorous predation. The formation of a workshop will be an initial step in the process.</p>	Results of the 2010-2012 research are scheduled to be presented in Spring 2013 to regional entities involved in non-indigenous piscine predation. From there next steps will be determined for future 2014-2018 implementation of actions.	<p>Three years of basic and applied research have occurred resulting from the general consensus of priority research hypotheses received from two regional workshops consisting of regional fishery research and management entities.</p> <p>Based on the research results to date (researchers are still analyzing 2012 results), it appears that while juvenile shad do comprise a significant diet component for one non-indigenous piscine predator (walleye) it does not appear that juv. shad are contributing to an increase in over-wintering survival of walleye or smallmouth bass and channel catfish. Therefore and action to exclude adult shad from upper reaches of the Columbia is not warranted.</p>

Action No.	Action Description	2014-2018 Actions	Adaptive Management																												
<i>Predation Management Strategy 2—Implement Avian Predation Control Measure to Increase Survival of Juvenile Salmon and steelhead in the lower Snake and Columbia Rivers</i>																															
45	<p>Reduce Caspian Terns on East Sand Island in the Columbia River Estuary</p> <p>The FCRPS Action Agencies will implement the Caspian Tern Management Plan. East Sand Island tern habitat will be reduced from 6.5 to 1.5 to 2 acres. It is predicted that the target acreage on East Sand Island will be achieved in approximately 2010.</p> <table> <tr> <th>Site</th><th>Acres</th><th>Proposed Year Of Creation</th><th>Proposed Year In Which Target Acreage Is Achieved</th></tr> <tr> <td>Fern Ridge Lake</td><td>1</td><td>2007/2008</td><td>2007/2008</td></tr> <tr> <td>Summer Lake</td><td>1.5</td><td>2008</td><td>2008</td></tr> <tr> <td>Crump Lake</td><td>1</td><td>2009</td><td>2009</td></tr> <tr> <td>Brooks Island (San Francisco Bay)</td><td>2</td><td>2008/2009</td><td>2008/2009</td></tr> <tr> <td>Hayward Regional Shoreline (San Francisco Bay)</td><td>0.5</td><td>2008/2009</td><td>2008/2009</td></tr> <tr> <td>Don Edwards NWR (San Francisco Bay)</td><td>0.5 – 1</td><td>2009</td><td>2009</td></tr> </table>	Site	Acres	Proposed Year Of Creation	Proposed Year In Which Target Acreage Is Achieved	Fern Ridge Lake	1	2007/2008	2007/2008	Summer Lake	1.5	2008	2008	Crump Lake	1	2009	2009	Brooks Island (San Francisco Bay)	2	2008/2009	2008/2009	Hayward Regional Shoreline (San Francisco Bay)	0.5	2008/2009	2008/2009	Don Edwards NWR (San Francisco Bay)	0.5 – 1	2009	2009	<p>The FCRPS Action Agencies will continue implementation of the Caspian Tern Management Plan, herein meaning the selected alternative identified in the 2006 ROD/EIS for Caspian Tern Management to Reduce Predation of Juvenile Salmon and steelhead in the Columbia River Estuary (CRE). To-date Caspian tern habitat has been created/enhanced in 8.3 acres of interior Oregon/northern California. This has allowed reduction Caspian tern habitat at East Sand Island tern habitat. 2013 marks the 3rd year that this habitat has been managed at 1.5-2.0 acres. This area may be further reduced to 1.0 acre if alternative acres are identified and constructed outside the Columbia River Basin.</p> <p>The Action Agencies will continue to assess the effectiveness of the alternative constructed sites in attracting and retaining tern populations per the EIS. Operation and Maintenance (O&M) Plans for these sites will be prepared and will include management actions, such as predator control. The O&M Plan will also describe plans for monitoring and evaluation of alternative constructed nesting sites.</p> <p>The Action Agencies will continue to assess the effectiveness of reducing nesting habitat on East Sand Island towards reducing juvenile salmon consumption by Caspian terns. If warranted, the Action Agencies will construct out-of-basin nesting habitat sufficient to allow a further reduction of ESI nesting habitat to 1.0 acre (the lowest level considered under the EIS for the management plan).</p>	<p>2012 was the first year in which nesting habitat could be reduced to the target of 1.5 acres. That was expected to reduce abundance to about 3125 nesting pairs. Actual abundance in 2012 was about 6,400 nesting pairs as a result of the terns nesting closer together than anticipated. However, predation on terns by eagles and gulls has increased in recent years; it is possible that the number of nesting pairs will continue to decrease even without further decreases in nesting area available. The Action Agencies will continue to facilitate the Tern Adaptive Management Team and will prepare an Adaptive Management Plan if Caspian tern response to the proposed management actions continues to not meet the specified objectives. Adaptive management would be used to effect change in the implementation, operation, and/or maintenance of actions towards reducing juvenile salmon consumption by the ESI Caspian tern colony.</p>
Site	Acres	Proposed Year Of Creation	Proposed Year In Which Target Acreage Is Achieved																												
Fern Ridge Lake	1	2007/2008	2007/2008																												
Summer Lake	1.5	2008	2008																												
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Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>Predation Management Strategy 2—Implement Avian Predation Control Measure to Increase Survival of Juvenile Salmon and steelhead in the lower Snake and Columbia Rivers</i>			
46	Double-Crested Cormorant The FCRPS Action Agencies will develop a cormorant management plan encompassing additional research, development of a conceptual management plan, and implementation of warranted actions in the estuary.	The Corps is developing a cormorant management plan/ environmental impact statement (EIS) evaluating a range of alternatives, including dissuasion and lethal take actions, to reduce cormorant predation of juvenile salmon and steelhead. Completion of the cormorant management plan/EIS (scheduled for 2014) will be done in coordination with USFWS and other cooperating agencies (ODFW, WDFW and USDA-APHIS). Issue a record of decision and implement the preferred alternative of the final EIS (anticipated in 2015) consistent with adaptive management.	See RPA Action 67 for monitoring information.
47	Inland Avian Predation The FCRPS Action Agencies will develop an avian management plan (for Double-Crested Cormorants, Caspian Terns, and other avian species as determined by RM&E) for Corps-owned lands and associated shallow-water habitat.	Responsible Action Agencies will continue working with regional partners including NMFS, USFWS, mid-Columbia Public Utility Districts, and tribes to complete the Inland Avian Predation Management Plan (IAPMP) and environmental and biological analysis pursuant to NEPA and ESA using key findings and recommendations from the 2011 Benefits Analysis ¹⁴ . This analysis of avian predation research data identifies potential actions that reduce predation on juvenile salmon and steelhead by Caspian tern colonies at Goose Island (Potholes Reservoir near Othello, WA) and Crescent Island (McNary Reservoir near Pasco, WA) as likely to provide the greatest potential benefit to upper Columbia and lower Snake river salmon and steelhead.	Under the draft plan, monitoring under RPA Action 68 would inform Phase II actions through an adaptive management process to ensure that the anticipated benefits of the plan are achieved.

¹⁴ Lyons, D.E., D.D. Roby, A.F. Evans, N.J. Hostetter, and K. Collis. 2011. *Benefits to Columbia River anadromous salmonids from potential reductions in avian predation on the Columbia Plateau. Report submitted to the U.S. Army Corps of Engineers - Walla Walla District. Bird Research Northwest. Available on-line at www.birdresearchnw.org.*

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>Predation Management Strategy 2—Implement Avian Predation Control Measure to Increase Survival of Juvenile Salmon and steelhead in the lower Snake and Columbia Rivers</i>			
		The preferred action currently proposed in the draft IAPMP and the assessment of environmental impacts in the draft EA is a phased dissuasion of Caspian terns initially at Goose Island during Phase I and later at Crescent Island during Phase II. Following conclusion of the NEPA process, anticipated completion in late 2013, the plan (as informed by the selected alternative) will be implemented as warranted.	
48	Other Avian Deterrent Actions The Corps will continue to implement and improve avian deterrent programs at all lower Snake and Columbia River dams. This program will be coordinated through the Fish Passage Operations and Maintenance Team and included in the FPP.	Continue existing avian deterrent program (hazing and tailrace wires) and implement additional actions as warranted. Review annually and identify potential areas for improvement through FPOM. Continue development and implementation of standardized reporting of bird counts to FPOM.	PLACEHOLDER FOR AM

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>Predation Management Strategy 3—Implement Marine Mammal Control Measures to Increase Survival of Adult Salmon and steelhead at Bonneville Dam</i>			
49	Marine Mammal Control Measures The Corps will install and improve as needed sea lion excluder gates at all main adult fish ladder entrances at Bonneville dam annually. In addition, the Corps will continue to support land and water based harassment efforts by NOAA Fisheries, Oregon Department of Wildlife (ODFW), Washington Department of Fish and Wildlife (WDFW), and the Tribes to keep sea lions away from the area immediately downstream of Bonneville Dam.	The Corps will continue to annually install sea lion excluder devices at all main fish ladder entrances, in accordance with the requirements in the Fish Passage Plan. Any needed improvements to the excluder devices will be regionally coordinated. The Action Agencies will continue to support land- and water based harassment efforts by NOAA Fisheries, ODFW, WDFW, and the tribes.	Sea Lion excluder devices have proven to be very effective at preventing pinniped access to ladder entrances.

RESEARCH, MONITORING, AND EVALUATION ACTIONS

The overall RM&E objective is to provide information needed to support planning and adaptive management and demonstrate accountability related to the implementation of FCRPS ESA hydropower and offsite actions for all ESUs. The Action Agencies will undertake RM&E through project implementation and compliance monitoring, status monitoring, action effectiveness research, and critical uncertainties research in the following nine areas:

- *RM&E Strategy 1—Monitor Status of Selected Fish Populations Related to FCRPS Actions*
- *RM&E Strategy 2—Hydropower RM&E*
- *RM&E Strategy 3—Tributary Habitat RM&E*
- *RM&E Strategy 4—Estuary and Ocean RM&E*
- *RM&E Strategy 5—Harvest RM&E*
- *RM&E Strategy 6—Hatchery RM&E*
- *RM&E Strategy 7—Predation Management RM&E*
- *RM&E Strategy 8—Coordination and Data Management*
- *RM&E Strategy 9—Project Implementation and Compliance Monitoring*

Each of the nine areas is identified as a strategy in the following discussion. Each strategy consists of one or more specific actions. These are summarized in the following sections.

The following identified measures will be monitored to assess progress toward achievement of performance standards (benchmarks) and performance targets (longer-term goals) to inform adaptive management actions. Two aspects of performance will be monitored:

- *Programmatic performance will be tracked through project implementation and compliance monitoring.*
- *Biological and environmental performance will be tracked and evaluated through status monitoring, action effectiveness research, and critical uncertainty research in combination with existing and developing quantitative models. Performance standards will be monitored to ensure accountability and adherence to proposed actions. Biological performance targets will be evaluated over longer time periods as new information and learning is applied through analytical models. Targets allow us to check for progress toward expected life stage NOAA Fisheries' Reasonable and Prudent Alternative Table of Actions*

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>RM&E Strategy 1—Monitor the Status of Selected Fish Populations Related to FCRPS Actions</i> <i>The Action Agencies' strategy is to support performance monitoring and adaptive management related to the status of fish populations.</i>			
50	Fish Population Status Monitoring The Action Agencies will enhance existing fish population status monitoring performed by fish management agencies through the specific actions listed below. In addition, ancillary population status and trend information is being obtained through several ongoing habitat and hatchery improvement projects (see project tables in Attachment B.2.6-1).	Best available data on fish population status is available at NOAA Fisheries' SPS Database https://www.webapps.nwfsc.noaa.gov/apex/f?p=261:home:0 And Fish Passage Center http://www.fpc.org/ Or in annual reports prepared by Action Agency project sponsor reports (e.g. for BPA at www.cbfish.org).	
	RPA Subaction 50.1 Implement and maintain the Columbia River Basin passive integrated transponder (PIT)- Tag Information System. (Annually)	PTAGIS will be funded annually by BPA to operate and maintain the PIT-tag system throughout the Columbia Basin and to maintain the PIT-tag database. A PIT-tag forecasting tool will be added to facilitate coordination and optimization of tagging efforts. The extensive network of in-stream PIT-tag detection sites will be maintained for juvenile and adult PIT-tag interrogation.	
	RPA Subaction 50.2 Monitor adult returns at mainstem hydroelectric dams using both visual counts and the PIT-tag detection system (see Hydrosystem section). (Annually)	Continue index of daytime visual counts at all dams. Continue PIT-tag monitoring of adults at Bonneville, McNary, and Lower Granite dams, and begin such monitoring at The Dalles Dam when the system there is fully functional.	A temporary system was installed at The Dalles early in 2013. Installation of a permanent system is scheduled for 2015.
	RPA Subaction 50.3 Monitor juvenile fish migrations at mainstem hydroelectric dams using smolt monitoring and the PIT-tag detection system (see Hydrosystem	The Action Agencies will PIT-tag yearling and subyearling Chinook, steelhead, and sockeye juveniles of hatchery and natural origin to support real time and planning assessments of progress and needed adaptive management.	

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>RM&E Strategy 1—Monitor the Status of Selected Fish Populations Related to FCRPS Actions</i> <i>The Action Agencies' strategy is to support performance monitoring and adaptive management related to the status of fish populations.</i>			
	section). (Annually)		
	<p>RPA Subaction 50.4</p> <p>Fund status and trend monitoring as a component of the pilot studies in the Wenatchee, Methow, and Entiat river basins in the Upper Columbia River, the Lemhi and South Fork Salmon river basins, and the John Day River Basin to further advance the methods and information needed for assessing the status of fish populations. (Initiate in FY 2007-2009 Project Funding, review and modify annually to ensure that these projects continue to provide a means of evaluating the effectiveness of tributary mitigation actions).</p>	<p>Continue monitoring fish-in and fish-out within the Wenatchee, Methow, Entiat, Lemhi, and South Fork Salmon and John Day using monitoring techniques and designs. This monitoring will be coordinated with PNAMP and the regional Coordinated Assessments process for sharing fish population indicator data.</p>	
	<p>RPA Subaction 50.5</p> <p>Provide additional status monitoring to ensure a majority of Snake River B-Run steelhead populations are being monitored for population productivity and abundance. (Initiate by FY 2009, then annually)</p>	<p>Maintain current efforts to monitor B-run steelhead adult escapement, estimate spawner abundance, and collect adult and juvenile genetics information.</p> <p>Continue to implement parental genotyping to assess DNA objectives for population identification.</p> <p>Systematically sample returning adult steelhead at Lower Granite Dam for genetics and age structure, and mark the fish with PIT-tags. Continue to maintain the PIT-tag array system and assess the distribution, abundance, and productivity of steelhead within a majority of the B-run populations.</p> <p>Expand existing approach to capture hatchery information by systematically tagging a proportion of hatchery fish at Lower Granite.</p> <p>Based on habitat and kelt performance tracking needs for B</p>	

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>RM&E Strategy 1—Monitor the Status of Selected Fish Populations Related to FCRPS Actions</i> <i>The Action Agencies' strategy is to support performance monitoring and adaptive management related to the status of fish populations.</i>			
		run steelhead, assess needs and benefits of expanding PIT-tag detection systems into the Selway and Lochsa.	
	RPA Subaction 50.6 Review and modify existing Action Agencies' fish population status monitoring projects to improve their compliance with regional standards and protocols, and ensure they are prioritized and effectively focused on critical performance measures and populations. (Initiate in FY 2008, develop proposed modification in FY 2009, implement modifications in FY 2010)	<p>Continue to monitor the following populations for adult spawner abundance and juvenile out-migrant abundance (fish-in/fish-out) according to the NOAA Fisheries guidance document:</p> <p>Snake River Spring / Summer Chinook evolutionarily significant unit (ESU):</p> <ul style="list-style-type: none"> ○ South Fork Salmon population within the South Fork MPG. ○ Middle Fork Salmon population within the Middle Fork MPG. ○ Lemhi population within the Upper Salmon MPG. ○ Pahsimeroi population within the Upper Salmon MPG. ○ Yankee Fork population within the Upper Salmon MPG. ○ Tucannon population within the Lower Snake MPG. ○ Upper Grande Ronde populations within the Grande Ronde/Imnaha MPG. ○ Catherine Creek population within the Grande Ronde/Imnaha MPG. <ul style="list-style-type: none"> • Upper Columbia Spring Chinook ESU: <ul style="list-style-type: none"> ○ Wenatchee population within the Upper Columbia MPG. ○ Entiat population within the Upper Columbia MPG. ○ Methow population within the Upper Columbia MPG. • Snake River Fall Chinook ESU: <ul style="list-style-type: none"> ○ Snake River Fall Chinook population 	

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>RM&E Strategy 1—Monitor the Status of Selected Fish Populations Related to FCRPS Actions</i> <i>The Action Agencies' strategy is to support performance monitoring and adaptive management related to the status of fish populations.</i>			
		<ul style="list-style-type: none"> • Lower Columbia Chinook ESU: <ul style="list-style-type: none"> ○ Hood population within the Gorge MPG. ○ Snake River Steelhead distinct population segment (DPS): ○ Lolo Creek population within the Clearwater MPG. ○ Lemhi River population within the Salmon MPG. ○ South Fork Salmon population within the Salmon MPG. ○ Asotin Creek population within the Lower Snake MPG. ○ Upper Grande Ronde population within the Grande Ronde MPG. ○ Imnaha population within the Imnaha MPG. • Upper Columbia Steelhead DPS: <ul style="list-style-type: none"> ○ Wenatchee population within the Upper Columbia MPG. ○ Entiat population within the Upper Columbia MPG. ○ Methow population within the Upper Columbia MPG. ○ Okanogan population within the Upper Columbia MPG. • Middle Columbia Steelhead DPS: <ul style="list-style-type: none"> ○ Klickitat River population within the Eastern Cascades MPG. ○ Fifteen Mile population within the Eastern Cascades MPG. ○ Toppenish population within the Yakima MPG. ○ Lower Mainstem population within the John Day MPG. ○ North Fork population within the John Day MPG. 	

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>RM&E Strategy 1—Monitor the Status of Selected Fish Populations Related to FCRPS Actions</i> <i>The Action Agencies' strategy is to support performance monitoring and adaptive management related to the status of fish populations.</i>			
		<ul style="list-style-type: none"> ○ Upper Mainstem population within the John Day MPG. ○ Middle Fork population within the John Day MPG. ○ South Fork population within the John Day MPG. ○ Umatilla population within the Umatilla/Walla Walla MPG. • Lower Columbia Steelhead DPS: <ul style="list-style-type: none"> ○ Upper Gorge (Wind and Hamilton) population within the Gorge MPG. • Snake River Sockeye: <ul style="list-style-type: none"> ○ Red Fish Lake population <p>Provide additional tagging to systematically PIT-tag adult hatchery Chinook at Lower Granite and assess potential modifications to current population monitoring to more effectively monitor these populations. Identify whether tagging rates beyond current tagging levels are needed.</p> <p>NOAA will conduct a quality assessment using ISTM criteria and approach coordinated through PNAMP. Adaptively modify existing monitoring projects based on quality needs, new monitoring approaches, and optimization within existing funding levels.</p>	
	RPA Subaction 50.7 Fund marking of hatchery releases from Action Agencies funded facilities to enable monitoring of hatchery-origin fish in natural spawning areas and the assessment of status of wild populations. (Annually)	Improve tracking and reporting of hatchery production, and marking levels, types of mark. Manage this information within a common data base for regional reporting. All marks and marking programs will be coordinated through RMIS and other regional efforts so that all field managers will know what to look for during surveys. All mark rates will be determined and made available to minimize bias in hatchery versus wild population estimates.	Where 100 percent of the hatchery fish cannot be marked with an adipose fin clip, alternative external or internal marks and marking rates will be used to assess VSP and habitat and hatchery effectiveness called for under the BiOp

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>RM&E Strategy 1—Monitor the Status of Selected Fish Populations Related to FCRPS Actions</i> <i>The Action Agencies' strategy is to support performance monitoring and adaptive management related to the status of fish populations.</i>			
			and Columbia Basin Recovery Plans.
	RPA Subaction 50.8 Report available information on population viability metrics in annual and comprehensive evaluation reports. (Initiate in FY 2008)	The Action Agencies will coordinate their status/trend assessments with NOAA Fisheries and the Action Agencies will ensure consistency of project level reporting with guidelines identified under RPA Actions 50.6 and 72. The NOAA Fisheries VSP data dictionary, metadata guidelines, and data exchange protocols will be finalized in coordination with PNAMP and other fishery co-managers and implemented through monitoring contracts. Monitoring contracts will be implemented following guidelines on the use of terms and definitions outlined in the NOAA Fisheries VSP data dictionary and these data will be readily accessible to NOAA Fisheries and the Action Agencies. Funding will be provided to integrate the results of the work group monitoring evaluation tables with ongoing NOAA data compilation and documentation efforts.	
51	Collaboration Regarding Fish Population Status Monitoring The Action Agencies will enhance existing fish populations status monitoring performed by fish management agencies through the following collaboration commitments:		
	RPA Subaction 51.1 Support the coordination, data management, and annual synthesis of fish population metrics through Regional Data Repositories and reports. (Annually)	The Action Agencies will implement the actions identified in this column under RPA Actions 71 and 72 to support this RPA Action.	

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>RM&E Strategy 1—Monitor the Status of Selected Fish Populations Related to FCRPS Actions</i> <i>The Action Agencies' strategy is to support performance monitoring and adaptive management related to the status of fish populations.</i>			
	RPA Subaction 51.2 Facilitate and participate in ongoing regional RM&E collaboration process to develop a regional strategy for status and trend monitoring for key ESA fish populations. (Initiate in FY 2008)	Population status and trend monitoring will target the NOAA Fisheries monitoring guidelines. The Action Agencies will work collaboratively with the region to further develop and implement BiOp critical work identified in the Columbia Basin Anadromous Fish Monitoring Strategy, and to advance data management and data sharing capabilities through the Coordinated Assessments Process to ensure that status and trend data are readily accessible for needed BiOp assessments.	
	RPA Subaction 51.3 Provide cost-shared funding support and staff participation in regional coordination forums such as the Pacific Northwest Aquatic Monitoring Partnership (PNAMP) fish population monitoring workgroup and the Northwest Environmental Data Network to advance regional standards and coordination for more efficient and robust monitoring and information management. (Annually)	Cost-share funding support and staff participation will continue in regional forums such as the Regional Implementation Oversight Group (RIOG) and PNAMP.	

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>RM&E Strategy 2—Hydrosystem Research, Monitoring, and Evaluation</i>			
52	Monitor and Evaluate Fish Performance within the FCRPS The Action Agencies will monitor the following biological responses and/or environmental attributes involved in passage through the hydrosystem, and report these estimates on an annual basis:		
	RPA Subaction 52.1 Monitor and evaluate salmon and steelhead dam survival rates for a subset of FCRPS projects.	Evaluate dam passage survival at Lower Snake River and Lower Columbia River dams as warranted to measure progress towards meeting performance standards.	Continue assessments as results dictate. Needs are reviewed annually under the Anadromous Fish Evaluation Program (AFEP).
	RPA Subaction 52.2 Monitor and evaluate juvenile salmon and steelhead in-river and system survival through the FCRPS, including estimates of differential post-Bonneville survival of transported fish relative to in-river fish (D-value) as needed.	Conduct seasonal transportation studies and coordinate any needed changes to scope and design with NOAA Fisheries and the region. Continue monitoring FCRPS system survival.	
	RPA Subaction 52.3 Monitor and evaluate adult salmon and steelhead system survival upstream through the FCRPS.	Adult survival estimates will be produced annually using returning PIT-tagged adults detected at Bonneville, McNary, and Lower Granite. A new adult PIT-tag detection system will be installed at The Dalles fishways, providing improved spatial resolution. A temporary adult PIT-tag detection system will be installed at Little Goose Dam (scheduled for 2014). It will be operated for two to four years to assess fallback, delay and travel times. The system will then be removed. Continue to assess and strategically locate stream-based PIT-tag detectors within mainstem tributaries to improve these system survival estimates as	

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>RM&E Strategy 2—Hydrosystem Research, Monitoring, and Evaluation</i>			
		needed.	
	RPA Subaction 52.4 Provide additional PIT-tag marking of Upper Columbia River populations to provide ESU specific estimates of juvenile and adult survival through the Federal mainstem dams.	Continue to PIT-tag naturally produced spring Chinook and steelhead juveniles in the Wenatchee, Methow, and Entiat basins to estimate migration timing, residence, and life-stage survivals. The Action Agencies will coordinate with NOAA and the SMP/CSS program to ensure UC population coverage is appropriate, and sample sizes are suitable to provide intended hydrosystem assessments. PUD tagging efforts will be included as part of the coordination effort.	
	RPA Subaction 52.5 Assess the feasibility of PIT-tag marking of juvenile Snake River Sockeye Salmon for specific survival tracking of this ESU from the Stanley Basin to Lower Granite Dam and through the mainstem FCRPS projects.	No further feasibility action planned, ongoing tagging will be carried out under other actions. The feasibility study was completed by 2012 and deemed successful.	
	RPA Subaction 52.6 Develop an action plan for conducting hydrosystem status monitoring (analytical approaches, tagging needs, methods, and protocols) in ongoing collaboration with the State and Federal fishery agencies and Tribes. This will be done in coordination with status monitoring needs and strategies being developed for estuary/ocean, habitat, hatcheries, and harvest. (Initiate in FY 2009)	The Action Agencies will rely on the newly drafted PIT-Tag Status and Needs Report (2013) to guide future decisions regarding refinement of the Columbia Basin PIT-Tag system, and scope of associated tagging activities.	
	RPA Subaction 52.7 Cooperate with NOAA Fisheries, US v Oregon parties, Confederated Tribes of the Colville Reservation, and other co-managers to 1) review relevant information	The Action Agencies will coordinate with NOAA and regional entities to review relevant information in order to develop a monitoring plan. To support this, the Action Agencies will: <ul style="list-style-type: none"> • Carry out two-year radio telemetry study 	

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>RM&E Strategy 2—Hydrosystem Research, Monitoring, and Evaluation</i>			
	and identify factors (migration timing, spatial distribution, etc.) that might explain the differential conversion rates (BON to MCN) observed for UCR steelhead and spring Chinook salmon compared to SR steelhead and spring/summer Chinook salmon (see RPA Table 7 and SCA - Adult Survival Estimates Appendix); 2) develop a monitoring plan to determine the most likely cause of these differential losses (considering the potential use of flat plate PIT-tag detectors in tributaries or fishery areas, additional adult detectors at The Dalles and John Day fishways, etc. to provide improved estimates of harvest or stray rates for improved conversion rate estimates in the future); and 3) implement the monitoring plan.	<p>(planned start date is 2013). Compare resulting estimates of escapement from Bonneville Dam to McNary dam, straying rates, harvest and unaccounted losses to those from 1996-2002 study. Assess changes in those metrics and plan corrective actions, if warranted.</p> <ul style="list-style-type: none"> • Operate adult PIT detection at The Dalles Dam, providing data for improved spatial resolution of inter-dam adult survival estimates. (Temporary system was installed in 2013. Installation of permanent system is scheduled for 2015.) 	
	RPA Subaction 52.8 Monitoring adult passage counts is a cornerstone monitoring activity that must be performed on an annual basis. Adult fish counting is typically performed 16 hours per day, during daylight hours, by either video or visual counting methods, at all of the Corps projects that pass fish. Adult fish counting will continue at a minimum on the schedule presented in Table 8.	Continue adult passage counts as shown in Table 8 in the BiOp RPA table, except that counts at The Dalles and John Day are conducted from April 1 through October 31. Note all times are PST only. Continue nighttime adult sockeye counts at Lower Granite.	
53	Monitor and Evaluate Migration Characteristics and River Condition The Action Agencies will monitor and evaluate the following biological and physical attributes of anadromous fish species migrating through the FCRPS on an		

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>RM&E Strategy 2—Hydrosystem Research, Monitoring, and Evaluation</i>			
	annual basis:		
	RPA Subaction 53.1 Monitor and estimate the abundance of smolts passing index dams.	The Action Agencies will provide this information to the region through the support of the Smolt Monitoring Program (SMP), and public data distribution via Fish Passage Center and Columbia DART.	
	RPA Subaction 53.2 Monitor and describe the migration timing of smolts at index dams, identify potential problems, and evaluate implemented solutions.	Continue the smolt monitoring program (SMP). Continue regional distribution of migration data through the FPC and Columbia DART websites to support real time operational decisions.	
	RPA Subaction 53.3 Monitor and document the condition (e.g., descaling and injury) of smolts at all dams with JBS systems, identify potential problems, and evaluate implemented solutions.	Continue the SMP monitoring of fish conditions.	
	RPA Subaction 53.4 Monitor and enumerate adult salmon and steelhead passing through fishways in the FCRPS, identify potential problems, and evaluate implemented solutions.	Corps ladder counts, in conjunction with PIT detectors as supplemental information for various analyses, will continue to be used for conversion rate estimation. These data are acquired annually.	
	RPA Subaction 53.5 In addition to current operations (generally April 10 – August 31), evaluate operation of the Bonneville PH2 corner collector from March 1 through start of spill as a potential means to provide a safer downstream passage route for steelhead kelts, and implement if warranted.	Action completed. Guidelines for operation are contained in the annual Fish Passage Plan.	

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>RM&E Strategy 2—Hydrosystem Research, Monitoring, and Evaluation</i>			
54	Monitor and Evaluate Effects of Configuration and Operation Actions The following will be conducted at specific projects for specific years as operations or configurations change, or new problems are identified.		
	RPA Subaction 54.1 Monitor and evaluate the effects of existing spillways, modifications, and operations on smolt survival.	The Anadromous Fish Evaluation Program will annually review the status of facilities and identify sites where evaluations are needed. These systems will also be evaluated through remaining performance standard testing.	
	RPA Subaction 54.2 Monitor and evaluate the effectiveness of traditional juvenile bypass systems and modifications to such, on smolt survival and condition.	The Anadromous Fish Evaluation Program will annually review the status of facilities and identify sites where evaluations are needed. Evaluation of bypass performance will occur as new systems are built or upgrades to existing facilities occur. These systems will also be evaluated through remaining performance standard testing. Complete evaluation of fish guidance efficiency (FGE) with turbine intake gates in lowered position.	
	RPA Subaction 54.3 Monitor and evaluate the effectiveness of surface bypass structures and modifications on smolt survival and condition.	The Anadromous Fish Evaluation Program will annually review the status of facilities and identify sites where evaluations are needed.	
	RPA Subaction 54.4 Monitor and evaluate the effectiveness of turbine operations and modifications on smolt survival and condition.	The Anadromous Fish Evaluation Program will annually review the status of facilities and identify sites where evaluations are needed. Two new turbines for Ice Harbor Dam are currently under design and scheduled for installation 2 and 3 beginning in 2015. A biological performance study design is scheduled for completion in 2013, with	

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>RM&E Strategy 2—Hydrosystem Research, Monitoring, and Evaluation</i>			
		performance testing scheduled for 2016 and 2017.	
	RPA Subaction 54.5 Monitor and evaluate overall dam passage with respect to modifications at projects (including forebay delay and survival).	Dam survival at lower Snake River and lower Columbia River projects will be evaluated as warranted to measure progress in meeting performance standards.	
	RPA Subaction 54.6 Monitor and evaluate the effectiveness of the juvenile fish transportation program and modifications to operations.	The Anadromous Fish Evaluation Program will continue to evaluate performance of transport facilities and operations, including seasonal effects of transportation.	
	RPA Subaction 54.7 Monitor and evaluate the effects of environmental conditions affecting juvenile fish survival.	Key factors will continue to be regularly monitored and evaluated throughout the FCRPS: Total dissolved gas, temperature, turbidity, and flow. PIT-tagged fish migrating through the system from assorted projects provide response units for analyzing effects of these variables on either smolt survival or migration characteristics. The FPC, NOAA Fisheries, and CSS conduct these types of probative analyses. The Corps funds the collection and recording of temperature and TDG data, as well as index flow at dams. Columbia DART and the FPC compile and display these and other environmental and fish data.	
	RPA Subaction 54.8 Monitor and evaluate the effectiveness of reducing predation toward improving juvenile fish survival.	Several studies on the effects of bird and fish predation on juvenile survival will continue in 2014 through 2018. See RPA Actions 43-49 and 68-70.	
	RPA Subaction 54.9 Investigate, evaluate and deploy alternative technologies and methodologies for fish passage and the RM&E Action.	The Action Agencies will assess and improve active tag technologies, including developing alternatives to reduce bias associated with fish bearing active tags and turbine passage, developing improved tagging methods, and improving receiver design.	

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>RM&E Strategy 2—Hydrosystem Research, Monitoring, and Evaluation</i>			
		<p>Continue to assist NOAA Fisheries in their work assessing the feasibility of developing a spillway PIT-tag detection system.</p> <p>New passage technologies will continue to be prototyped, tested, and ultimately deployed as part of the annual Anadromous Fish Evaluation Program (AFEP) and CRFM.</p>	
	<p>RPA Subaction 54.10</p> <p>Determine if actions directed at benefiting juveniles have an unintended effect on migrating adults (e.g., certain spill operations).</p>	<p>2014 - Complete evaluations of the effects of the Dalles spillwall on adult passage.</p> <p>2013-2014 - Adult passage evaluations at Lower Snake River Dams. Results will be used to develop alternative operations if needed.</p> <p>This issue will continue to be addressed at each project as need arises. The Anadromous Fish Evaluation Program forum annually reviews the status of adult passage conditions and determines the appropriate research objectives or solutions to improve adult passage via physical modeling and potential spill pattern changes and powerhouse prioritization.</p> <p>Evaluation of methods to reduce straying of transported juvenile salmon and steelhead including modifications to barge environment and identifying specific causes of increased straying.</p>	
	<p>RPA Subaction 54.11</p> <p>Install and maintain adult PIT-tag detectors in fish ladders at key dams in the FCRPS and evaluate adult survival (conversion rates).</p>	<p>PIT-tag detectors are installed and will continue to be maintained in all key FCRPS ladders (Bonneville, McNary, Lower Granite dams).</p> <p>A temporary adult PIT-tag detection system was installed at The Dalles ladders in 2013. Installation of a permanent system is scheduled for 2013.</p> <p>A temporary adult PIT-tag detection system will be installed at Little Goose Dam (scheduled for 2014). It will be operated for two to four years to assess fallback, delay and travel times. The system will</p>	

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>RM&E Strategy 2—Hydrosystem Research, Monitoring, and Evaluation</i>			
		then be removed.	
	RPA Subaction 54.12 Monitor and evaluate the effects of fish ladder operations and configurations on adult passage rates.	No specific action anticipated at this time. This RPA Action will continue to be addressed at each project through the Anadromous Fish Evaluation Program process as need arises. Adult passage rates are monitored annually at every dam per RPA Subactions 50.2 and 52.3, ensuring fish ladder operations maintain good adult passage conditions.	
	RPA Subaction 54.13 In addition to the current sluiceway operation (generally April 1 – November 30), evaluate operation of The Dalles Dam sluiceway from March 1 – March 31 and from December 1 – December 15 as a potential means to provide a safer fallback passage route for overwintering steelhead and kelts, implement if warranted.	Evaluation completed. Guidelines for operations are found in the annual Fish Passage Plan.	
	RPA Subaction 54.14 Investigate surface-flow outlets during wintertime to provide safer fallback opportunity for over wintering steelhead (need will be determined by results of further research).	The Action Agencies, through AFEP will consider study results through 2013 to determine whether specific actions are warranted.	
55	Investigate Hydro Critical Uncertainties and Investigate New Technologies The Action Agencies will fund selected research directed at resolving critical uncertainties that are pivotal in lifecycle model analyses. These specific actions include:		

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>RM&E Strategy 2—Hydrosystem Research, Monitoring, and Evaluation</i>			
	RPA Subaction 55.1 Investigate and quantify delayed differential effects (D-value) associated with the transportation of smolts in the FCRPS as needed. (Initiate in FY 2007-2009 Projects)	The Action Agencies, thru AFEP will develop research objectives to investigate and further quantify 'D' which will be prioritized through AFEP. The Action Agencies will perform transport evaluations for Snake River sockeye once the new Springfield Hatchery production is up and running	Use information from these studies to evaluate the need for, and/or degree to which, "spread the risk" is the preferred strategy for spring-migrating ESUs. This will involve balancing spill frequency and magnitude with the need to transport some specified fraction of each ESU Using information gathered during the conduct of the collaborative Snake river fall Chinook passage study, formulate a passage strategy for summer-migrants that maximizes SAR, and maintains the diverse life history patterns for this ESU.
	RPA Subaction 55.2 Investigate the post-Bonneville mortality effect of changes in fish arrival timing and transportation to below Bonneville. (Initiate in FY 2007-2009)	Action completed. No further specific actions anticipated at this time. Ongoing seasonal transport and CSS studies will continue to address the relationships between arrival timing and survival.	
	RPA Subaction 55.3 Conduct a workshop every other year with members of the Independent Scientific Advisory Board (ISAB) to review current research and monitoring approaches on post Bonneville mortality for transported and non-transported fish. (Initiate in FY 2009)	Conduct another workshop with the ISAB if or when significant new study results become available.	
	RPA Subaction 55.4 Investigate, describe and quantify key	The Action Agencies will synthesize the large body of research information gathered for more than a	A wealth of information from both the multi-year early life

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>RM&E Strategy 2—Hydrosystem Research, Monitoring, and Evaluation</i>			
	characteristics of the early life history of Snake River Fall Chinook Salmon in the mainstem Snake, Columbia, and Clearwater rivers. (Initiate in FY 2007-2009 Project)	decade on the early life history of Snake River fall Chinook. In that effort, discuss management ramifications for this ESU with respect to hydrosystem operations. Determine information gaps that require further research or monitoring.	history investigations and the results from the 5-year Collaborative Passage study, will be in hand. This information base will form the basis for developing a long-term management strategy for Snake River fall Chinook in the FCRPS. The need for, and focus of, future RM&E on this ESU will be part of the adaptive process.
	RPA Subaction 55.5 Complete analysis and reporting of a multiyear (2000-2007) investigation on the effects of adult passage experience in the FCRPS on pre-spawning mortality (2008). Following reporting, SRWG will review the results and provide a recommendation on the need and nature of future research. Future research will be coordinated through the Regional Forum.	Action completed.	
	RPA Subaction 55.6 Continue development of state-of-the-art turbine units to obtain improved fish passage survival through turbines with the goal of using these new units in all future turbine rehabilitation or replacement programs.	The Turbine Survival Program (TSP) will continue to develop and test hypotheses. As part of this program, new turbine runners will be installed in two units at Ice Harbor, with construction scheduled to begin in 2015. Design of new units for McNary Dam is scheduled to begin in 2015.	
	RPA Subaction 55.7 Investigate feasibility of developing PIT-tag detectors for spillways and turbines.	To assess feasibility, a spillway PIT detector is currently being designed for installation at Lower Granite Dam in 2015. Biological evaluation will be developed and conducted through the AFEP program.	

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>RM&E Strategy 2—Hydrosystem Research, Monitoring, and Evaluation</i>			
	RPA Subaction 55.8 Evaluate new tagging technologies for use in improving the accuracy and assessing delayed or indirect hydro effects on juvenile or adult fish.	Continue the ongoing development of JSATS tags, including injectable designs, focused on reducing tag size and increasing detection efficiency. Further evaluate tag effects on behavior and survival as warranted.	
	RPA Subaction 55.9 Assess the feasibility of developing PIT-tag detectors for use in natal streams and tributaries, or other locations, as appropriate to support more comprehensive and integrated All-H monitoring designs and assessments of stray rates.	Action completed. The PIT-Tag Status and Needs Report (see http://www.salmonrecovery.gov/Evaluation/Reports.aspx) identifies tributary sites where stream-based detections systems have been or will be installed to enhance data needed for FCRPS adult passage monitoring. The feasibility studies were instrumental in providing a foundation for improved monitoring capability.	

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>RM&E Strategy 3—Tributary Habitat Research, Monitoring, and Evaluation</i> <i>The Action Agencies' strategy is to support performance monitoring and adaptive management related to tributary habitat actions.</i>			
56	Monitor and Evaluate Tributary Habitat Conditions and Limiting Factors The Action Agencies will:	The Action Agencies will monitor and evaluate both tributary habitat and limiting factors that affect salmon production. Models are being used to help organize habitat status and trend data, limiting factor data, and to help further characterize salmon population responses to habitat improvement actions.	
	RPA Subaction 56.1 Implement research in select areas of the pilot study basins (Wenatchee, Methow and Entiat river basins in the Upper Columbia River, the Lemhi and South Fork Salmon river basins, and the John Day River Basin) to quantify the relationships between habitat conditions and fish productivity (limiting factors) to improve the development and parameterization of models used in the planning and implementation of habitat projects. These studies will be coordinated with the influence of hatchery programs in these habitat areas. Review and modify annually to ensure that these projects continue to provide a means of evaluating the effectiveness of tributary mitigation actions).	In the pilot basins, monitoring will continue to focus on the relationship between limiting factors, habitat actions, and fish productivity. Mechanistic research on relationships between limiting factors and fish productivity will occur within the Methow Basin. PIT-tagging of juveniles will inform this research. Information generated from focused studies and correlative studies will be shared with other regions and will also be used in models including the AMIP life cycle models. This modeling work will also be supported by habitat and fish status monitoring within these watersheds.	
	RPA Subaction 56.2 Implement habitat status and trend monitoring as a component of the pilot studies in the Wenatchee, Methow, and Entiat river basins in the Upper Columbia	Ongoing habitat status and trend monitoring will continue in the Wenatchee and Entiat basins, the Lemhi and South Fork Salmon river basins, and the John Day River Basin. The Generalized Random Tessellated Survey GRTS-based master-sample	

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>RM&E Strategy 3—Tributary Habitat Research, Monitoring, and Evaluation</i> <i>The Action Agencies' strategy is to support performance monitoring and adaptive management related to tributary habitat actions.</i>			
	River, the Lemhi and South Fork Salmon river basins, and the John Day River Basin. (Initiate in FY 2007-2009 Projects, annually review and modify annually to ensure that these project continue to provide a means of evaluating the effectiveness of tributary mitigation actions.	management tools will continue to be implemented to monitor habitat status and trend in the Methow Basin.	
	RPA Subaction 56.3 Facilitate and participate in an ongoing collaboration process to develop a regional strategy for limited habitat status and trend monitoring for key ESA fish populations. This monitoring strategy will be coordinated with the status monitoring needs and strategies being developed for hydropower, habitat, hatchery, harvest, and estuary/ocean. (Initiate in FY 2008)	<p>The Action Agencies will facilitate and participate in ongoing collaboration processes. This includes development and coordination of a habitat monitoring framework, with ISAB review and Action Agencies/NOAA RM&E workgroup coordination. Methods, protocols, and regional collaboration will also be coordinated with PNAMP.</p> <p>Habitat within the geographic distribution of at least one population per MPG will be monitored for habitat status and trend (most of these populations will also be monitored for fish-in/fish-out according to RPA Action 50). This planned monitoring will also meet the habitat monitoring and climate change monitoring needs of the associated actions on page 12 of the AMIP.</p> <p>Habitat status and trend monitoring will follow the Generalized Random Tessellation Stratification (GRTS)- based, master sample management tools.</p> <p>Habitat status and trend data will be used to characterize population responses to habitat restoration actions, develop relationships between local habitat and fish condition indicators, and support correlation assessments relating habitat and fish population productivity and capacity (see RPA Subaction 56.1).</p>	

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>RM&E Strategy 3—Tributary Habitat Research, Monitoring, and Evaluation</i> <i>The Action Agencies' strategy is to support performance monitoring and adaptive management related to tributary habitat actions.</i>			
		Maintained current levels PIT-tagging juveniles and adults will continue to support this work.	
57	Evaluate the Effectiveness of Tributary Habitat Actions The Action Agencies will evaluate the effectiveness of habitat actions through RM&E projects that support the testing and further development of relationships and models used for estimating habitat benefits. These evaluations will be coordinated with hatchery effectiveness studies.	The Action Agencies will investigate key habitat/fish relationships. Extensive data are being generated and evaluated over the 2014-2018 period to support the testing and further development of relationships and models used for estimating habitat benefits.	
	RPA Subaction 57.1 Action effectiveness pilot studies in the Entiat River Basin to study treatments to improve channel complexity and fish productivity. (Initiate in FY 2007-2009 Projects, review and modify annually to ensure that these projects continue to provide a means of evaluating the effectiveness of tributary mitigation actions).	Ongoing monitoring in the Entiat Basin will continue. Potential confounding effects of hatchery operations will be evaluated. Linkages between habitat and fish productivity will benefit from continued PIT-tagging of adults and juveniles.	
	RPA Subaction 57.2 Pilot study in the Lemhi River Basin to study treatments to reduce entrainment and provide better fish passage flow conditions. (Initiate in FY 2007-2009 Projects, review and modify annually to ensure that these projects continue to provide a means of evaluating the effectiveness of tributary mitigation actions).	Action effectiveness studies will continue in the Lemhi River Basin, and linkages between habitat and fish productivity will benefit from continued PIT-tagging of adults and juveniles.	

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>RM&E Strategy 3—Tributary Habitat Research, Monitoring, and Evaluation</i> <i>The Action Agencies' strategy is to support performance monitoring and adaptive management related to tributary habitat actions.</i>			
	RPA Subaction 57.3 Action effectiveness pilot studies in Bridge Creek of the John Day River Basin to study treatments of channel incision and its effects on passage, channel complexity, and consequentially fish productivity. (Initiate in FY 2007-2009 Projects, review and modify annually to ensure that these projects continue to provide a means of evaluating the effectiveness of tributary mitigation actions).	Action effectiveness studies will continue in Bridge Creek, and linkages between habitat and fish productivity will continue to benefit from increased PIT-tagging of adults and juveniles.	
	RPA Subaction 57.4 Project- and watershed-level assessments of habitat, habitat restoration, and fish productivity in the Wenatchee, Methow and John Day basins. (Initiate in FY 2007-2009 Projects, review and modify annually to ensure that these projects continue to provide a means of evaluating the effectiveness of tributary mitigation actions).	Monitoring of habitat and fish within the Wenatchee, Methow, and John Day basins will continue, and linkages between habitat and fish productivity will continue to benefit from increased PIT-tagging of adults and juveniles. Reclamation is implementing an aquatic metabolism study that will be used to parameterize its aquatic trophics productivity model and develop large – reach assessments of project effectiveness. In the Twisp River watershed Reclamation is funding watershed-level research of aquatic productivity including estimates of watershed carrying capacity for the target fish species. These studies will mostly be complete by 2015 and will be reviewed and revised in 2016 to ensure that they continue to provide a means of evaluating the effectiveness of tributary habitat actions.	
	RPA Subaction 57.5 Action Agencies will convene a regional technical group to develop an initial set of relationships in FY 2008, then annually	The existing NOAA Fisheries/Action Agency technical work group will be expanded to include technical staff from federal, state, and tribal agencies. This group will annually convene to expand and refine	

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>RM&E Strategy 3—Tributary Habitat Research, Monitoring, and Evaluation</i> <i>The Action Agencies' strategy is to support performance monitoring and adaptive management related to tributary habitat actions.</i>			
	convene the group to expand and refine models relating habitat actions to ecosystem function and salmon survival by incorporating research and monitoring results and other relevant information. (Initiate in FY 2008)	models relating habitat actions to ecosystem function and survival. This model development and application will further support the habitat modeling needs of the associated action on page 12 of the AMIP. Reclamation will continue the Methow River IMW group to contribute watershed-level model evaluations, methods and results to regional evaluations.	

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>RM&E Strategy 4—Estuary Habitat and Ocean Research, Monitoring, and Evaluation</i> <i>The Action Agencies' strategy is to support performance monitoring and adaptive management related to estuary habitat actions.</i>			
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:		
	RPA 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)	The JSATS and POST studies have provided reach survival estimates for yearling and subyearling Chinook salmon and steelhead in the LCRE. The Action Agencies will consider updating the studies when new JSATS transmitter technology becomes available.	
	RPA Subaction 58.2 Develop an index and monitor and evaluate life history diversity of salmon and steelhead populations at representative locations in the estuary. (Initiate in FY 2007-2009 Projects)	The Action Agencies have developed an early life history index and applied it at the landscape scale in an LCRE reach. The Action Agencies will apply the index as appropriate in comparing life history diversity at the same locale, but across time (e.g., status and trends) or across space (e.g., different locales or habitats).	
	RPA Subaction 58.3 Monitor and evaluate juvenile salmon and steelhead 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)	The Action Agencies will continue ongoing work as part of AEMR (see 60.2).	
	RPA Subaction 58.4 Monitor and evaluate temporal and spatial species composition, abundance, and foraging rates of juvenile salmon and steelhead predators at representative locations in the estuary and plume.	Predation is being addressed under system-wide studies of predation (RPA Actions 47, 48, 68-70). The Action Agencies will apply the results of predation studies as appropriate to the design of restoration projects and AEMR to minimize predation risk (e.g. structures preferred by predators) in	

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>RM&E Strategy 4—Estuary Habitat and Ocean Research, Monitoring, and Evaluation</i> <i>The Action Agencies' strategy is to support performance monitoring and adaptive management related to estuary habitat actions.</i>			
	(Initiate in FY 2007-2009 Projects, annually review and modify until complete)	habitat projects. For example, avian studies may track movement of prospecting and foraging Caspian terns and double-crested cormorants. These results can be spatially overlaid with AEMR to evaluate avian use of restoration sites.	
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:		
	RPA Subaction 59.1 Map bathymetry and topography of the estuary as needed for RM&E. (Initiate in FY 2007-2009 Projects)	The Action Agencies have completed bathymetric and topographic mapping and will update the maps as needed.	
	RPA Subaction 59.2 Establish a hierarchical habitat classification system based on hydro-geomorphology, ground-truth it with vegetation cover monitoring data, and map existing habitats. (Initiate in FY 2007-2009 Projects)	The Action Agencies have completed the classification system and it is currently being used for restoration project planning and design. No future work anticipated in 2014-2018.	
	RPA 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)	The Action Agencies will continue developing a habitat connectivity index with planned completion 2013 for applications in AEMR and restoration project planning and prioritization.	

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>RM&E Strategy 4—Estuary Habitat and Ocean Research, Monitoring, and Evaluation</i> <i>The Action Agencies' strategy is to support performance monitoring and adaptive management related to estuary habitat actions.</i>			
	RPA 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 salmon and steelhead. (Initiate in FY 2007-2009 Projects, then annually)	The Action Agencies will continue research on fish/habitat associations in existing RM&E studies in the LCRE.	
	RPA 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. (FY 2007-2009 Projects, then annually)	Status and trends monitoring has been performed over the last seven years. The Action Agencies intend to integrate this work into AEMR during 2014-2018. (For example, status and trends monitoring could support site scale AEMR, e.g., a control site.)	
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:	In 2013-2018, action effectiveness monitoring and research will focus on the list of uncertainties related to estuary habitat actions (ERTG Doc #2012-02) that the ERTG provided to the Action Agencies in 2012.	
	RPA 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)	As suite of 48 references site LCRE-wide has been established and will be used as appropriate in upcoming AEMR studies. The Action Agencies will conduct future sampling at reference sites as part of site-specific AEMR (see 60.2).	
	RPA Subaction 60.2	AEMR studies have been conducted and in 2013-	

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>RM&E Strategy 4—Estuary Habitat and Ocean Research, Monitoring, and Evaluation</i> <i>The Action Agencies' strategy is to support performance monitoring and adaptive management related to estuary habitat actions.</i>			
	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)	2018 the Action Agencies will implement site-scale AEMR studies within the framework of the new CEERP AEMR plan.	
	RPA 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)	The Action Agencies have completed a methodology and performed an initial evaluation of the cumulative effects of ecosystem restoration at landscape and estuary-wide scales. The Action Agencies will consider a subsequent evaluation in the later part of 2014-2018 to incorporate new findings in 2014-2018 to more comprehensively evaluate the cumulative effects of habitat restoration/implementation to juvenile salmon and steelhead within the BiOp period.	
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:		
	RPA 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 salmon and steelhead populations in the Columbia River Basin.	The Action Agencies will continue integrated critical uncertainties and AEMR work in the LCRE, plume, and nearshore ocean ecosystems to define ecological importance in terms of viability and recovery, i.e., life history diversity, spatial structure, and productivity/abundance of juvenile salmon in these ecosystems. The Action Agencies will focus on	

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>RM&E Strategy 4—Estuary Habitat and Ocean Research, Monitoring, and Evaluation</i> <i>The Action Agencies' strategy is to support performance monitoring and adaptive management related to estuary habitat actions.</i>			
		<p>applying new knowledge to CEERP actions that can affect LCRE, plume, and nearshore ocean ecosystems to the benefit listed salmon and steelhead using these ecosystems.</p> <p>The AAs AEMR will also attempt to address critical uncertainties that have been raised by the ERTG by other investigators in the LCRE.</p>	
	<p>RPA Subaction 61.2</p> <p>Continue work to define the causal mechanisms and migration/behavior characteristics affecting survival of juvenile salmon during their first weeks in the ocean.</p>	<p>In the context of AEMR for CEERP habitat restoration actions, the Action Agencies will continue work in the LCRE, plume, and nearshore ocean to understand critical uncertainties concerning causal mechanisms and migration/behavior characteristics affecting juvenile salmon and steelhead survival during early ocean entry. The Action Agencies will focus on identifying linkages between the estuary and ocean whereby CEERP actions improve salmon and steelhead survival during early marine residence.</p>	
	<p>RPA Subaction 61.3</p> <p>Investigate the importance of early life history of salmon populations in tidal fresh water of the lower Columbia River.</p>	<p>The Action Agencies will continue integrated critical uncertainties and AEMR work in LCRE tidal freshwater ecosystems to investigate the importance of these areas in terms of life history diversity, spatial structure, and productivity/abundance of juvenile salmon and steelhead. The Action Agencies will focus on applying new knowledge to CEERP actions that can affect tidal freshwater ecosystems to benefit listed salmon and steelhead using these areas.</p>	
	<p>RPA Subaction 61.4</p> <p>Continue development of a hydrodynamic numerical model for the estuary and plume</p>	<p>Models have been developed; will be applied as appropriate to support future CU and AEMR.</p>	

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>RM&E Strategy 4—Estuary Habitat and Ocean Research, Monitoring, and Evaluation</i> <i>The Action Agencies' strategy is to support performance monitoring and adaptive management related to estuary habitat actions.</i>			
	to support critical uncertainties investigations.		

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>RM&E Strategy 5—Harvest Research, Monitoring, and Evaluation</i> <i>The Action Agencies' strategy is to support performance monitoring and adaptive management related to harvest actions.</i>			
62	Fund Selected Harvest Investigations The Action Agencies will fund selected harvest investigations linked to FCRPS interests:		
	RPA Subaction 62.1 Evaluate the feasibility of obtaining PIT-tag recoveries between Bonneville and McNary dams (Zone 6) to determine whether recoveries can help refine estimates of inriver harvest rates and stray rates used to assess adult survival rates. For FY 2009, focus on a pilot to test the feasibility of PIT-tag recoveries of harvested fish in his reach (spring, summer, and fall Chinook salmon and summer steelhead). (Initiate in FY 2007-2009 Projects)	PIT recoveries in mainstem Columbia fisheries began in 2011. Continue to implement existing projects that are fully addressing this RPA Action.	
	RPA Subaction 62.2 Evaluate methods to develop or expand use of selective fishing methods and gear. (Initiate in FY 2007-2009 Projects)	Continue to implement projects 2007-249-00 and 1993-060-000 that address this RPA Action. These projects are fully implementing integrated selective fisheries within their respective jurisdictions.	
	RPA Subaction 62.3	Post release mortality from Action Agency sponsored	

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>RM&E Strategy 5—Harvest Research, Monitoring, and Evaluation</i> <i>The Action Agencies' strategy is to support performance monitoring and adaptive management related to harvest actions.</i>			
	Evaluate post-release mortality rates for selected fisheries. (Initiate in FY 2007-2009 Projects)	research is concluded and mortality rates are incorporated in impact assessments during management of fisheries.	
	RPA Subaction 62.4 Support coded-wire tagging and coded-wire tag recovery operations that inform survival, straying, and harvest rates of hatchery fish by stock, rearing facility, release treatment, and location. (Initiate in FY 2007-2009 Projects)	Continue to fund and implement projects that support tag insertion, recovery, and data management. In addition, various BPA-funded hatchery and RM&E projects will conduct CWT insertion and recovery.	CWT recovery programs have integrated PIT and genetic data recovery into their sampling protocols. Refinement of CWT sampling protocols to increase efficiency of recovery and data management for all three tags types will continue.
	RPA Subaction 62.5 Investigate the feasibility of genetic stock identification monitoring techniques. (Initiate in FY 2007-2009 Projects)	GSI monitoring techniques (e.g. SNPs) will continue to be refined, which will help trace natural- and hatchery-origin Chinook and steelhead to their stocks of origin in sampling programs at dam/ mainstem sampling programs and in ocean fisheries. Specifically, projects 2008-907-00, 2010-026-00 and 2010-031-00 (among others) will continue this work.	

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>RM&E Strategy 6—Hatchery Research, Monitoring, and Evaluation</i> <i>The Action Agencies' strategy is to support performance monitoring and adaptive management related to hatchery actions.</i>			
63	Monitor Hatchery Effectiveness The Action Agencies will fund selected monitoring and evaluation of the effectiveness of Hatchery Actions. The evaluation of hatchery projects will be coordinated with the Tributary Habitat monitoring and evaluation program. These actions include:		
	RPA Subaction 63.1 Determine the effect that safety-net and conservation hatchery programs have on the viability and recovery of the targeted populations of salmon and steelhead. (Initiate in FY 2007-2009 Projects)	<ul style="list-style-type: none"> • The Action Agencies will monitor VSP attributes of populations supported by safety-net and conservation hatchery programs. • Implement BiOp critical hatchery effectiveness monitoring that is a component of the Columbia Basin Anadromous Salmon and steelhead Monitoring Strategy. Facilitate the formation of a regional work group process to implement and further refine regionally based hatchery effectiveness monitoring based on the recommendations of the Ad Hoc Supplementation Work Group (AHSWG). This strategy will further inform the monitoring required in individual HGMPs and will help ensure that monitoring will be coordinated to address the regional hatchery effectiveness questions. • All hatchery programs funded by the Action Agencies will be conducting a base level of implementation and compliance monitoring as recommended by the AHSWG. • The Action Agencies will pursue improved project level annual progress reporting and synthesis of information to support comprehensive evaluations. 	

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>RM&E Strategy 6—Hatchery Research, Monitoring, and Evaluation</i> <i>The Action Agencies' strategy is to support performance monitoring and adaptive management related to hatchery actions.</i>			
		<ul style="list-style-type: none"> For Snake River sockeye and spring/summer Chinook, the Action Agencies will implement existing Action Agency programs. For Snake River B-run steelhead, use information gathered under RPA Subaction 50.5 to investigate development of a trigger for a potential future safety-net program. For steelhead kelt reconditioning in the Upper Columbia, continue to support the development and implementation of experimental strategies and adaptive management information needs. The Action Agencies will support the development of a locally adapted steelhead program in the Okanogan River Basin. Continue baseline monitoring for the East Fork Salmon River steelhead. 	
	RPA Subaction 63.2 Determine the effect that implemented hatchery reform actions have on the recovery of targeted salmon and steelhead populations. (Initiate in FY 2007-2009 Projects)	<ul style="list-style-type: none"> Continue to support ongoing VSP monitoring and monitoring for additional performance measures to assess the effectiveness of the actions. Continue to implement BiOp critical hatchery effectiveness monitoring that is a component of the Columbia Basin Anadromous Salmon and steelhead Monitoring Strategy. Participate in NOAA development and facilitation of a regional work group process to implement and further refine regionally based hatchery effectiveness monitoring based on the recommendations of the Ad Hoc Supplementation Work Group. Continue to implement development of local broodstocks in the Winthrop NFH, Touchet, and Tucannon steelhead programs. 	

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>RM&E Strategy 6—Hatchery Research, Monitoring, and Evaluation</i> <i>The Action Agencies' strategy is to support performance monitoring and adaptive management related to hatchery actions.</i>			
64	Investigate Hatchery Critical Uncertainties The Action Agencies will fund selected research directed at resolving artificial propagation critical uncertainties:		
	RPA Subaction 64.1 Continue to estimate the relative reproductive success (RRS) of hatchery – origin salmon and steelhead compared to reproductive success of their natural-origin counterparts for ESA-listed spring/summer Chinook population in the Upper Grande Ronde, Lostine River, and Catherine Creek; listed spring Chinook in the Wenatchee River; and listed steelhead in the Hood River. Continue to fund the ongoing RRS feasibility study for Snake River fall Chinook to completion in 2009. (Initiate in FY 2007- 2009 Projects)	The Action Agencies will continue to implement projects to support relative reproductive success (RRS) studies for listed Chinook in the Upper Grande Ronde, Lostine River, Catherine Creek, and the Wenatchee River as listed in IP Appendix A. The RRS Snake River fall Chinook feasibility study was completed in 2011 and found that an RRS study on Snake River fall Chinook would not be implementable at this time. The report can be found at https://pisces.bpa.gov/release/documents/documentviewer.aspx?doc=P119846	
	RPA Subaction 64.2 Determine if properly designed intervention programs using artificial production make a net positive contribution to recovery of listed populations. (Initiate in FY 2007-2009)	Continue to implement projects to support this RPA Action (see IP Appendix A) as well as related RPA 63 actions. The Action Agencies will pursue improved project level annual progress reporting and synthesis of information to support comprehensive evaluations. Continue monitoring of streams where there are no current or planned artificial propagation to support analytical comparisons between those streams (reference) and those where current artificial programs are operating (treatment).	
	RPA Subaction 64.3 In collaboration with the other entities	The Action Agencies will support PUD-NMFS RRS study for Methow steelhead.	

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>RM&E Strategy 6—Hatchery Research, Monitoring, and Evaluation</i> <i>The Action Agencies' strategy is to support performance monitoring and adaptive management related to hatchery actions.</i>			
	responsible for steelhead mitigation in the Methow River, BPA will fund a new RSS study for ESA-listed steelhead in the Methow River. BPA will also fund a new RSS study for listed fall Chinook in the Snake River. NOAA Fisheries will provide technical assistance to the Action Agencies in development of conceptual study designs suitable for use by the Action Agencies in obtaining a contractor to implement the new studies. (Initiate in FY 2007-2009 Projects)	For Snake River fall Chinook, see RPA Action 65.	
65	Investigate Hatchery Critical Uncertainties The Action Agencies will fund research directed at resolving critical uncertainties:		
	RPA Subaction 65.1 In the mainstem Snake River above the Lower Granite Dam, estimate the effectiveness/fitness in nature of hatchery-origin fall Chinook salmon from federally funded Snake River hatchery programs relative to natural-origin Snake River fall Chinook.	Implement the monitoring in the Snake River fall Chinook salmon HGMPs that was identified by NOAA to support this RPA Action.	
	RPA Subaction 65.2 Estimate fall Chinook hatchery program effects on the productivity of the fall Chinook salmon ESU.	The Action Agencies intend to meet the needs of this RPA through work under RPA Subactions 64.1, 64.3, and 65.1.	
	RPA Subaction 65.3 NOAA Fisheries will provide technical assistance to the Action Agencies in development of conceptual study designs	Continue to seek NOAA Fisheries technical assistance where appropriate.	

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>RM&E Strategy 6—Hatchery Research, Monitoring, and Evaluation</i> <i>The Action Agencies' strategy is to support performance monitoring and adaptive management related to hatchery actions.</i>			
	suitable for use by the Action Agencies in obtaining a contractor to implement new studies.		

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>RM&E Strategy 7—Predation Management Research, Monitoring, and Evaluation</i> <i>The Action Agencies' strategy is to support performance monitoring and adaptive management related to predation management actions.</i>			
66	Monitor and Evaluate the Caspian Tern Population in the Columbia River Estuary The Action Agencies will monitor the tern population in the estuary and its impacts on outmigrating juvenile salmon and steelhead, as well as the effectiveness of the Caspian tern management plan.	The Action Agencies will evaluate the effectiveness of nesting habitat reduction at East Sand Island towards reducing juvenile salmon consumption by Caspian terns. The Action Agencies will evaluate the effectiveness of habitat creation/enhancement at alternative constructed sites towards attracting and retaining Caspian tern populations. Monitoring includes assessment of nesting ecology (presence, absence, colony size and reproductive success) and assessment of diet composition. The Action Agencies will coordinate with an avian technical team to discuss ongoing RM&E and ongoing implementation actions.	
67	Monitor and Evaluate the Double-Crested Cormorant Population in the Columbia River Estuary The Action Agencies will monitor the cormorant population in the estuary and its impacts on outmigrating juvenile salmon and steelhead and develop and implement a management plan to decrease predation rates, if warranted.	Continue research and monitoring in support of the Cormorant Management Plan and EIS (See also the actions for RPA Action 46.)	
68	Monitor and Evaluate Inland Avian Predators The Action Agencies will monitor avian predator populations in the Mid-Columbia River and evaluate their impacts on outmigrating juvenile salmon and steelhead and develop and implement a management plan to decrease predations rates, if warranted.	The Inland Avian Predation Management Plan (IAPMP) will be completed and implementation is expected to occur in 2014-2018. The Action Agencies will work with regional partners including fishery agencies, and tribes to address implementation of the Inland Avian Predation Management Plan and other factors associated with inland predation by piscivorous birds.	

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>RM&E Strategy 7—Predation Management Research, Monitoring, and Evaluation</i> <i>The Action Agencies' strategy is to support performance monitoring and adaptive management related to predation management actions.</i>			
69	Monitoring Related to Marine Mammal Predation The Action Agencies will:	The Corps will visually monitor abundance of pinnipeds, predation rates, and effectiveness of deterrent actions. The Corps will adjust this monitoring as determined through adaptive management and coordination with the regional forum. (Note: Additional actions in RPA Action 49 support this RPA Action.)	
	RPA Subaction 69.1 Estimate overall sea lion abundance immediately below Bonneville Dam. (Initiate in FY 2007-2009 Projects)	See above.	
	RPA Subaction 69.2 Monitor the spatial and temporal distribution of sea lion predation attempts and estimate predation rates. (Initiate in FY 2007-2009 Projects)	See above.	
	RPA Subaction 69.3 Monitor the effectiveness of deterrent actions (e.g., exclusion gates, acoustics, harassment and other measures) and their timing of application on spring runs of anadromous fish passing Bonneville Dam. (Initiate in FY 2007-2009 Projects)	See above.	
70	Monitoring Related to Piscivorous (Fish) Predation The Action Agencies will:		
	RPA Subaction 70.1 Continue to update and estimate the cumulative benefits of sustained removals of northern pikeminnow since 1990.	The Biological Evaluation program component of the Northern Pikeminnow Management Program (NPMP) will annually assess the cumulative benefits of the pikeminnow removal program. These estimates will	The original NPMP set minimum sizes in the Sport Reward Fishery at 11 inches ($\geq 250\text{mm}$ fork length).

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>RM&E Strategy 7—Predation Management Research, Monitoring, and Evaluation</i> <i>The Action Agencies' strategy is to support performance monitoring and adaptive management related to predation management actions.</i>			
	(Initiate in FY 2007-2009 Projects)	be presented in the annual reports of the NPMP.	Following ISRP recommendations to change the minimum size down one age class (≥ 200 mm fork length), exploitation rates for both size classes are now computed.
	RPA Subaction 70.2 Continue to evaluate if inter and intra compensation is occurring. (Initiate in FY 2007-2009 Projects)	The Biological Evaluation program component of the Northern Pikeminnow Management Program (NPMP) will annually assess whether compensatory mechanisms are occurring as a result of annual exploitation of northern pikeminnow.	
	RPA Subaction 70.3 Evaluate the benefit of additional removals and resultant increase in exploitation rate's effect on reduction in predator mortality since the 2004 program incentive increase. (Initiate in FY 2007-2009 Projects)	Ongoing projects will be continued.	
	RPA Subaction 70.4 Develop a study plan to review, evaluate, and develop strategies to reduce non-indigenous piscivorous predation. (Initiate in FY 2007-2009 Projects)	Research was initiated in Fall of 2010. Two field seasons were completed. Results of the research are scheduled to be presented in Spring 2013 to regional entities involved in non-indigenous piscine predation. From there next steps will be determined for future 2014-2018 implementation of actions	

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>RM&E Strategy 8—Coordination and Data Management Research, Monitoring, and Evaluation</i> <i>The Action Agencies are committed to making coordination and data management more effective, since FCRPS RM&E is part of the overall RM&E for recovery of salmon in the Columbia River Basin.</i>			
71	Coordination The Action Agencies will coordinate RM&E activities with other Federal, State and Tribal agencies on an ongoing annual basis, including:		
	RPA Subaction 71.1 Organizing and supporting the Corps AFEP.	AFEP planning, RM&E, and the implementation process will continue to be regionally coordinated with tribes, states, federal agencies, and others through the regular annual cycle of Studies Review Work Group (SRWG), Fish Facility Design Review Work Group (FFDRWG), and Fish Passage Operations and maintenance (FPOM meetings). Regular rotating independent reviews of segments of the program by entities such as ISAB and ISRP will continue.	
	RPA Subaction 71.2 Supporting and participating in the Council's Columbia River Basin Fish and Wildlife Program project planning and review efforts.	The Action Agencies and NOAA Fisheries will brief the ISRP and NPCC on the FCRPS 2008 BiOp Annual and Comprehensive Reports. The Action Agencies and NOAA Fisheries will participate and support the Council's Columbia River Basin Fish and Wildlife Program categorical reviews and respond to programmatic conditions that relate to FCRPS RM&E.	
	RPA Subaction 71.3 Supporting the standardization and coordination of tagging and monitoring efforts through participation and leadership in regional coordination forums such as PNAMP.	Continue coordination within the Columbia Basin while recognizing opportunities outside of the Columbia Basin. Continue development of monitoringmethods.org tools, other data systems, and requirement of sponsors to document methods and standardize monitoring where appropriate.	

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>RM&E Strategy 8—Coordination and Data Management Research, Monitoring, and Evaluation</i> <i>The Action Agencies are committed to making coordination and data management more effective, since FCRPS RM&E is part of the overall RM&E for recovery of salmon in the Columbia River Basin.</i>			
		Ensure adequate ongoing staff and resources are prioritized for product and infrastructure development.	
	RPA Subaction 71.4 Working with regional monitoring agencies to develop, cooperatively fund, and implement standard metrics, business practices, and information collection and reporting tools needed to cooperatively track and report on the status of regional fish improvement and fish monitoring projects.	The Action Agencies will work with the Pacific Northwest Aquatic Monitoring Partnership (PNAMP) to develop standard data management guidelines for all monitoring projects that collect fish and aquatic habitat data that specify how specific categories of data should be handled, stored, and made available to the region. This will include the following: Improve metadata documentation for all monitoring projects by supporting development of PNAMP's monitoringresources.org tools. Ensure that projects are consistent with PNAMP Data Management Leadership Team recommendations. Provide implementation and coordination support through a regional network of data management positions. Investigate additional pilot efforts to demonstrate approaches to improved data sharing and transparency. Complete the development of regional High Level Indicators, associated metrics, and information mapping to help focus coordination needs and products. Continue to advance the data management and reporting components of the Columbia Basin Anadromous Fish Monitoring Strategy through ongoing collaboration with state and tribal fish management agencies through the Coordinated Assessments Project.	

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>RM&E Strategy 8—Coordination and Data Management Research, Monitoring, and Evaluation</i> <i>The Action Agencies are committed to making coordination and data management more effective, since FCRPS RM&E is part of the overall RM&E for recovery of salmon in the Columbia River Basin.</i>			
		Implement regionally developed guidelines and business rules for Fish and Wildlife Program, Reclamation, and AFEP RM&E projects through contract specifications. BPA's data collection and data management projects will implement actions associated with its 2013 Data Management Strategy	
	RPA Subaction 71.5 Coordinating the further development and implementation of Hydrosystem, Tributary Habitat, Estuary/Ocean, Harvest, Hatchery, and Predation RM&E through leadership and participation in ongoing collaboration and review processes and workgroups.	The Action Agencies will participate and support the collaboration processes (PNAMP, Federal Caucus RM&E team, Fish and Wildlife Program, Anadromous Fish Evaluation Program, Columbia Basin Fish and Wildlife Authority (CBFWA), RIOG, and other ad hoc RM&E collaboration processes) and products, including the current Action Agencies, NOAA Fisheries, and NPCC work group collaboration on implementation planning, annual/comprehensive progress reporting, and adaptive management of RM&E strategies.	
	RPA Subaction 71.6 Coordinating implementation with other appropriate regional collaboration processes. This includes coordination related to statutory provisions for the Federal government (BPA/ Council), voluntary coordination among Federal agencies (Federal Caucus), and coordination with regional processes for Federal/non- Federal engagement (Technical Management Team (TMT), System Configuration Team (SCT), PNAMP, Northwest Environmental Data-Network (NED)), and others.	The Action Agencies will actively participate in regional forums and accomplishing this subaction through actions described above for RPA Action 71.	NED is no longer functioning, but PNAMP has assumed the advancement of NED objectives.

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>RM&E Strategy 8—Coordination and Data Management Research, Monitoring, and Evaluation</i> <i>The Action Agencies are committed to making coordination and data management more effective, since FCRPS RM&E is part of the overall RM&E for recovery of salmon in the Columbia River Basin.</i>			
72	Data Management The Action Agencies will ensure that the information obtained under the auspices of the FCRPS RM&E Program is archived in appropriate data management systems. Actions include:		
	RPA Subaction 72.1 Continue to work with regional, Federal, State and Tribal agencies to establish a coordinated and standardized information system network to support the RM&E program and related performance assessments. The coordination of this development will occur primarily through leadership, participation, and joint funding support in regional coordination forums such as the NED workgroup, and PNAMP and the ongoing RM&E pilot studies in the Wenatchee River, John Day River, Upper Salmon River, and Columbia River Estuary. (Initiate in FY 2007-2009 Projects)	The Action Agencies will continue working with PNAMP to develop tools that support data management standards in the monitoringresources.org tools , and other data management products identified in RPA Action 71: Continue development and review of the Aquatic Resource Schema (ARS) in the STEM database and CHaMPmonitoring.org data management system and similar approaches to ensure consistency with standard metrics identified in RPA Subaction 71.4. Continue Coordinated Assessments efforts to map data flow and Data Exchange Standards for priority BiOp fish and habitat data for agencies at the project level consistent with ongoing methods used by NOAA's Northwest Fisheries Science Center (NWFSC) efforts to update and maintain TRT Population, as well as, juvenile production datasets. Implement a data strategy guide to facilitate and implement data standards and metadata across the Columbia Basin that support BiOp needs. Develop and implement a network of data support staff and infrastructure to support the Coordinated Assessments tasks and data strategy guide in partnership with regional natural resource management entities and PNAMP. Support the development of regional-level data	NED is no longer functioning, but PNAMP has assumed the advancement of NED objectives.

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>RM&E Strategy 8—Coordination and Data Management Research, Monitoring, and Evaluation</i> <i>The Action Agencies are committed to making coordination and data management more effective, since FCRPS RM&E is part of the overall RM&E for recovery of salmon in the Columbia River Basin.</i>			
		<p>management work groups for specific BiOp critical information to standardize development of data management tools and procedures for data collection, storage, and access.</p> <p>Continue to advance the data management and reporting components of the Columbia Basin Anadromous Fish Monitoring Strategy through ongoing collaboration with state and tribal fish management agencies. In addition to advancing fish data exchange capabilities, advance these capabilities to areas of metadata, water quality and flow, a habitat environmental condition, project implementation tracking, and other data exchanges as needed.</p> <p>Continue to advance standard project implementation metrics.</p>	
	<p>RPA Subaction 72.2</p> <p>Contribute funding for data system components that support the information management needs of individual Hydrosystem, Tributary Habitat, Estuary/Ocean, Harvest, Hatchery, and Predation RM&E. (Initiate in FY 2007-2009 Projects)</p>	<p>The Action Agencies, together with other natural resource management entities, will co-fund and provide staff support for the data support positions and infrastructure at the StreamNet, PTAGIS, CHaMP, monitoring.org, STEM, Oncor, RMIS, GAPs, the new SNPs databases and other State and Tribal data systems used for proper sharing and management of key FCRPS datasets and will continue support of PNAMP's monitoringresources.org data management products and guidelines identified in RPA Subaction 72.1.</p> <p>Continue support of PNAMP's monitoringresources.org data management products and guidelines identified in RPA Subactions 72.1, 71.3 and 71.4.</p>	
	RPA Subaction 72.3	The Action Agencies will support funding of staff and	

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>RM&E Strategy 8—Coordination and Data Management Research, Monitoring, and Evaluation</i> <i>The Action Agencies are committed to making coordination and data management more effective, since FCRPS RM&E is part of the overall RM&E for recovery of salmon in the Columbia River Basin.</i>			
	Participate in Northwest regional coordination and collaboration efforts such as the current PNAMP and NED efforts to develop and implement a regional management strategy for water, fish and habitat data. (Initiate in FY 2007-2009 Projects)	agency participation in work groups, such as the PNAMP data management leadership team, and the Coordinated Assessments process to advance the data strategy under RPA Subaction 72.1.	

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>RM&E Strategy 9—Project Implementation and Compliance Monitoring Research, Monitoring, and Evaluation</i> <i>The Action Agencies have identified specific commitments or actions for each of the hydrosystem, estuary/ocean, tributary habitat, hatchery, and predator control strategies, providing clear programmatic level measures for evaluating progress, subject to adaptive management. Implementation details will be updated in 3-year cycles. Projects will be monitored for implementation of planned deliverables and compliance to performance expectations.</i>			
73	Implementation and Compliance Monitoring The Action Agencies will:		
	RPA Subaction 73.1 Annually monitor the successful implementation of projects through standard procedures and requirements of contract oversight and management, and review of project deliverables and final reports.	The Action Agencies will advance the coordination, standardization, and development of their project tracking systems with NOAA Fisheries' Pacific Coast Salmon Recovery Fund (PCSRF), BPA PISCES programs, and Reclamation and Corps programs. BPA will continue to develop and expand capabilities for performing post-implementation (compliance) monitoring of habitat projects to verify they were implemented as stated in the contract and continue to function as intended. The Action Agencies and NOAA Fisheries will work with PNAMP to further develop the Monitoring Explorer tool at www.monitoringresources.org to ensure Action Agencies, NOAA Fisheries and other state, Tribal and Federal RM&E projects and studies may be tracked and shared for use in the FCRPS BiOp assessments (including Expert Panel Limiting Factor Assessments, ERTG project evaluations, Salmon and steelhead Life Cycle Modeling, etc.)	
	RPA Subaction 73.2 Maintain project and action level details for planning and reporting purposes. This approach will provide the most up-to-date information about the status of actions and	BPA will continue the process of revising Pisces and developing the Taurus program to track RPA action implementation by sponsors and BPA staff. The U.S. Army Corps of Engineers will develop a multi-district review and spreadsheet to track RPA	

Reasonable and Prudent Alternative (RPA) Actions

Action No.	Action Description	2014-2018 Actions	Adaptive Management
<i>RM&E Strategy 9—Project Implementation and Compliance Monitoring Research, Monitoring, and Evaluation</i> <i>The Action Agencies have identified specific commitments or actions for each of the hydrosystem, estuary/ocean, tributary habitat, hatchery, and predator control strategies, providing clear programmatic level measures for evaluating progress, subject to adaptive management. Implementation details will be updated in 3-year cycles. Projects will be monitored for implementation of planned deliverables and compliance to performance expectations.</i>			
	projects being implemented.	<p>Action project-level implementation. Reclamation will continue to update its RPA Action implementation tracking system. The Action Agencies will coordinate the annual reporting of this project-level implementation to NOAA.</p> <p>Continue work with PNAMP on development of a regionally endorsed data dictionary for environmental resource action and project implementation metrics.</p> <p>Develop and implement compatible project tracking metrics for all RPA Action and project types, such as habitat restoration and protection, harvest and hatchery management, and research and monitoring.</p>	
	<p>RPA Subaction 73.3</p> <p>Maintain a comprehensive habitat project tracking system where relevant project information is contained in an accessible comprehensive data system. The data system will contain project level information that is needed for both implementation and effectiveness monitoring. The system will include the set of minimum metrics and meta data for RM&E data design listed in Data Management Needs for Regional Project Tracking to Support Implementation and Effectiveness Monitoring (Katz et al. 2006). (Initiate in FY 2008)</p>	<p>The Action Agencies will support processes to update and integrate regional habitat restoration and protection tracking metrics based on the Katz et al. standards in the NOAA PNSHP database.</p> <p>BPA's automated annual transfers of Pisces habitat project contract information to PNSHP will continue to fully comply with this RPA Action.</p>	

Adaptive Management Implementation Plan (AMIP) Actions – RPA Action 1A

In September 2009, the FCRPS BiOp was enhanced through an AMIP which includes accelerated actions, additional research related to fish status and climate change, and precautionary use of biological triggers and contingency plans in case there is an unexpected, significant fish decline. The original AMIP actions and six new implementation actions that were amended to the AMIP were incorporated into NOAA Fisheries' 2010 Supplemental BiOp. The following section provides an update on the progress of the AMIP actions implemented by NOAA and the Action Agencies. For more details regarding each action please refer to the 2013 FCRPS Comprehensive Evaluation.

AMIP Reference	Action Description	2014 – 2018 actions	Adaptive Management
<i>AMIP Category: II Acceleration & Enhancement of RPA Mitigation Actions</i>			
II. A	Estuary Habitat Improvement & Memorandum of Agreement on Columbia River Estuary Actions with State of Washington	Washington Memorandum of Agreement (WA MOA) was issued in 2009 and can be found at the following link: http://www.salmonrecovery.gov/Files/Partners/Estuary%20Habitat%20MOA%209-16-09.pdf See RPA Actions 36 & 37 for additional discussion of estuary habitat actions and implementation status. Refer to IP Appendix A for a list of Washington Department of fish and Wildlife (WDFW) projects associated with the MOA.	
II. B	Reintroduction The NWFSC is now initiating an evaluation of additional opportunities for reintroduction of listed fish in areas downstream of Chief Joseph Dam and the Hells Canyon Complex. The NWFSC will examine the potential benefits of additional reintroductions, considering locations where reintroduction will advance recovery and further lower the risk of extinction.	These actions were completed by NOAA's NWFSC in 2011 (McClure et al 2011) ¹⁵ .	
II. C	Predator & Invasive Species	These research objectives were completed in 2011 after	For Action 1, research has

¹⁵ McClure et al. 2011. *Anadromous Salmonid Reintroductions: General Planning Principles for Long-term Viability and Recovery*. NWFSC. 66pp.

Adaptive Management Implementation Plan (AMIP) Actions – RPA Action 1A

AMIP Reference	Action Description	2014 – 2018 actions	Adaptive Management
	<p>Controls</p> <p>The Action Agencies and NOAA Fisheries will move forward in the three highest priority areas to establish baseline information for future predator control activities:</p> <ol style="list-style-type: none"> 1. Shad: document the influence of juvenile shad on the growth and condition of introduced predators in the fall as they (the predators) prepare for overwintering 2. Catfish: document the distribution and predation rates of channel catfish 3. Smallmouth bass: document whether removals of smallmouth bass in areas of intense predation could reduce the mortality of juvenile salmon and steelhead <p>For these three priority approaches and in order to accelerate implementation of the RPA, by November 2009 BPA will develop a research study design proposal, and will promptly request an expedited review of the proposal by the Independent Scientific Review Panel (ISRP) to accelerate field implementation. The Action Agencies will implement the research study during the next field season(s), anticipated by</p>	<p>three years of study.</p> <p>In the spring of 2013, interested regional fish predation representatives will present and review research to determine the priority of next steps within this topic area.</p>	<p>determined that that juvenile shad are not contributing significantly enough to walleye survival to warrant a management action on adult shad.</p> <p>For Action 2, juvenile shad have not been found to be a diet component of channel catfish.</p> <p>For Action 3, diet analyses of smallmouth bass show that crustaceans comprise of 50-78 percent of their diet, walleye represents a majority of fish consumed with juvenile salmon and steelhead comprising less than 10 percent.</p>

Adaptive Management Implementation Plan (AMIP) Actions – RPA Action 1A

AMIP Reference	Action Description	2014 – 2018 actions	Adaptive Management
	December 2010. Once this research supports a specific management strategy, the Action Agencies could implement site-specific removals of smallmouth bass and could exclude adult American shad from upper mainstem dams as early as the following migration season.		
II. D	<p>Spill Spring Spill: Assess data from previous years and discuss with the RIOG parties each year to inform transport/spill operation decisions for the subsequent year. There is no longer a presumptive spill / transport operation for the spring the RPA Action 29.</p>	Action for spring spill is identified in RPA Action 29. The Action Agencies will continue to review on data on transport and spill operations to inform future operations.	
	<p>Summer Spill: To further enhance the summer spill program, the Action Agencies will develop an appropriate safeguard, based on adult returns, that continues summer spill at the Snake River projects through August 31, during the subsequent juvenile outmigration. Using this trigger, low abundance of naturally-produced Snake River fall Chinook in one year would trigger spill through August 31 at the Snake River projects the following year, regardless of the number of juveniles collected. The Agencies will coordinate with the RIOG in developing the</p>	Completed, no further actions planned. Actions for summer spill is identified in RPA Action 29. The Action Agencies will continue to use the 400 or fewer natural origin adult Snake River Fall Chinook Salmon trigger, see http://www.salmonrecovery.gov/Files/BiologicalOpinions/2010/safeguard%20letter.pdf	

Adaptive Management Implementation Plan (AMIP) Actions – RPA Action 1A

AMIP Reference	Action Description	2014 – 2018 actions	Adaptive Management
	trigger, to be in place for the 2010 juvenile fish migration.		
AMIP Category: III Enhanced Research Monitoring & Evaluation			
III. A	<p>Enhanced Life-Cycle Monitoring for Evaluation of Contingencies</p> <p>Starting in 2010, NOAA Fisheries and the Action Agencies will jointly fund and implement updates to the existing life cycle models. The updates to the life-cycle models will be implemented by December, 2012. These enhancements will be developed using the same approach as for the COMPASS model, a transparent process and independent science peer review. Results will be discussed with the RIOG and reported annually to the region.</p>	The Action Agencies have fulfilled this commitment.	The AMIP life-cycle modeling group completed a draft document in December 2012. This document underwent internal and regional review. An updated version was provided to the ISAB in June 2013 for review. The document contains several chapters that contained the following material: an update to modeling metrics; several expanded life-cycle models that focused on the benefits of freshwater habitat actions; several new models that are under development; hatchery-wild interaction; updated hydro parameters; expanded estuary modeling with avian predation; updated models of ocean survival; and spatial interactions among populations.
III. B	<p>Adult Status & Trend Monitoring</p> <p>By December 2011, NOAA Fisheries will improve existing adult status and trend monitoring to obtain adult natural spawner abundance and</p>	<p>Mechanisms for data reporting and dissemination were completed on schedule in 2010.</p> <p>NOAA's NWFSC created the SPS database to disseminate data to enable early detection of regional population specific changes in status. The database is available online at https://www.webapps.nwfsc.noaa.gov/apex/f?p=238:home:</p>	

Adaptive Management Implementation Plan (AMIP) Actions – RPA Action 1A

AMIP Reference	Action Description	2014 – 2018 actions	Adaptive Management
	full life-cycle productivity estimates, with known statistical certainty and power, for additional ESA-listed populations. These improvements will better inform decisions regarding which Rapid Response Actions and Long-term Contingency Actions will be taken if a trigger is tripped, as well as ongoing viability assessments. Additionally, by December 2010, NOAA Fisheries will develop mechanisms for the timely and efficient reporting and dissemination of these data, in order to ensure they can provide for the early detection of regional or population specific changes in status.	Q	
III. C	Juvenile Status & Trend Monitoring By December, 2011, the Action Agencies will enhance the existing monitoring of juvenile production and survival. This will ensure that at least one population per MPG is being monitored to better inform decisions regarding what Rapid Response and Long-term Contingency Actions will be taken if an adult trigger is tripped, as well as informing viability assessments. In addition to allowing the detection of downturns in natural freshwater production	The strategy was completed on schedule in 2010. Consistent with ISRP comments, in 2011 BPA proceeded with partial implementation and evaluation for CHaMP and associated paired fish population monitoring. Full implementation will follow based on additional ISRP review. (See III. D below.)	

Adaptive Management Implementation Plan (AMIP) Actions – RPA Action 1A

AMIP Reference	Action Description	2014 – 2018 actions	Adaptive Management
	and juvenile survival, this monitoring will help to assess climate change impacts. The Action Agencies will develop a strategy to improve the management and timely reporting of juvenile salmon and steelhead monitoring data by December, 2010.		
III. D	Habitat Condition Status & Trend Monitoring By December, 2011, the Action Agencies will expand habitat status and trend monitoring (for at least one population or watershed per MPG) and support updated modeling of the expected benefits of habitat actions. By December, 2011, the Action Agencies will also ensure monitoring of appropriate metrics across a diversity of ecological regions and habitat types to assess responses to climate change.	The CHaMP program may be expanded in 2014 and will continue to be adaptively implemented based on the annual synthesis of results, the ongoing assessment of the value of individual indicator metrics, and the input from ongoing ISRP science review. CHaMP will be integrated with the USFS PIBO program as appropriate and feasible. The results of CHaMP habitat monitoring will be used with fish status and trends monitoring data to support model development. Models are being developed to assess the benefit of various treatment types in order to refine habitat project planning, development, and implementation. Ultimately, the data being used to develop the models as well as model outputs will be provided to expert panels for use in estimating the benefit of habitat actions. This information will also be used to identify potential limiting factors to better inform habitat action planning and evaluation.	
III. E.	Intensively Monitored Watersheds: The Action Agencies are implementing IMWs under RPA Actions 56 and 57 for fish status monitoring and habitat effectiveness monitoring in the John Day, Wenatchee, Entiat, Methow, Lemhi, and South Fork Salmon basins. NOAA Fisheries funds five additional or complementary IMWs in interior subbasins in Idaho (Upper Potlach River, Lemhi River);	The analysis of IMWs was completed in 2010. Consistent with this assessment, habitat actions within IMW watersheds will be coordinated and implemented as practical to provide an adequate treatment effect for IMWs. The strategy for developing habitat and fish response relationships that was initiated under the pilot IMWs is being expanded to include habitat status and parallel fish status monitoring for at least one population per MPG to cover a sufficiently diverse representation of geographic areas and limiting factors (see AMIP III D).	

Adaptive Management Implementation Plan (AMIP) Actions – RPA Action 1A

AMIP Reference	Action Description	2014 – 2018 actions	Adaptive Management
	Oregon (Upper Middle Fork John Day River); and Washington (Yakima River, Asotin Creek). The Action Agencies' IMWs have been through independent science evaluation and review by the NPCC. Under the RPA provisions, enhancements to these efforts are already planned or underway.		
III. F	Climate Change Monitoring & Evaluation This AMIP Action enhances or clarifies other RPA actions as follows:	This Action is ongoing. In August 2012, The NOAA NMFSC released a literature review of current climate change research. Pursuant to AMIP Action III.F [AMIP pg. 25], the NWFSC has agreed to provide the Action Agencies with an annual review of relevant climate change literature for inclusion in the Action Agencies' Annual Progress Reports.	
	RPA Action 2 requires the inclusion of new climate change research findings in the Action Agencies' annual progress reports NOAA Fisheries will annually provide the Action Agencies with a literature review relevant to the implementation of the RPA.	The Action Agencies will continue to include relevant climate change research findings annually in progress reports.	
	Consistent with RPA Actions 56-61, data on habitat conditions and action effectiveness will be collected during ongoing and enhanced tributary habitat and ocean research. By December 2011, the Action Agencies and NOAA Fisheries will ensure that this information is appropriately managed in a database allowing changes to be tracked over time.	<p>The action is ongoing.</p> <p>BPA funded the creation of the CHaMP data system for tributary habitat status and trend monitoring associated with RPA Actions 56 and 57 at http://www.champmonitoring.org.</p> <p>BPA and NOAA NWFSC funded tributary habitat action effectiveness monitoring for RPA Actions 56 and 57 via the ISEMP project, found at http://www.nwfsc.noaa.gov/research/divisions/cbd/mathbio/iseмп/index.cfm, which tracks and manages data in the Status and Trend Effectiveness Monitoring Databank at https://www.webapps.nwfsc.noaa.gov.</p> <p>For estuarine habitat data, data related to food web and</p>	

Adaptive Management Implementation Plan (AMIP) Actions – RPA Action 1A

AMIP Reference	Action Description	2014 – 2018 actions	Adaptive Management
		<p>water quality (flow, temperature, dissolved oxygen, pH, plankton (nontoxic or pharmaceutical)) are stored at http://www.stccmop.org/saturn.</p> <p>For ocean habitat conditions, data from BPA and NOAA NWFSC Project may be found at the NOAA Ocean Indicators Tool (http://www.nwfsc.noaa.gov/research/divisions/fed/oeip/a-ecinhome.cfm).</p> <p>Additional data on ocean conditions for the BPA-funded "Canada-USA Shelf Salmon Survival Study," conducted with the Canadian Department of Fisheries and Oceans (DFO), are reported in the Pacific Region Oceanography Database at http://www.pac.dfo-mpo.gc.ca/science/oceans/data-donnees/index-eng.htm.</p>	
	Under RPA Actions 35 and 37, the Action Agencies will use the new climate change information to guide tributary and estuary habitat project selection and prioritization and other aspects of adaptive management.	For RPA Actions 35 and 37: The action is ongoing. The annual NOAA reviews of new climate change literature provided under AMIP Action III.F [AMIP pg. 25] will be shared with regional partners.	Climate change findings will be included with other RME results that are shared with regional partners to identify, develop, implement, and evaluate tributary and estuary habitat improvement projects.
	Under RPA Action 7, the Action Agencies investigate the impacts of possible climate change scenarios on listed salmon and steelhead. As part of this effort, the Action Agencies will use new climate change information to improve regional hydrological models. In addition, the Action Agencies will review existing forecasting tools. As new procedures and techniques are identified with significant potential to reduce forecast error and improve forecast reliability, the Action	<p>This action is ongoing.</p> <p>The results of the work from the three agencies (<i>Climate and Hydrology Datasets for use in the RMJOC Agencies' Longer-Term Planning Studies</i>) are available at http://www.bpa.gov/power/pgf/HydrPNW.shtml.</p>	

Adaptive Management Implementation Plan (AMIP) Actions – RPA Action 1A

AMIP Reference	Action Description	2014 – 2018 actions	Adaptive Management
	Agencies will review these with the RIOG and other interested parties.		
	Enhanced monitoring of adult status and trends, juvenile status and trends, habitat condition status and trend and IMWs (flows and temperature) will contribute to climate change assessments. Climate change information will be discussed with the RIOG and reported to the region annually.	The action is ongoing. Enhanced monitoring in 2011 under AMIP III B, C, D, and E (adult, juvenile, habitat status, and IMWs) all support and contribute to climate change assessments. See these sections above for more information.	
AMIP Category: IV Contingency Plans in Case of Early Warning or Significant Fish Declines			
IV. A. 1	<p>Early Warning Indicator for Chinook Salmon & Steelhead:</p> <p>The Action Agencies and NOAA Fisheries will develop, in coordination with the RIOG, at least one additional Early Warning Indicator by December, 2010, which may be revised pending additional analyses and discussion. Specifically, the additional Early Warning Indicator(s) would evaluate whether a species is likely to have substantially reduced abundance (and productivity) in the future based on two years of adult return information, preliminary biological information, and environmental indicators or</p>	<p>This Action is completed. Significant Decline and Early Warning Indicators (including a metric indicative of trend) were documented in the Action Agencies' Rapid Response and Long-Term Contingency Plan (https://www.salmonrecovery.gov/Files/2011%20APR%20files/2011_RRandLTC_Plan.pdf).</p> <p>Subsequently, the NWFSC developed a forecasting tool to be used in conjunction with the Early Warning Indicator. The tool would evaluate whether a species is likely to have substantially reduced abundance in the future based on one to two years of adult return information, preliminary biological information, and environmental indicators. A paper describing this tool was completed in 2011¹⁶.</p>	

¹⁶ Buhle, Eric R. *Forecasting population size and risk: Accounting for time-varying demography and environmental drivers*.

Adaptive Management Implementation Plan (AMIP) Actions – RPA Action 1A

AMIP Reference	Action Description	2014 – 2018 actions	Adaptive Management
	<p>known environmental disasters. These indicators may include, but are not limited to, low jack counts or numbers of juvenile outmigrants (biological), indicators of ocean conditions predicting very low abundance of adult returns for recent outmigrants (environmental indicators), or wide-spread forest fires, increased distribution and virulence of pathogens, new invasive species, prolonged severe droughts, etc. (environmental disasters). Unlike the interim Early Warning Indicators, which evaluates information at the species level, the additional Early Warning Indicators may use information more representative of effects on major population groups (MPGs), important management units (e.g., A-run vs. B-run Snake River steelhead, or key populations). Responses to impacts affecting a specific MPG or subset of populations would be tailored to the appropriate scale.</p>		
IV. A. 2	<p>Significant Decline Trigger for Chinook Salmon & Steelhead: The Action Agencies and NOAA Fisheries, in coordination with the RIOG, will further improve the Significant Decline Trigger no later than December 2010</p>	<p>The action was completed in 2010. The letter and attachment describing this approach can be found at http://www.salmonrecovery.gov/BiologicalOpinions/FCRPSBiOp/2010SupplementalFCRPSBiOp/AMIP.aspx</p>	

Adaptive Management Implementation Plan (AMIP) Actions – RPA Action 1A

AMIP Reference	Action Description	2014 – 2018 actions	Adaptive Management
	by incorporating a metric indicative of trend.		
IV. A. 3	Contingency Plan Implementation for Snake River Sockeye Salmon	This action is ongoing. BPA will continue to fund contingency actions for Snake River sockeye.	Contingency actions include the safety net hatchery program; construction, operation, and maintenance of the Springfield Sockeye Hatchery to expand smolt production up to one million smolts; and a multi-year investigation of the highly variable juvenile mortality rates between Sawtooth Valley and Lower Granite Dam. If necessary as a contingency action, the Action Agencies will fund transportation of adult sockeye from Lower Granite Dam to Sawtooth Valley lakes or artificial production facilities.
IV. B	Rapid Response Actions: Within 90 days of NOAA Fisheries determining that a significant decline trigger has been tripped, the Action Agencies, in coordination with NOAA Fisheries and the RIOG, will assess alternative Rapid Response Actions and determine which action(s) will be implemented. The Rapid Response Actions will be implemented as soon as practicable after a decision is made, and not later than 12 months after a Significant	<p>The Rapid Response and Long-Term Contingency Plan addressed all related actions and was completed in 2011. The document can be found at https://www.salmonrecovery.gov/Files/2011%20APR%20files/2011_RRandLTC_Plan.pdf</p> <p>The Action Agencies (in coordination with NOAA Fisheries, the RIOG and other regional parties) will implement rapid response and, if needed, long-term contingency actions to minimize and mitigate for the decline. There are four decision points in this process: 1) the Significant Decline Trigger tripping; 2) identification of appropriate rapid response actions; 3) evaluation of the sufficiency of those actions; and 4) determination of appropriate long-term contingency actions, if needed.</p> <p>Annually, NOAA Fisheries and the Action Agencies will review current information to evaluate whether a Significant</p>	

Adaptive Management Implementation Plan (AMIP) Actions – RPA Action 1A

AMIP Reference	Action Description	2014 – 2018 actions	Adaptive Management
	<p>Decline Trigger is tripped. Most, if not all, Rapid Response Actions will be temporary in nature.</p> <p>By December 2011, the Action Agencies and NOAA Fisheries will develop a Rapid Response Plan, which will include a detailed description of these potential Rapid Response Actions together with implementation milestones:</p> <ul style="list-style-type: none"> • Hydro Actions: The Corps will implement, in coordination with NOAA Fisheries and the other Action Agencies, hydrosystem actions that will increase the survival of the species in question beyond the current juvenile dam passage performance standards. Specific actions will be based on the most recent data available and might include targeted spill and changes in fish transportation operations based on recent survival data. The federal agencies, in collaboration with the RIOG and appropriate technical groups, will review the current status of biological research and discuss where additional project survival benefits could be gained for the 	<p>Decline Trigger has been tripped. Once NOAA Fisheries has determined that the Significant Decline Trigger has been tripped, the agencies have up to 90 days to determine, in consultation with RIOG, what factors or conditions may have caused the trigger to trip and assess which rapid response action or actions may be effective in minimizing or mitigating for the decline. This assessment will consider all potential actions- hydro, predation, harvest, and hatchery that may effectively address the decline.</p> <p>See the Rapid Response and Long-Term Contingency Plan Section 1.2, page 6 for more detail.</p>	

Adaptive Management Implementation Plan (AMIP) Actions – RPA Action 1A

AMIP Reference	Action Description	2014 – 2018 actions	Adaptive Management
	<p>species in question.</p> <ul style="list-style-type: none"> • Predator Control: BPA and the Corps, in conjunction with the USFWS and the States, will implement more aggressive, targeted efforts to control predatory fish, birds, and invasive species to increase survival of listed fish. This will include a temporary increase in the pikeminnow sport fishery reward program and increased hazing of birds in close proximity to the dams. • Harvest: All fisheries that affect the species of concern, including ocean, mainstem, and terminal will be reviewed by NOAA Fisheries to assess whether existing harvest management agreements provide adequate protection. Under the United States v. Oregon agreement, if the performance measure of any indicator stock declines for three consecutive years when compared to the base period, any party may request that an analysis of the decline is conducted. The analysis must be completed within one year. After review of the 		

Adaptive Management Implementation Plan (AMIP) Actions – RPA Action 1A

AMIP Reference	Action Description	2014 – 2018 actions	Adaptive Management
	<p>analysis, the parties may make recommendations to modify the agreement. If it is determined that additional protection is necessary, NOAA Fisheries will use existing procedural provisions of the agreements to seek consensus among the parties to modify the agreements.</p> <ul style="list-style-type: none"> • Safety-Net Hatchery Programs: BPA and NOAA Fisheries use safety-net hatchery programs to address short-term extinction risk. By December 2011, the federal agencies will consult with the RIOG and identify opportunities and further processes to implement safety-net programs that could be used for each interior species. BPA is the primary agency for safety-net hatchery program implementation. Such actions may require additional approvals and National Environmental Policy Act (NEPA) reviews. The goal is to establish safety-net programs within one year at existing hatchery facilities where only minor facility 		

Adaptive Management Implementation Plan (AMIP) Actions – RPA Action 1A

AMIP Reference	Action Description	2014 – 2018 actions	Adaptive Management
	modifications are needed.		
IV. C	<p>Long-term Contingency Actions:</p> <p>Within four to six months of a Significant Decline trigger being tripped, the Action Agencies (in coordination with NOAA Fisheries, the RIOG and other regional parties) will conduct an All-H Diagnosis and life-cycle model analysis to determine if the Rapid Response Action(s) are likely to be sufficient or if Long-term Contingency Actions will need to be implemented, and if so, what Long-term Contingency Actions are appropriate for implementation. If necessary, the Long-term Contingency Actions will then be implemented as soon as practicable thereafter. Unlike the Rapid Response Actions, all of which have been determined to be implementable within 1-12 months of a triggering event, each Long-Term Contingency Action has a unique timeline for implementation depending on its complexity.</p> <p>By December 2011, the Action Agencies and NOAA Fisheries will develop a Long Term Contingency Plan, which will include a detailed description of potential Long-term Contingency Actions, a selection process and implementation</p>	<p>The Rapid Response and Long-Term Contingency Plan addressed Actions 1-6 and was completed in 2011. The document can be found at https://www.salmonrecovery.gov/Files/2011%20APR%20file%20s/2011_RRandLTC_Plan.pdf</p> <p>For Action 7, the plan for John Day Minimum Operating Pool was completed in July, 2012. http://www.salmonrecovery.gov/Files/BiologicalOpinions/2012/JDA%20MOP%20Final%20Plan%20of%20Study%20with%20letter%20comments%20and%20responses%20(071112).pdf</p> <p>For Action 8, The Corps published the plan of study in March 2010. The document can be found at http://www.nww.usace.army.mil/amip/lrrip/report/plan_of_study_final_03_30_10.pdf</p>	

Adaptive Management Implementation Plan (AMIP) Actions – RPA Action 1A

AMIP Reference	Action Description	2014 – 2018 actions	Adaptive Management
	<p>milestones for the following potential long-term contingency actions as further described in the AMIP:</p> <ol style="list-style-type: none"> 1. Phase II Hydro Actions 2. Reintroduction 3. Predator Control 4. Harvest 5. Conservation Hatcheries 6. Hatchery Reform 7. John Day Reservoir at Minimum Operating Pool from April – June 8. Breaching Lower Snake River Dams: By March, 2010, the Corps in coordination with NOAA Fisheries and the other Action Agencies will complete a “Study Plan” for breaching of lower Snake River dams. 		
AMIP Category: Amendments			
Amendment 1	<p>Identify the use and location of adult salmon thermal refugia in Lower Columbia and Lower Snake rivers</p> <p>Under RPA Action 55 the Action Agencies will undertake selected hydrosystem research to resolve critical uncertainties. As part of this action, by June 2012, the Corps will complete a report to identify the use and location of adult salmon</p>	<p>This Action was completed by the Corps in 2012. A link to the report Location and Use of Adult Salmon Thermal Refugia in the Lower Columbia and Lower Snake Rivers FCRPS Pools can be found at https://www.salmonrecovery.gov/Files/BiologicalOpinions/2010/Thermal%20refugia%20report%20Feb%2014%202013.pdf</p> <p>The report identifies the use and location of adult salmon thermal refugia in the lower Columbia and lower Snake Rivers using existing information on adult migration, temperature monitoring data, and modeling efforts.</p>	

Adaptive Management Implementation Plan (AMIP) Actions – RPA Action 1A

AMIP Reference	Action Description	2014 – 2018 actions	Adaptive Management
	thermal refugia in the lower Columbia and lower Snake Rivers using existing information on adult migration, temperature monitoring data, and modeling efforts. Additional investigation or action may be warranted based on the results of this report.		
Amendment 2	Assess feasibility of adding adult PIT-tag detection systems at The Dalles Dam and John Day Dam	The Corps, in coordination with NOAA, determined that adult PIT-tag detection should only be at The Dalles Dam. Temporary PIT-tag detectors were installed at The Dalles Dam ladders in early 2013. Installation of permanent detectors is anticipated in late 2014 or early 2015.	
Amendment 3	Action Agencies to provide temperature data for NOAA's regional temperature database Under RPA Action 15, the Action Agencies are providing water quality information and implement water quality measures to enhance fish survival and protect habitat. As part of this action, the Action Agencies will contribute to regional climate change impact evaluations by providing NOAA past and future water temperature data from their existing monitoring stations, to be used as part of a regional temperature database. The Action Agencies will begin to provide data to NOAA within 6 months following the	NOAA and the Action Agencies are satisfying this requirement by submitting data developed for FCRPS BiOp RME to the USFS's Rocky Mountain Research stream and air temperature database (http://www.fsJed.us/rm/boise/AWAE/projects/streamtemperature.shtml).	

Adaptive Management Implementation Plan (AMIP) Actions – RPA Action 1A

AMIP Reference	Action Description	2014 – 2018 actions	Adaptive Management
	establishment of a regional database and annually thereafter. NOAA anticipates having a regional database established no later than 2012.		
Amendment 4	<p>Action Agencies to provide tributary habitat effectiveness study data for NOAA's regional climate change database</p> <p>Under RPA Action 35, the Action Agencies are identifying tributary habitat projects for implementation and consider potential effects of climate change on limiting factors. As part of this action, the Action Agencies will continue to coordinate with NOAA in its efforts to use existing tributary habitat effectiveness studies, IMWs, and the NOAA enhanced lifecycle modeling to track climate change impacts. Starting in September 2011, the Action Agencies will annually provide NOAA with study data to be used as part of a regional climate change database. After 2011, new climate change findings will be provided to the tributary habitat expert panels to apply and use to help identify and prioritize habitat improvement actions.</p>	The annual NOAA reviews of new climate change literature provided under AMIP Action III.F [AMIP pg. 25] will be shared with regional partners and the tributary habitat Expert Panels in advance of the workshops to be held in 2015 and 2018.	Climate change findings will be included with other RME results that are shared with regional partners to identify, develop, implement, and evaluate tributary and estuary habitat improvement projects as well as shared with the expert panels and technical groups who evaluate those projects for the FCRPS BiOp.
Amendment 5	Action Agencies will provide available invasive species and site-specific toxicology information for	The Action Agencies will share information on the presence of invasive species or site-specific toxicology that was submitted by any appropriate state or federal agency with expert panels by October 1, 2014 prior to the 2015	

Adaptive Management Implementation Plan (AMIP) Actions – RPA Action 1A

AMIP Reference	Action Description	2014 – 2018 actions	Adaptive Management
	<p>consideration by the Expert Panels</p> <p>Under RPA Action 35, the Action Agencies are identifying tributary habitat projects for implementation based on the population specific overall habitat quality improvement identified in the RPA Action. As part of this action, after 2011, the Action Agencies will include as a consideration in the Expert Panel project evaluation process 1) the presence of invasive species and 2) site-specific toxicology issues, based on information made available by the appropriate state and Federal agencies.</p>	workshops.	
Amendment 6	<p>Action Agencies will assist NOAA to develop or modify existing studies that address the Ad Hoc Supplementation Workgroup (AHSWG)</p> <p>Under RPA Action 64 and under the AMIP Hatchery Effects p. 22, the Action Agencies are supporting efforts to resolve hatchery critical uncertainties. As part of this effort, beginning in December 2010, the Action Agencies will assist NOAA to further develop or modify existing studies that address the Ad Hoc Supplementation Workgroup Recommendations Report and that additionally address potential density-dependent impacts of FCRPS</p>	The Action Agencies will assist NOAA in the development of a Columbia River Hatchery Effects Evaluation Team (CRHEET) to support efforts to resolve critical hatchery uncertainties.	PLACEHOLDER for NOAA if needed

Adaptive Management Implementation Plan (AMIP) Actions – RPA Action 1A

AMIP Reference	Action Description	2014 – 2018 actions	Adaptive Management
	hatchery releases on listed species. These studies would provide support for future hatchery management actions to reduce potential adverse hatchery effects. By December 2010, the Action Agencies will work with NOAA to convene a technical workgroup with fishery managers to discuss potential studies and potential management tools. The goal for the workgroup will be to complete its work by December 2011.		

Appendix A: Project Lists

Hydro Projects

BPA Hydro Projects BiOp Strategy	Action #	Sub Action #	End FY	Project #	Project Title	Project URL
Develop and Implement a Kelt Management Plan	33	3	2018	2007-401-00	Kelt Reconditioning and Reproductive Success Evaluation Research	http://www.cbfish.org/Project.mvc/Display/2007-401-00
Develop and Implement a Kelt Management Plan	33	4	2018	2007-401-00	Kelt Reconditioning and Reproductive Success Evaluation Research	http://www.cbfish.org/Project.mvc/Display/2007-401-00

Tributary Habitat Projects

This table summarizes limiting factors, metrics, the menu of projects that implement those metrics, and habitat quality improvements (HQIs) for Snake River and Upper Columbia Chinook and steelhead and Middle Columbia River steelhead populations. The table reflects those 2012 to 2018¹⁷ tributary habitat improvement projects that were evaluated by the expert panels in 2012. Projects and metrics may be reported twice in this table (once under each ESU/DPS) if they improve habitat for both Chinook salmon ESU and steelhead DPS. The project column provides web links to BPA-funded contracts associated with these projects¹⁸. Metrics can address one or more limiting factors in adjacent columns shown between horizontal lines.

The following metric definitions and units are used in this table.

Flow: Water protected by efficiency improvements and water purchase/lease projects, reported as either volume in acre-feet per year (AF) or as river flow in cubic feet per second (cfs).

Entrainment: Number of screens addressed can include new screens installed, existing screens improved for compliance with criteria, or entrainment issues addressed by elimination/consolidation of diversions.

Passage: Number of barriers addressed by providing passage or removing the barrier, reported to include number of miles of access improved by addressing the barriers.

Complexity: Miles of instream channel improved by adding habitat features via wood or boulder structures, or reconnecting existing habitat such as side channels.

WQ/Riparian: Projects undertaken to improve water quality by enhancing or protecting instream habitat or riparian function are reported in four different ways as described below.

- Stream miles protected: Miles of stream habitat protected, typically by land purchases, conservation easements, or fencing projects that improve land use practices such as excluding cattle from the stream.
- Stream miles improved: Miles of stream habitat improved, typically by projects that enhance the function of the streambank such as planting native vegetation on the streambanks.
- Riparian acres protected: Acres of riparian habitat protected by purchases or conservation easements that improve land use practices, allowing natural processes to reestablish riparian habitat.
- Riparian acres improved: Acres of riparian habitat improved by projects to improve riparian habitat such as planting native vegetation or control of noxious weeds.

The 2018 Habitat Quality Improvement Estimates column depicts the 2018 RPA Action 35, Table 5 HQI and the status of progress toward meeting or exceeding 2018 RPA Action 35, Table 5 HQIs with:

- HQIs determined from expert panel results for actions completed from 2007 to 2011 and for projects to be completed from 2012 to 2018 for each population evaluated by the expert panels
- HQIs for a menu of supplemental projects (IP Appendix B) identified by tribal partners and the Action Agencies for completion from 2012 to 2018 (see 2013 Draft CE, Appendix A).
- Supplemental projects have been developed only for those six priority populations where 2012 expert panel results indicated the need for additional habitat improvement actions. The menu of supplemental projects was assembled to assure enough projects to meet or exceed HQIs for

¹⁷ The expert panel workshop schedule called for in RPA Action 35 does not conform with FCRPS BiOp comprehensive evaluation and implementation plan reporting schedules. The 2012 expert panel workshops were completed prior to the 2012 construction season. Therefore, actions planned for implementation after the 2012 workshops are included in this table. The next expert panel workshop is scheduled for 2015.

¹⁸ A complete portfolio of project information is available at <http://www.cbfish.org/Portfolio.mvc/Index>

Appendix A: Project Lists

all RPA Action 35, Table 5 populations. Supplemental projects were not evaluated by the 2012 expert panels. HQIs for metrics associated with the supplemental projects were estimated by the Action Agencies from the relation between HQIs and metrics for projects evaluated by the expert panels (see 2013 Draft CE, Appendix B). Projects not evaluated by the 2012 expert panels will be evaluated by the panels in 2015. The HQIs in this table and in Appendix B are the same and are repeated in each table for convenience.

- This column also includes HQIs from the 2008 Columbia Basin Fish Accords between the Three Treaty Tribes and FCRPS Action Agencies and the Confederated Tribes of the Colville Reservation and the FCRPS Action Agencies. Both of these Fish Accords included menus of habitat improvement projects. At the time the Accords were negotiated, the Umatilla, Warm Springs, Yakama, and Colville Tribes developed population-level habitat improvement estimates (the “2018 Accord estimates”) for the menu of Accord projects through 2018, using the same methodology applied by the expert panels. These estimates denote the anticipated benefits from Accord projects and are reported separately in this table. Subsequently, the expert panels have evaluated these Accord projects alongside other proposed and completed tributary habitat projects. Therefore the expert panel generated HQIs in the following table reflect habitat improvements associated with the Accord projects as well as other tributary habitat projects supported by the Action Agencies.

❖ Indicates populations with Reclamation involvement. Reclamation provides technical assistance to states, tribes, federal agencies, and other local partners for identification, design, and construction of stream habitat improvement projects that primarily address streamflow, access, entrainment, and channel complexity limiting factors.

Appendix A: Project Lists

Population	Metric Category	Limiting Factors to Be Addressed in 2013-2018	2013-2018 Metrics Evaluated by the 2012 Expert Panels	Projects Associated with Metrics Evaluated by the 2012 Expert Panels	2018 Habitat Quality Improvement Estimates
Snake River Spring/Summer Chinook					
Grande Ronde/Imnaha					
❖Catherine Creek	Flow:	9.2: Decreased Water Quantity	Protect 3,230 AF and 3 cfs flow	1992-026-01: Grande Ronde Model Watershed 1984-025-00: Blue Mountain Fish Habitat Improvement 1996-083-00: Grande Ronde Watershed Restoration	2018 Table 5 HQI: 23%
	Passage:	1.1 Anthropogenic Barriers	Address 14 barriers Improve 30.8 miles Address 1 screen		2007-11 Accomplishment: 5%
	Complexity:	6.1: Bed and Channel Form 6.2: Instream Structural Complexity	Improve 19.2 instream miles		2012-18 Estimate: 6%
	WQ/Riparian:	4.1: Riparian Condition 4.2: LWD Recruitment 5.1: Side Channel and Wetland Conditions 5.2: Floodplain Condition 7.2: Increased Sediment Quantity 8.1: Temperature 8.2: Oxygen 8.4: Turbidity	Improve 1.5 riparian miles Protect 1 riparian mile Improve 1,520 riparian acres Improve 98 wetland acres Improve 22 road miles		Supplemental Estimate: 4% 2018 Fish Accord Estimate: 10%
❖Lostine/Wallowa River	Flow:	9.1: Increased Water Quantity	Protect 30 cfs flow	1992-026-01: Grande Ronde Model Watershed 2007-393-00: Protect and Restore Northeast Oregon	2018 Table 5 HQI: 2%
		9.2: Decreased Water Quantity			2007-11 Accomplishment: 3%
	Passage:	1.1: Anthropogenic Barriers	Address 6 barriers, improve 41.3 miles		2012-18 Estimate: 4%
	Complexity:	6.1: Bed and Channel Form 6.2: Instream Structural Complexity	Improve 1.6 instream miles		
	WQ/Riparian:	4.1: Riparian Condition 5.2: Floodplain Condition 7.2: Increased Sediment Quantity 8.1: Temperature 8.2: Oxygen	Protect 257 riparian acres		

Appendix A: Project Lists

Population	Metric Category	Limiting Factors to Be Addressed in 2013-2018	2013-2018 Metrics Evaluated by the 2012 Expert Panels	Projects Associated with Metrics Evaluated by the 2012 Expert Panels	2018 Habitat Quality Improvement Estimates
❖Grande Ronde River Lower Mainstem Tributaries	Passage:	1.1: Anthropogenic Barriers	Address 4 barriers Improve 16 miles		2018 Table 5 HQI: N/A 2007-11 Accomplishment: <1% 2012-18 Estimate: <1%
❖Grande Ronde River Upper Mainstem	Flow:	9.2: Decreased Water Quantity	Protect 1,782 AF Protect 6.5 cfs flow	1992-026-01: Grande Ronde Model Watershed	2018 Table 5 HQI: 23% 2007-11 Accomplishment: 4% 2012-18 Estimate: 1% Supplemental Estimate: 18% 2018 Fish Accord Estimate: 18%
	Passage:	1.1: Anthropogenic Barriers	Address 3 barriers Improve 5 miles	1996-083-00: Grande Ronde Watershed Restoration	
	Complexity:	6.1: Bed and Channel Form 6.2: Instream Structural Complexity	Improve 43.8 instream miles	2008-207-00: Umatilla Tribe Ceded Area Stream Corridor Conservation & Protection	
	WQ/Riparian:	4.1: Riparian Condition 4.2: LWD Recruitment 7.2: Increased Sediment Quantity 8.1 Temperature	Improve 31 riparian miles Protect 24 riparian acres Improve 59 road miles		
Imnaha River Mainstem	Passage:	1.1: Anthropogenic Barriers	Address 3 barriers Improve 16 miles	1992-026-01: Grande Ronde Model Watershed 2007-393-00: Protect and Restore Northeast Oregon	2018 Table 5 HQI: 1% 2007-11 Accomplishment: 1% 2012-18 Estimate: <1%
Big Sheep Creek	Passage:	1.1: Anthropogenic Barriers	Address 4 barriers Improve 20.7 miles	1992-026-01: Grande Ronde Model Watershed 2007-393-00: Protect and Restore Northeast Oregon	2018 Table 5 HQI: N/A 2007-11 Accomplishment: <1% 2012-18 Estimate: <1%

Appendix A: Project Lists

Population	Metric Category	Limiting Factors to Be Addressed in 2013-2018	2013-2018 Metrics Evaluated by the 2012 Expert Panels	Projects Associated with Metrics Evaluated by the 2012 Expert Panels	2018 Habitat Quality Improvement Estimates
Snake River Spring/Summer Chinook					
Middle Fork & South Fork Salmon River					
Big Creek	Passage:	1.1: Anthropogenic Barriers	Address 3 barriers Improve 8 miles	2007-127-00: East Fork of South Fork Salmon River Passage Restoration	2018 Table 5 HQI: 1%
	WQ/Riparian:	7.2: Increased Sediment Quantity 8.7: Toxic Contaminants	Improve 102.6 riparian acres Improve 5 road miles		2007-11 Accomplishment: <1% 2012-18 Estimate: 4%
Secesh River	Passage:	1.1: Anthropogenic Barriers	Address 2 barriers Improve 1.9 miles	2007-127-00: East Fork of South Fork Salmon River Passage Restoration	2018 Table 5 HQI: 1%
	WQ/Riparian:	7.2: Increased Sediment Quantity	Improve 20 road miles		2007-11 Accomplishment: 5% 2012-18 Estimate: 1%
South Fork Salmon River	Passage:	1.1: Anthropogenic Barriers	Address 5 barriers Improve 8.7 miles	2007-127-00: East Fork of South Fork Salmon River Passage Restoration	2018 Table 5 HQI: <1%
	WQ/Riparian:	7.2: Increased Sediment Quantity 8.1: Temperature 8.7: Toxic Contaminants	Improve 2 riparian acres Improve 98 road miles		2007-11 Accomplishment: 2% 2012-18 Estimate: 3%
Snake River Spring/Summer Chinook					
Lower Snake					
Tucannon River	Flow:	9.2: Decreased Water Quantity	Protect 23.4 AF	1994-018-06: Tucannon Stream and Riparian Restoration 1994-018-07: Garfield County Fall Chinook and Steelhead Habitat Improvement 2008-202-00: Protect and Restore Tucannon Watershed	2018 Table 5 HQI: 17%
	Complexity:	6.1: Bed and Channel Form 6.2: Instream Structural Complexity	Improve 21.7 instream miles		2007-11 Accomplishment: 2% 2012-18 Estimate: 27%
	WQ/Riparian:	4.1: Riparian Condition 5.2: Floodplain Condition 7.2: Increased Sediment Quantity 8.1: Temperature 8.4: Turbidity	Improve 3.9 riparian miles Protect 1.3 riparian miles Improve 146.9 riparian acres Improve 3 wetland acres Improve 41.4 road miles		2018 Fish Accord Estimate: 4 %

Appendix A: Project Lists

Population	Metric Category	Limiting Factors to Be Addressed in 2013-2018	2013-2018 Metrics Evaluated by the 2012 Expert Panels	Projects Associated with Metrics Evaluated by the 2012 Expert Panels	2018 Habitat Quality Improvement Estimates
Asotin Creek	Passage:	1.1: Anthropogenic Barriers	Address 1 barrier Improve 50 mi.		2018 Table 5 HQI: N/A
	Complexity:	6.1: Bed and Channel Form 6.2: Instream Structural Complexity	Improve 5.2 instream miles		2007-11 Accomplishment: 2% 2012-18 Estimate: <1%
Snake River Spring/Summer Chinook					
Upper Salmon River					
❖East Fork Salmon River	Flow:	9.2: Decreased Water Quantity	Protect 6 cfs flow	1994-015-00: Idaho Fish Screening Project 2007-268-00: Idaho Watershed Habitat Restoration-Custer District 2007-399-00: Upper Salmon Screen Tributary Passage	2018 Table 5 HQI: 1%
	Entrainment:	2.3: Mechanical Injury	Address 7 screens		2007-11 Accomplishment: 2%
	Passage:	1.1: Anthropogenic Barriers	Address 5 barriers Improve 6.9 miles		2012-18 Estimate: 4%
	Complexity:	6.1: Bed and Channel Form	Improve 0.1 instream miles		
❖Lemhi River	Flow:	9.2: Decreased Water Quantity	Protect 36.8 cfs flow plus periodic 100 cfs 3-day channel maintenance flow	1994-015-00: Idaho Fish Screening Project 2007-394-00: Idaho Watershed Habitat Restoration-Lemhi 2007-399-00: Upper Salmon Screen Tributary Passage 2008-601-00: Upper Lemhi River-Acquisition 2008-602-00: Upper Lemhi River-Restoration 2008-605-00: Lower Lemhi Habitat-Easements 2008-606-00: Lower Lemhi Habitat-Restorations 2008-608-00: Idaho MOA/Fish Accord Water Transactions	2018 Table 5 HQI: 7%
	Entrainment:	2.3: Mechanical Injury	Address 26 screens		2007-11 Accomplishment: 28%
	Passage:	1.1: Anthropogenic Barriers	Address 34 barriers Improve 61.3 miles		2012-18 Estimate: 4%
	Complexity:	6.1: Bed and Channel Form 6.2: Instream Structural Complexity	Improve 11.7 instream miles		
	WQ/Riparian:	4.1: Riparian Condition 5.2: Floodplain Condition 8.1: Temperature	Improve 11.8 riparian miles Protect 11.5 riparian miles Improve 15 riparian acres		

Appendix A: Project Lists

Population	Metric Category	Limiting Factors to Be Addressed in 2013-2018	2013-2018 Metrics Evaluated by the 2012 Expert Panels	Projects Associated with Metrics Evaluated by the 2012 Expert Panels	2018 Habitat Quality Improvement Estimates
❖ Lower Mainstem Salmon River	Flow:	9.2: Decreased Water Quantity	Protect 2.5 cfs flow	1994-015-00: Idaho Fish Screening Project 1999-019-00: Restore 12 Mile Reach of Upper Salmon River 2002-013-01: Water Entity-Water Transaction Program 2007-268-00: Idaho Watershed Habitat Restoration-Custer District 2007-394-00: Idaho Watershed Habitat Restoration-Lemhi 2007-399-00: Upper Salmon Screen Tributary Passage 2008-602-00: Upper Lemhi River-Restoration	2018 Table 5 HQI: 1% 2007-11 Accomplishment: 3% 2012-18 Estimate: <1%
	Entrainment:	2.3: Mechanical Injury	Address 1 screen		
	Passage:	1.1: Anthropogenic Barriers	Address 5 barriers Improve 18 miles		
❖ Upper Mainstem Salmon River	Flow:	9.2: Decreased Water Quantity	Protect 14 cfs flow	1994-015-00: Idaho Fish Screening Project Restoration-Lemhi 2002-013-01: Water Entity-Water Transaction Program 2007-268-00: Idaho Watershed Habitat Restoration-Custer District 2007-399-00: Upper Salmon Screen Tributary Passage	2018 Table 5 HQI: 14% 2007-11 Accomplishment: 5% 2012-18 Estimate: 8% Supplemental Estimate: 1%
	Passage:	1.1: Anthropogenic Barriers	Address 5 barriers Improve 18.5 miles		
	WQ/Riparian:	4.1: Riparian Condition 7.2: Increased Sediment Quantity 8.1: Temperature	Improve 2 riparian miles Improve 6.4 riparian acres Improve 2 road miles	2008-602-00: Upper Lemhi River-Restoration 2008-608-00: Idaho MOA/Fish Accord Water Transactions	

Appendix A: Project Lists

Population	Metric Category	Limiting Factors to Be Addressed in 2013-2018	2013-2018 Metrics Evaluated by the 2012 Expert Panels	Projects Associated with Metrics Evaluated by the 2012 Expert Panels	2018 Habitat Quality Improvement Estimates
❖Pahsimeroi River	Flow:	9.2: Decreased Water Quantity	Improve 14 cfs flow	1994-015-00: Idaho Fish Screening Project Restoration-Lemhi 2002-013-01: Water Entity-Water Transaction Program	2018 Table 5 HQI : 41%
	Entrainment:	2.3: Mechanical Injury	Address 5 screens		2007-11 Accomplishment: 62%
	Passage:	1.1: Anthropogenic Barriers	Address 17 barriers Improve 73.4 miles		2012-18 Estimate: 8%
	Complexity:	6.1: Bed and Channel Form	Improve 17.8 instream miles	2007-268-00: Idaho Watershed Habitat Restoration-Custer District 2007-399-00: Upper Salmon Screen Tributary Passage 2008-603-00: Pahsimeroi River Habitat 2008-608-00: Idaho MOA/Fish Accord Water Transactions	
	WQ/Riparian:	4.1: Riparian Condition 7.2: Increased Sediment Quantity 8.1: Temperature	Improve 9 riparian miles		
❖Valley Creek	Flow:	9.2: Decreased Water Quantity	Protect 4 cfs flow	1994-015-00: Idaho Fish Screening Project Restoration-Lemhi 2007-399-00: Upper Salmon Screen Tributary Passage 2008-608-00: Idaho MOA/Fish Accord Water Transactions	2018 Table 5 HQI : 1%
	Entrainment:	2.3: Mechanical Injury	Address 10 screens		2007-11 Accomplishment: 13% 2012-18 Estimate: 6%
❖Yankee Fork	Complexity:	6.1: Bed and Channel Form 6.2: Instream Structural Complexity	Improve 6.1 instream miles		2018 Table 5 HQI : 30%
	WQ/Riparian:	4.2: LWD Recruitment 5.2: Floodplain Condition 7.1: Decreased Sediment Quantity	Improve 29.2 riparian acres Improve 4.8 wetland acres		2007-11 Accomplishment: 0% 2012-18 Estimate: 21% Supplemental Estimate: 22%

Appendix A: Project Lists

Population	Metric Category	Limiting Factors to Be Addressed in 2013-2018	2013-2018 Metrics Evaluated by the 2012 Expert Panels	Projects Associated with Metrics Evaluated by the 2012 Expert Panels	2018 Habitat Quality Improvement Estimates
Upper Columbia River Spring/Summer Chinook					
Upper Columbia - below Chief Joseph					
❖Entiat	Entrainment:	2.3: Mechanical Injury	Address 8 screens	2002-013-01: Water Entity-Water Transaction Program 2007-231-00: Entiat River Riparian Restoration 2009-003-00: Upper Columbia Habitat Restoration 2010-001-00: Upper Columbia Programmatic Habitat	2018 Table 5 HQI : 22%
	Passage:	1.1: Anthropogenic Barriers	Address 3 barriers Improve 3.5 miles		2007-11 Accomplishment: 3%
	Complexity:	6.1: Bed and Channel Form 6.2: Instream Structural Complexity	Improve 6.2 instream miles		2012-18 Estimate: 6%
	WQ/Riparian:	4.1: Riparian Condition 5.1: Side Channel and Wetland Conditions 5.2: Floodplain Condition 7.2: Increased Sediment Quantity	Improve 2.65 riparian miles Improve 123.8 riparian acres		Supplemental Estimate: 15% 2018 Fish Accord Estimate: 19%
❖Methow	Flow:	9.1: Increased Water Quantity	Protect 14 cfs Protect 7,351 AF flow	2002-013-01: Water Entity-Water Transaction Program 2007-035-00: Methow Basin Riparian Enhancement Program 2007-264-00: Methow River Complexity Fisheries Enhancement 2009-003-00: Upper Columbia Habitat Restoration	2018 Table 5 HQI : 6%
		9.2: Decreased Water Quantity			2007-11 Accomplishment: 2%
	Entrainment:	2.3: Mechanical Injury	Address 7 screens		2012-18 Estimate: 6%
	Passage:	1.1: Anthropogenic Barriers	Address 8 barriers Improve 42 miles		2018 Fish Accord Estimate: 1%
	Complexity:	6.1: Bed and Channel Form 6.2: Instream Structural Complexity	Improve 223.2 instream miles	2010-001-00: Upper Columbia Programmatic Habitat	
	WQ/Riparian:	4.1: Riparian Condition 5.1: Side Channel and Wetland Conditions	Improve 4.6 riparian miles Improve 152.7 riparian acres		
		5.2: Floodplain Condition	Protect .3 riparian acres		
		7.2: Increased Sediment Quantity 8.1: Temperature	Improve 169.4 wetland acres		

Appendix A: Project Lists

Population	Metric Category	Limiting Factors to Be Addressed in 2013-2018	2013-2018 Metrics Evaluated by the 2012 Expert Panels	Projects Associated with Metrics Evaluated by the 2012 Expert Panels	2018 Habitat Quality Improvement Estimates
❖Wenatchee	Flow:	9.2: Decreased Water Quantity	Protect 15 cfs flow	2002-013-01: Water Entity- Water Transaction Program 2007-035-00: Methow Basin Riparian Enhancement Program 2007-400-00: Wenatchee River Subbasin Fish Passage Enhancement 2009-003-00: Upper Columbia Habitat Restoration 2010-001-00: Upper Columbia Programmatic Habitat	2018 Table 5 HQI : 3% 2007-11 Accomplishment: 1% 2012-18 Estimate: 4% 2018 Fish Accord Estimate: 7%
	Passage:	1.1: Anthropogenic Barriers	Address 6 barriers Improve 24.5 miles		
	Complexity:	6.1: Bed and Channel Form 6.2: Instream Structural Complexity	Improve 11.95 instream miles		
	WQ/Riparian:	4.1: Riparian Condition 5.1: Side Channel and Wetland Conditions 5.2: Floodplain Condition 7.2: Increased Sediment Quantity 8.1: Temperature	Improve 2 riparian miles Improve 23.9 riparian acres		
Middle Columbia River Steelhead					
Cascades Eastern Slope Tributaries					
Deschutes River Eastside	Flow:	9.2: Decreased Water Quantity	Protect 144.6 AF Return 0.6 cfs	2002-013-01: Water Entity - Water Transaction Program 1998-028-00: Trout Creek Watershed Restoration 2008-301-00 Habitat Restoration Planning/Design/ Implementation within boundaries of Warm Springs Reservation, Lower Deschutes River, Oregon 2002-019-00: Develop Riparian Buffer Systems in Lower Wasco County 1994-042-00 : Trout Creek Operations and Maintenance (O&M) 2008-301-00 Habitat Restoration Plan/Design/ Implement	2018 Table 5 HQI : 1% 2007-2011 Accomplishment: 1% 2018 Fish Accord Estimate: 2%
	Passage:	1.1: Anthropogenic barriers	Address 1 barrier		
	Complexity:	5.2: Floodplain condition 6.1: Bed and Channel Form	Install 7 log structures Install 1 large wood/boulder project Create 4 pools Improve 3.7 stream miles Install 5 water bars		
	WQ/Riparian:	4.1: Riparian Condition	Install 1 sediment control structure Protect 333 stream bank miles Protect 815 riparian acres Treat 41.4 riparian miles Treat 507.3 riparian acres Maintain 520 riparian acres Maintain 120 stream bank miles		

Appendix A: Project Lists

Population	Metric Category	Limiting Factors to Be Addressed in 2013-2018	2013-2018 Metrics Evaluated by the 2012 Expert Panels	Projects Associated with Metrics Evaluated by the 2012 Expert Panels	2018 Habitat Quality Improvement Estimates
Deschutes River Westside	WQ/Riparian:	4.1 Riparian Condition	Protect 70 riparian acres Protect 3.5 streambank miles	2002-013-01: Water Entity - Water Transaction Program 2002-019-00: Riparian Buffer Systems in Lower Wasco Co. 2008-301-00 Habitat Restoration Plan/Design/Implement	2018 Table 5 HQI : <1% 2007-2011 Accomplishment: <1% 2018 Fish Accord Estimate: 31%
Fifteenmile Creek (Winter Run)	Flow:	9.2: Decreased Water Quantity	Secure 407.6 AF instream (CBWTP) Secure 4.1 cfs instream (CBWTP)	2002-013-01: Water Entity - Water Transaction Program 2001-021-00: 15 Mile Creek Riparian Buffers	2018 Table 5 HQI : <1% 2007-2011 Accomplishment: <1%
	WQ/Riparian:	4.1: Riparian Condition	Protect 70 riparian acres Protect 3.5 streambank miles		
Klickitat River	Complexity:	5.2: Floodplain condition 6.1: Bed and Channel Form	Improve stream complexity 2.6 miles Install 18 log structures Install 80 logs Install 14 log jams	1997-056-00 Klickitat Watershed Enhancement 1988-120-25: Yakima River Management, Data and Habitat- Yakima/Klickitat Fisheries Project 1988-120-35: Klickitat River Management, Data and Habitat-Yakima/Klickitat Fisheries Project	2018 Table 5 HQI : 4% 2007-2011 Accomplishment: 4% 2018 Fish Accord Estimate: 13%
	WQ/Riparian:	4.1: Riparian Condition	Treat 7.4 riparian miles Treat 99.3 riparian acres		
Rock Creek	WQ/Riparian:	4.1: Riparian Condition	Treat 8 riparian acres Treat 3 riparian miles Maintain 4 riparian acres	2007-156-00: Rock Creek Fish and Habitat Assessment	2018 Table 5 HQI : n/a 2018 Fish Accord Estimate: 20%

Appendix A: Project Lists

Population	Metric Category	Limiting Factors to Be Addressed in 2013-2018	2013-2018 Metrics Evaluated by the 2012 Expert Panels	Projects Associated with Metrics Evaluated by the 2012 Expert Panels	2018 Habitat Quality Improvement Estimates
Middle Columbia River Steelhead					
John Day River					
John Day River Lower Mainstem	Flow:	9.2: Decreased Water Quantity	Develop 5 off channel water sources Return 0.5 cfs Return 0.50 AF	2002-035-00: Riparian Buffers in Gilliam County 2002-034-00: Riparian Buffers in Wheeler County 2007-397-00: John Day Passage, Flow and Habitat Enhancement 1984-021-00: John Day Habitat Enhancement 1998-022-00: Pine Creek Conservation Area	2018 Table 5 HQI: <1% 2007-2011 Accomplishment: <1% 2018 Fish Accord Estimate: 60%
	Entrainment:	2.3: Mechanical injury	Install 8 fish screens		
	Passage:	1.1 Anthropogenic Barriers	Install 4 ladders Remove 14 push up dams Remove or replace 4 culverts 114.5 miles habitat accessed		
	Complexity:	5.2: Floodplain condition 6.1: Bed and Channel Form	Create 31 pools Improve 20.5 stream miles Install 134 log structures Install 16 boulder structures		
	WQ/Riparian:	4.1: Riparian Condition 8.1: Temperature	Protect 1379.3 riparian acres Protect 4 riparian miles Protect 149.2 streambank miles Treat 160.6 riparian miles Treat 34.9 riparian acres Maintain 44 riparian acres Maintain 0.5 riparian miles Improve 0.3 riparian miles		

Appendix A: Project Lists

Population	Metric Category	Limiting Factors to Be Addressed in 2013-2018	2013-2018 Metrics Evaluated by the 2012 Expert Panels	Projects Associated with Metrics Evaluated by the 2012 Expert Panels	2018 Habitat Quality Improvement Estimates
John Day River Upper Mainstem	Flow:	9.2: Decreased Water Quantity	Secure 953.8 AF (CBWTP) Secure 7.8 cfs (CBWTP)	1984-021-00: John Day Habitat Enhancement 1993-066-00: Oregon Fish Screens Project 2001-041-01: Forrest Ranch Conservation Area 1998-018-00: John Day Watershed Restoration 2007-397-00: John Day Passage, Flow and Habitat Enhancement 2002-015-00 Coordination and Technical Assistance to Watershed Councils and Individuals in Sherman County, Oregon	2018 Table 5 HQI : <1% 2007-2011 Accomplishment: <1% 2018 Fish Accord Estimate: 84%
	Entrainment:	2.3: Mechanical injury	Install 120 fish screens		
	Complexity:	5.2: Floodplain condition 6.1: Bed and Channel Form	Improve 1.60 stream miles Install 25 log structures Install 35 log jams Create 40 pools		
	WQ/Riparian:	4.1 Riparian Condition	Protect 4845 riparian acres Protect 48.5 streambank acres Protect 44.6 streambank miles Treat 125 riparian acres Treat 6 riparian miles		
Middle Fork John Day River	Complexity:	5.2: Floodplain condition 6.1: Bed and Channel Form	Improve 1.9 miles stream Install 30 log jams Create 10 pools	2000-015-00: Oxbow Conservation Area 2002-015-00 Coordination and Technical Assistance to Watershed Councils and Individuals in Sherman County, Oregon 2001-041-01: Forrest Ranch Conservation Area 2007-397-00: John Day Passage, Flow and Habitat Enhancement	2018 Table 5 HQI : <1% 2007-2011 Accomplishment: <1% 2018 Fish Accord Estimate: 104%
	WQ/Riparian:	4.1: Riparian Condition	Protect 44.1 streambank miles Protect 180 streambank acres Protect 13 riparian miles Protect 630 riparian acres Treat 127.2 riparian acres Treat 4.7 riparian miles		

Appendix A: Project Lists

Population	Metric Category	Limiting Factors to Be Addressed in 2013-2018	2013-2018 Metrics Evaluated by the 2012 Expert Panels	Projects Associated with Metrics Evaluated by the 2012 Expert Panels	2018 Habitat Quality Improvement Estimates
North Fork John Day River	Flow:	9.2: Decreased Water Quantity	Install 3 alternative water source	1984-021-00: John Day Habitat Enhancement 2000-031-00: Enhance Habitat in the North Fork John Day River	2018 Table 5 HQI: <1% 2007-2011 Accomplishment: <1% 2018 Fish Accord Estimate: 17%
	Passage:	1.1: Anthropogenic barriers	Install 1 bridge Replace 1 culvert 6 miles of habitat accessed		
	Complexity:	5.2: Floodplain condition 6.1: Bed and Channel Form	Create 35 pools Install 58 log structures Install 447 rock/boulder structures Improve 1.8 stream miles Install 12 large wood features		
	WQ/Riparian:	4.1: Riparian Condition	Protect 86.4 streambank miles Protect 14.1 riparian miles Protect 659.7 riparian acres Treat 790 riparian acres Treat 22.8 riparian miles		
South Fork John Day River	WQ/Riparian:	4.1 Riparian Condition	Protect 3.8 streambank miles Protect 55 riparian acres	1984-021-00: John Day Habitat Enhancement 2008-201-00: Umatilla Tribe Ceded Land Culvert and Passage	2018 Table 5 HQI: 1% 2007-2011 Accomplishment: 1% 2018 Fish Accord Estimate: 47%
Middle Columbia River Steelhead					
Umatilla and Walla River					
Touchet River	Passage:	1.1: Anthropogenic barriers	Remove 1 diversion dam Remove 2 culverts 34.50 miles habitat accessed	1996-046-01: Walla Walla River Basin Fish Habitat Enhancement 2000-026-00: Rainwater Wildlife Area Operations	2018 Table 5 HQI: 4% 2007-2011 Accomplishment: 4%
	Complexity:	5.2: Floodplain condition 6.1: Bed and Channel Form	Install 3 log jams Install 132 logs Improve 1.5 miles stream		
	WQ/Riparian:	4.1 Riparian Condition	Treat 338.4 riparian acres Treat 26 riparian miles Maintain 14 riparian acres Maintain 1.2 riparian miles Protect 9 streambank miles		

Appendix A: Project Lists

Population	Metric Category	Limiting Factors to Be Addressed in 2013-2018	2013-2018 Metrics Evaluated by the 2012 Expert Panels	Projects Associated with Metrics Evaluated by the 2012 Expert Panels	2018 Habitat Quality Improvement Estimates
Umatilla River	Flow:	9.2: Decreased Water Quantity	Secure 326 AF (CBWTP) Secure 6.2 cfs (CBWTP)	1987-100-01: Umatilla Anadromous Fish Habitat-Umatilla Tribe 1993-066-00: Oregon Fish Screens Project 1987-100-02: Umatilla Anadromous Fish Habitat-Oregon Department of Fish and Wildlife (ODFW) 2008-206-00: Instream Flow Restoration 1988-022-00: Umatilla	2018 Table 5 HQI: 4% 2007-2011 Accomplishment: 4% 2018 Fish Accord Estimate: 37%
	Entrainment:	2.3: Mechanical injury	Install 120 fish screens		
	Passage:	1.1: Anthropogenic barriers	Remove 0.8 miles dike Remove 1 push up dam 7.5 miles habitat accessed		
	Complexity:	5.2: Floodplain condition 6.1: Bed and Channel Form	Install 22 log jams Install 20 logs Improve complexity 2.5 miles		
	WQ/Riparian:	4.1 Riparian Condition	Create 2.4 miles side channel Treat 51.9 miles riparian Treat 0.03 of dike set back Treat 473.8 riparian acres Protect 76.64 miles streambank Maintain 254 riparian acres Protect 443 riparian acres	Fish Passage Operations 2008-203-00: Assess Reintroduction of Steelhead in Butte, McKay & Willow Creeks	
Walla Walla River	Flow:	9.2: Decreased Water Quantity	Return 6665.8 AF Return 24.9 cfs Secure 1500 AF (CBWTP) Secure 14 cfs (CBWTP) Improve flow in 395.2 stream miles 39 miles habitat accessed	2007-396-00: Walla Walla Basinwide Tributary Passage and Flow 2008-206-00: Instream Flow Restoration 1993-066-00: Oregon Fish Screens Project 1996-046-01: Walla Walla River Basin Fish Habitat Enhancement	2018 Table 5 HQI: 4% 2007-2011 Accomplishment: 4% 2018 Fish Accord Estimate: 43%
	Entrainment:	2.3: Mechanical injury	Install 120 fish screens		
	Passage:	1.1: Anthropogenic barriers	Remove 1 push up dam		

Appendix A: Project Lists

Population	Metric Category	Limiting Factors to Be Addressed in 2013-2018	2013-2018 Metrics Evaluated by the 2012 Expert Panels	Projects Associated with Metrics Evaluated by the 2012 Expert Panels	2018 Habitat Quality Improvement Estimates
Middle Columbia River Steelhead					
Yakima River Group					
Naches River	Flow:	9.2: Decreased Water Quantity	Secure 757.8 AF (CBWTP) Secure 11.3 cfs (CBWTP)	1996-035-01: Yakama Reservation Watershed Project 1988-120-25: Yakima River Management, Data and Habitat-Yakima/Klickitat Fisheries Project (YKFP)	2018 Table 5 HQI: 4% 2007-2011 Accomplishment: 4% 2018 Fish Accord Estimate: 9%
	Entrainment:	2.3: Mechanical injury	Install 1 fish screen	1997-051-00: Yakima Basin Side Channels Land Acquisition	
	WQ/Riparian:	4.1 Riparian Condition	Protect 24.5 streambank miles		
Satus Creek	WQ/Riparian:	4.1 Riparian Condition	Treat 808.5 riparian acres Install 37 sediment basins	1996-035-01: Yakama Reservation Watershed Project 1997-051-00: Yakima Basin Side Channels Land Acquisition 1988-120-25: Yakima River Management, Data and Habitat-Yakima/Klickitat Fisheries Project (YKFP)	2018 Table 5 HQI: 4% 2007-2011 Accomplishment: 4% 2018 Fish Accord Estimate: 7%
Toppenish	Flow:	9.2: Decreased Water Quantity	Protect 5820 AF Secure 307.9 AF	1992-062-00: Lower Yakima Valley Riparian Wetlands Restoration 1996-035-01: Yakama Reservation Watershed Project	2018 Table 5 HQI: 4% 2007-2011 Accomplishment: 4% 2018 Fish Accord Estimate: 13%
	Passage:	1.1 Anthropogenic Barriers	Remove 1 culvert 0.2 miles habitat accessed	1997-051-00: Yakima Basin Side Channels Land Acquisition	
	Complexity:	5.2: Floodplain condition 6.1: Bed and Channel Form	Install 25 log structures Improve 0.1 stream miles	1988-120-25: Yakima River Management, Data and Habitat-Yakima/Klickitat Fisheries Project (YKFP)	
	WQ/Riparian:	4.1 Riparian Condition	Treat 9 riparian miles Treat 123.3 riparian acres Protect 64.3 streambank miles Protect 2784.4 riparian acres Maintain 300 riparian acres		

Appendix A: Project Lists

Population	Metric Category	Limiting Factors to Be Addressed in 2013-2018	2013-2018 Metrics Evaluated by the 2012 Expert Panels	Projects Associated with Metrics Evaluated by the 2012 Expert Panels	2018 Habitat Quality Improvement Estimates
Yakima River Upper Mainstem	Flow:	9.2: Decreased Water Quantity	Protect 7852.7 AF Secure 3792 AF (CBWTP) Secure 11.75 cfs (CBWTP) Improve 72.4 stream miles from flow Return 41.8 cfs Access 10 miles	1988-120-25: Yakima River Management, Data and Habitat-Yakima/Klickitat Fisheries Project (YKFP) 2002-013-01: Water Entity - Water Transaction Program	2018 Table 5 HQI: 4% 2007-2011 Accomplishment: 4% 2018 Fish Accord Estimate: 10%
	Entrainment:	2.3: Mechanical injury	3 screens addressed	2006-004-00 Wenas Wildlife Mitigation 2007-398-00: Yakima	
	Passage:	1.1 Anthropogenic Barriers	Remove 2 diversion dams Remove 2 push-up dams Remove 1 culvert Remove 1 weir	Basinwide Tributary Passage and Flow 1997-051-00: Yakima Basin Side Channels Land Acquisition 1992-062-00: Lower Yakima Valley Riparian Wetlands Restoration	
	WQ/Riparian:	4.1 Riparian Condition	Protect 16 streambank miles Treat 85 riparian acres Treat 4 riparian miles		
Snake River Steelhead					
Clearwater River					
Lochsa River	Passage:	1.1: Anthropogenic Barriers	Address 13 barriers, improve 56.5 mi.	2007-395-00: Protect and Restore Lochsa Watershed	2018 Table 5 HQI: 16% 2007-11 Accomplishment: 6% 2012-18 Estimate: 2% Supplemental Estimate: 9%
	Complexity:	6.2: Instream Structural Complexity	Improve 35 instream miles		
	WQ/Riparian:	4.1: Riparian Condition 4.2: LWD Recruitment 7.2: Increased Sediment Quantity 8.1: Temperature	Protect 75 riparian miles Improve 1,549 riparian acres Improve 268.3 road miles		

Appendix A: Project Lists

Population	Metric Category	Limiting Factors to Be Addressed in 2013-2018	2013-2018 Metrics Evaluated by the 2012 Expert Panels	Projects Associated with Metrics Evaluated by the 2012 Expert Panels	2018 Habitat Quality Improvement Estimates
Lolo Creek	Passage:	1.1: Anthropogenic Barriers 1.2: Natural Barriers	Address 5 barriers Improve 27.4 miles	1996-077-02: Lolo Creek Watershed Restoration	2018 Table 5 HQI: 12% 2007-11 Accomplishment: 3% 2012-18 Estimate: 15%
	Complexity:	6.2: Instream Structural Complexity	Improve 0.4 instream miles		
	WQ/Riparian:	4.1: Riparian Condition 7.2: Increased Sediment Quantity 8.1: Temperature 8.2: Oxygen	Improve 1 riparian mile Protect 16 riparian miles Improve 10 riparian acres Improve 60 road miles		
Selway River	Passage:	1.1: Anthropogenic Barriers	Address 3 barriers Improve 34.1 miles	2007-092-00: Restore Selway River Watershed	2018 Table 5 HQI: <1% 2007-11 Accomplishment: <1% 2012-18 Estimate: 1%
	WQ/Riparian:	4.1: Riparian Condition 7.2: Increased Sediment Quantity 8.1: Temperature	Improve 1 riparian mile Improve 35 road miles		
South Fork Clearwater River	Passage:	1.1: Anthropogenic Barriers	Address 23 barriers Improve 71.7 miles	1996-077-05: Meadow Creek Watershed Restoration 2000-035-00: Newsome Creek Watershed Restoration 2000-036-00: Mill Creek Watershed Restoration 2002-072-00: Red River Watershed Restoration 2007-134-00: Restore and Protect Crooked River Watershed 2007-142-00: Restore and Protect American River Watershed	2018 Table 5 HQI: 14% 2007-11 Accomplishment: 4% 2012-18 Estimate: 9% Supplemental Estimate: 4%
	Complexity:	6.2: Instream Structural Complexity	Improve 8.1 instream miles		
	WQ/Riparian:	4.1: Riparian Condition 4.2: LWD Recruitment 5.1: Side Channel and Wetland Conditions 5.2: Floodplain Condition 7.2: Increased Sediment Quantity 8.1: Temperature	Improve 15 riparian miles Improve 276.5 riparian acres Improve 38 wetland acres Improve 179.6 road miles		

Appendix A: Project Lists

Population	Metric Category	Limiting Factors to Be Addressed in 2013-2018	2013-2018 Metrics Evaluated by the 2012 Expert Panels	Projects Associated with Metrics Evaluated by the 2012 Expert Panels	2018 Habitat Quality Improvement Estimates
Clearwater River Lower Mainstem	Flow:	9.1: Increased Water Quantity 9.2: Decreased Water Quantity		1997-017-00: Protect and Restore Lapwai Creek Watershed 2002-070-00: Lapwai Creek Anadromous Habitat 2008-604-00: Lower Clearwater and Potlatch Watersheds Habitat Improvement	2018 Table 5 HQI: N/A 2007-11 Accomplishment: <1% 2012-18 Estimate: <1%
	Passage:	1.1: Anthropogenic Barriers	Address 4 barriers Improve 71 miles		
	Complexity:	6.1: Bed and Channel Form 6.2: Instream Structural Complexity	Improve 8.61 instream miles		
	WQ/Riparian:	4.1: Riparian Condition 7.2: Increased Sediment Quantity 8.1: Temperature 8.7: Toxic Contaminants	Protect 6.7 riparian miles Improve 36.8 riparian acres		
Snake River Steelhead					
Grande Ronde/Imnaha					
Grande Ronde River Lower Mainstem Tributaries	Flow:	9.1: Increased Water Quantity 9.2: Decreased Water Quantity		1992-026-01: Grande Ronde Model Watershed	2018 Table 5 HQI: <1% 2007-11 Accomplishment: <1% 2012-18 Estimate: <1%
	Passage:	1.1: Anthropogenic Barriers	Address 1 barrier Improve 8 miles		
	Complexity:	6.2: Instream Structural Complexity			
	WQ/Riparian:	4.1: Riparian Condition 7.2: Increased Sediment Quantity 8.1: Temperature	Improve 7.4 road miles		

Appendix A: Project Lists

Population	Metric Category	Limiting Factors to Be Addressed in 2013-2018	2013-2018 Metrics Evaluated by the 2012 Expert Panels	Projects Associated with Metrics Evaluated by the 2012 Expert Panels	2018 Habitat Quality Improvement Estimates
❖Grande Ronde River Upper Mainstem	Flow:	9.2: Decreased Water Quantity	Protect 1,782 AF Protect 15.5 cfs	1992-026-01: Grande Ronde Model Watershed 1984-025-00: Blue Mountain Fish Habitat Improvement 1996-083-00: Grande Ronde Watershed Restoration 2008-207-00: Umatilla Tribe Ceded Area Stream Corridor Conservation & Protection	2018 Table 5 HQI: 4%
	Passage:	1.1: Anthropogenic Barriers	Address 28 barriers Improve 75.6 miles Address 2 screens		2007-11 Accomplishment: 3%
	Complexity:	6.1: Bed and Channel Form 6.2: Instream Structural Complexity	Improve 108.6 instream miles		2012-18 Estimate: 1%
	WQ/Riparian:	4.1: Riparian Condition 4.2: LWD Recruitment 5.1: Side Channel and Wetland Conditions 5.2: Floodplain Condition 7.2: Increased Sediment Quantity 8.1: Temperature 8.2: Oxygen 8.4: Turbidity	Improve 45.5 riparian miles Protect 15 riparian miles Improve 1,818.5 riparian acres Protect 1,000 riparian acres Improve 98 wetland acres Improve 87 road miles		2018 Fish Accord Estimate: 28%
Joseph Creek	Flow:	9.2: Decreased Water Quantity	Protect 0.8 cfs flow	2007-393-00: Protect and Restore Northeast Oregon	2018 Table 5 HQI : <1% (Oregon) and 4% (Washington)
	WQ/Riparian:	4.1: Riparian Condition 5.2: Floodplain Condition 7.2: Increased Sediment Quantity 8.1: Temperature 8.2: Oxygen	Improve 0.5 riparian miles Improve 51.7 road miles		2007-11 Accomplishment: <1% (Oregon) and 4% (Washington) 2012-18 Estimate: <1% (Oregon and Washington)

Appendix A: Project Lists

Population	Metric Category	Limiting Factors to Be Addressed in 2013-2018	2013-2018 Metrics Evaluated by the 2012 Expert Panels	Projects Associated with Metrics Evaluated by the 2012 Expert Panels	2018 Habitat Quality Improvement Estimates
❖Wallowa River	Flow:	9.1: Increased Water Quantity 9.2: Decreased Water Quantity	Protect 30 cfs flow	1992-026-02: Grande Ronde Model Watershed 2007-393-00: Protect and Restore Northeast Oregon	2018 Table 5 HQI : <1% 2007-11 Accomplishment: 2% 2012-18 Estimate: 1%
	Passage:	1.1: Anthropogenic Barriers	Address 7 barriers Improve 54.3 mi.		
	Complexity:	6.1: Bed and Channel Form 6.2: Instream Structural Complexity	Improve 2 instream miles		
	WQ/Riparian:	4.1: Riparian Condition 5.2: Floodplain Condition 7.2: Increased Sediment Quantity 8.1: Temperature 8.2: Oxygen	Protect 257 riparian acres		
Imnaha River	Flow:	9.1: Increased Water Quantity 9.2: Decreased Water Quantity	Protect 1.2 cfs flow	1992-026-01: Grande Ronde Model Watershed 2007-393-00: Protect and Restore Northeast Oregon	2018 Table 5 HQI : N/A 2007-11 Accomplishment: <1% 2012-18 Estimate: <2%
	Passage:	1.1: Anthropogenic Barriers	Address 9 barriers Improve 74 miles		
	WQ/Riparian:	4.1: Riparian Condition 7.2: Increased Sediment Quantity 8.1: Temperature 8.2: Oxygen	Improve 2 riparian miles Improve 18.2 road miles		

Appendix A: Project Lists

Population	Metric Category	Limiting Factors to Be Addressed in 2013-2018	2013-2018 Metrics Evaluated by the 2012 Expert Panels	Projects Associated with Metrics Evaluated by the 2012 Expert Panels	2018 Habitat Quality Improvement Estimates
Snake River Steelhead					
Lower Snake					
Tucannon River	Flow:	9.2: Decreased Water Quantity	Protect 23.4 AF	1994-018-06: Tucannon Stream and Riparian Restoration 1994-018-07: Garfield County Fall Chinook and Steelhead Habitat Improvement 2008-202-00: Protect and Restore Tucannon Watershed	2018 Table 5 HQI : 5% 2007-11 Accomplishment: 3% 2012-18 Estimate: 44% 2018 Fish Accord Estimate: 8%
	Passage:	1.1: Anthropogenic Barriers	Address 1 barrier Improve 30 miles.		
	Complexity:	6.1: Bed and Channel Form 6.2: Instream Structural Complexity	Improve 26.4 instream miles		
	WQ/Riparian:	4.1: Riparian Condition 5.2: Floodplain Condition 7.2: Increased Sediment Quantity 8.1: Temperature 8.4: Turbidity	Improve 13.9 riparian miles Protect 1.3 riparian miles Improve 143 riparian acres Improve 121.4 road miles		
Asotin Creek	Passage:	1.1: Anthropogenic Barriers	Address 1 barrier Improve 8 miles	1994-018-05: Asotin Creek Enhancement and Restoration 2002-050-00: Riparian Buffers on Couse and Tenmile Creek in Asotin County	2018 Table 5 HQI : 4% 2007-11 Accomplishment: 5% 2012-18 Estimate: 0%
	Complexity:	6.1: Bed and Channel Form 6.2: Instream Structural Complexity	Improve 6.5 instream miles		
	WQ/Riparian:	4.1: Riparian Condition 5.2: Floodplain Condition 7.2: Increased Sediment Quantity 8.1: Temperature 8.4: Turbidity	Improve 4 riparian miles Improve 2 road miles		

Appendix A: Project Lists

Population	Metric Category	Limiting Factors to Be Addressed in 2013-2018	2013-2018 Metrics Evaluated by the 2012 Expert Panels	Projects Associated with Metrics Evaluated by the 2012 Expert Panels	2018 Habitat Quality Improvement Estimates
Snake River Steelhead					
Salmon River					
Lower Middle Fork, Salmon River (Big, Camas, and Loon Creeks)	Passage:	1.1: Anthropogenic Barriers	Address 3 barriers Improve 8 miles	2007-127-00: East Fork of South Fork Salmon River Passage Restoration	2018 Table 5 HQI: 2% 2007-11 Accomplishment: <1% 2012-18 Estimate: 3%
	WQ/Riparian:	7.2: Increased Sediment Quantity 8.7: Toxic Contaminants	Improve 102.6 riparian acres Improve 5 road miles		
❖East Fork Salmon River	Flow:	9.2: Decreased Water Quantity	Protect 15.5 cfs flow	1994-015-00: Idaho Fish Screening Project 2007-268-00: Idaho Watershed Habitat Restoration-Custer District 2007-399-00: Upper Salmon Screen Tributary Passage 2008-608-00: Idaho MOA/Fish Accord Water Transactions	2018 Table 5 HQI: 2% 2007-11 Accomplishment: 2% 2012-18 Estimate: 2%
	Entrainment:	2.3: Mechanical Injury	Address 3 screens		
	Passage:	1.1: Anthropogenic Barriers	Address 3 barriers Improve 7.9 miles		
❖Lemhi River	Flow:	9.2: Decreased Water Quantity	Protect 36.8 cfs flow plus periodic 100 cfs 3-day channel maintenance flow	1994-015-00: Idaho Fish Screening Project 2007-394-00: Idaho Watershed Habitat Restoration-Lemhi 2007-399-00: Upper Salmon Screen Tributary Passage 2008-601-00: Upper Lemhi River-Acquisition 2008-602-00: Upper Lemhi River-Restoration 2008-608-00: Idaho MOA/Fish Accord Water Transactions	2018 Table 5 HQI: 3% 2007-11 Accomplishment: 23% 2012-18 Estimate: 4%
	Entrainment:	2.3: Mechanical Injury	Address 35 screens		
	Passage:	1.1: Anthropogenic Barriers	Address 34 barriers Improve 63.2 miles		
	Complexity:	6.1: Bed and Channel Form 6.2: Instream Structural Complexity	Improve 10.87 instream miles		
	WQ/Riparian:	4.1: Riparian Condition 5.2: Floodplain Condition 7.2: Increased Sediment Quantity 8.1: Temperature	Improve 10.75 riparian miles Protect 11.5 riparian miles Improve 5 wetland acres		

Appendix A: Project Lists

Population	Metric Category	Limiting Factors to Be Addressed in 2013-2018	2013-2018 Metrics Evaluated by the 2012 Expert Panels	Projects Associated with Metrics Evaluated by the 2012 Expert Panels	2018 Habitat Quality Improvement Estimates
❖Pahsimeroi River	Flow:	9.2: Decreased Water Quantity	Protect 14 cfs flow	1994-015-00: Idaho Fish Screening Project Restoration-Lemhi 2002-013-01: Water Entity-Water Transaction Program 2007-268-00: Idaho Watershed Habitat Restoration-Custer District	2018 Table 5 HQI : 9%
	Entrainment:	2.3: Mechanical Injury	Address 5 screens		2007-11 Accomplishment: 27%
	Passage:	1.1: Anthropogenic Barriers	Address 17 barriers Improve 72.4 miles		2012-18 Estimate: 10%
	Complexity:	6.1: Bed and Channel Form	Improve 17.8 instream miles		
	WQ/Riparian:	4.1: Riparian Condition 7.1: Decreased Sediment Quantity 7.2: Increased Sediment Quantity 8.1: Temperature	Improve 7 riparian miles Protect 2 riparian miles	2007-399-00: Upper Salmon Screen Tributary Passage 2008-603-00: Pahsimeroi River Habitat 2008-608-00: Idaho MOA/Fish Accord Water Transactions	
❖Upper Mainstem Salmon River	Flow:	9.2: Decreased Water Quantity	Protect 22 cfs flow	1994-015-00: Idaho Fish Screening Project Restoration-Lemhi 2002-013-01: Water Entity-Water Transaction Program 2007-268-00: Idaho Watershed Habitat Restoration-Custer District 2007-399-00: Upper Salmon Screen Tributary Passage 2008-602-00: Upper Lemhi River-Restoration 2008-608-00: Idaho MOA/Fish Accord Water Transactions	2018 Table 5 HQI : 6%
	Entrainment:	2.3: Mechanical Injury			2007-11 Accomplishment: 4%
	Passage:	1.1: Anthropogenic Barriers	Address 6 barriers Improve 9.9 miles		2012-18 Estimate: 4%
	Complexity:	6.1: Bed and Channel Form 6.2: Instream Structural Complexity	Improve 7.92 instream miles		
	WQ/Riparian:	4.1: Riparian Condition 4.2: LWD Recruitment 5.2: Floodplain Condition 7.1: Decreased Sediment Quantity 7.2: Increased Sediment Quantity 8.1: Temperature	Improve 20 wetland acres Improve 2 road miles		

Appendix A: Project Lists

Population	Metric Category	Limiting Factors to Be Addressed in 2013-2018	2013-2018 Metrics Evaluated by the 2012 Expert Panels	Projects Associated with Metrics Evaluated by the 2012 Expert Panels	2018 Habitat Quality Improvement Estimates
Secesh River	Passage:	1.1: Anthropogenic Barriers	Address 2 barriers Improve 1.9 miles	2007-127-00: East Fork of South Fork Salmon River Passage Restoration	2018 Table 5 HQI : 6%
	WQ/Riparian:	7.2: Increased Sediment Quantity	Improve 20 road miles		2007-11 Accomplishment: 5% 2012-18 Estimate: 1%
South Fork Salmon River	Passage:	1.1: Anthropogenic Barriers	Address 6 barriers Improve 12.2 miles	2007-127-00: East Fork of South Fork Salmon River Passage Restoration	2018 Table 5 HQI : 1%
	WQ/Riparian:	7.2: Increased Sediment Quantity 8.1: Temperature 8.7: Toxic Contaminants	Improve 2 riparian acres Improve 98 road miles		2007-11 Accomplishment: 1% 2012-18 Estimate: 4%
Upper Columbia Steelhead					
Upper Columbia River - below Chief Joseph					
❖Entiat	Flow:	9.1: Increased Water Quantity 9.2: Decreased Water Quantity		2002-013-01: Water Entity-Water Transaction Program 2007-231-00: Entiat River Riparian Restoration 2009-003-00: Upper Columbia Habitat Restoration 2010-001-00: Upper Columbia Programmatic Habitat	2018 Table 5 HQI : 8%
	Entrainment:	2.3: Mechanical Injury	Address 8 screens		2007-11 Accomplishment: 3%
	Passage:	1.1: Anthropogenic Barriers	Address 3 barriers Improve 3.5 miles		2012-18 Estimate: 5%
	Complexity:	6.1: Bed and Channel Form 6.2: Instream Structural Complexity	Improve 6.2 instream miles		2018 Fish Accord Estimate: 12%
	WQ/Riparian:	4.1: Riparian Condition 5.1: Side Channel and Wetland Conditions 5.2: Floodplain Condition	Improve 2.6 riparian miles Improve 125.8 riparian acres		

Appendix A: Project Lists

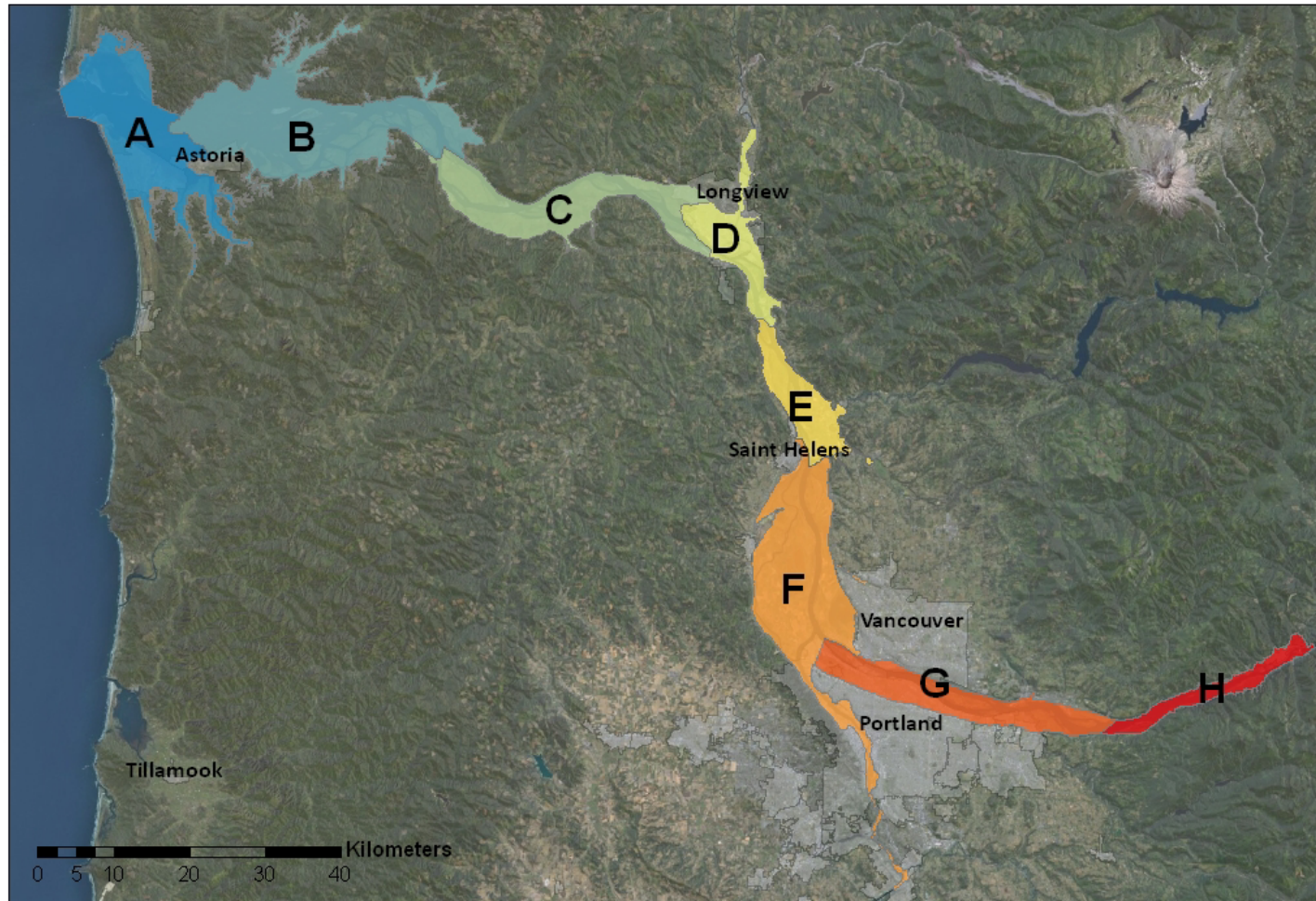
Population	Metric Category	Limiting Factors to Be Addressed in 2013-2018	2013-2018 Metrics Evaluated by the 2012 Expert Panels	Projects Associated with Metrics Evaluated by the 2012 Expert Panels	2018 Habitat Quality Improvement Estimates
❖Methow	Flow:	9.1: Increased Water Quantity 9.2: Decreased Water Quantity	Protect 14 cfs, 7,351 AF flow	2002-013-01: Water Entity-Water Transaction Program 2007-035-00: Methow Basin Riparian Enhancement Program 2007-264-00: Methow River Complexity Fisheries Enhancement 2009-003-00: Upper Columbia Habitat Restoration 2010-001-00: Upper Columbia Programmatic Habitat	2018 Table 5 HQI : 4% 2007-11 Accomplishment: 2% 2012-18 Estimate: 5% 2018 Fish Accord Estimate: 2%
	Entrainment:	2.3: Mechanical Injury	Address 7 screens		
	Passage:	1.1: Anthropogenic Barriers	Address 8 barriers Improve 42 miles		
	Complexity:	6.1: Bed and Channel Form 6.2: Instream Structural Complexity	Improve 23.2 instream miles		
	WQ/Riparian:	4.1: Riparian Condition 5.1: Side Channel and Wetland Conditions 5.2: Floodplain Condition 7.2: Increased Sediment Quantity 8.1: Temperature	Improve 4.6 riparian miles Improve 152.7 riparian acres Protect 0.3 riparian acres Improve 167.9 wetland acres		
❖Wenatchee	Flow:	9.2: Decreased Water Quantity	Protect 15 cfs flow	2002-013-01: Water Entity-Water Transaction Program 2007-325-00: Wenatchee River Complexity Fisheries Enhancement 2007-400-00: Wenatchee River Subbasin Fish Passage Enhancement 2009-003-00: Upper Columbia Habitat Restoration 2010-001-00: Upper Columbia Programmatic Habitat	2018 Table 5 HQI : 4% 2007-11 Accomplishment: 2% 2012-18 Estimate: 4% 2018 Fish Accord Estimate: 6%
	Passage:	1.1: Anthropogenic Barriers	Address 2 barriers Improve 26.5 miles		
	Complexity:	6.1: Bed and Channel Form 6.2: Instream Structural Complexity	Improve 20.1 instream miles		
	WQ/Riparian:	4.1: Riparian Condition 5.1: Side Channel and Wetland Conditions 5.2: Floodplain Condition 7.2: Increased Sediment Quantity 8.1: Temperature	Improve 2 riparian miles Improve 23.9 riparian acres		

Appendix A: Project Lists

Population	Metric Category	Limiting Factors to Be Addressed in 2013-2018	2013-2018 Metrics Evaluated by the 2012 Expert Panels	Projects Associated with Metrics Evaluated by the 2012 Expert Panels	2018 Habitat Quality Improvement Estimates
❖Okanogan	Flow:	9.2: Decreased Water Quantity	Protect 4,630 AF Protect 7.5 cfs flow	1996-042-00: Restore Salmon Creek Anadromous Fish	2018 Table 5 HQI: 14% 2007-11 Accomplishment: 7% 2012-18 Estimate: 10% 2018 Fish Accord Estimate: 64%
	Entrainment:	2.3: Mechanical Injury	Address 55 screens	2000-001-00: Omak Creek Anadromous Fish Habitat and Passage	
	Passage:	1.1: Anthropogenic Barriers	Address 3 barriers Improve 26.6 miles	2002-013-01: Water Entity-Water Transaction Program	
	Complexity:	6.1: Bed and Channel Form 6.2: Instream Structural Complexity	Improve 2.4 instream miles	2007-034-00: Columbia Cascade Pump Screen Correction	
	WQ/Riparian:	4.1: Riparian Condition 5.1: Side Channel and Wetland Conditions 5.2: Floodplain Condition 7.1: Decreased Sediment Quantity 7.2: Increased Sediment Quantity 8.1: Temperature 8.3: Gas Saturation 8.5: pH	Improve 4.6 riparian miles Improve 0.4 riparian acres Improve 5 road miles	2007-145-00: Okanogan Livestock and Water for Habitat Improvement 2007-224-00: Okanogan Subbasin Habitat Implementation Program 2008-102-00: Okanogan Habitat Acquisition and Restoration 2008-104-00: Land & Water Acquisition 2010-001-00: Upper Columbia Programmatic Habitat	

Estuary Habitat Projects

Columbia River Estuarine Ecosystem Classification: Hydrogeomorphic Reaches



Action Agency 2014-2018 Estuary Habitat Projects¹⁹

Location (Reach A–H)	Project Name	Project Number	Lead Agency/ Sponsor	Type of Action	Estuary Module Action (Project Subactions Addressing Identified Limiting Factors)	Linear Miles of Riparian Stream/ Channel Improved	Acres Restored	Ocean SBUs	Stream SBUs	SBU Type
Reach A -- River Miles 2 - 14										
A	Wallacut River – Phase 2	2010-073- 00 2003-011- 00	BPA / Columbia Land Trust	Tidal Reconnection - Dike Breach	CRE 1.4 Restore and maintain ecological benefits in riparian areas; this includes managing vegetation on dikes and levees to enhance ecological function and adding shoreline/instream complexity for juvenile salmonid refugia	1.8		0.30	0.1	Preliminary
					CRE 9.4 restore degraded off-channel habitats with high intrinsic potential for increasing habitat quality		1.9			

¹⁹ This Estuary Habitat Project Table provides more detail than was included in the 2010 through 2013 IP table. In this table, the Action Agencies are presenting actions and their associated Survival Benefit Units (SBUs) based upon the Columbia River Estuary Module Actions (e.g. CRE 10.1 dike breach).

Appendix A: Project Lists

Location (Reach A–H)	Project Name	Project Number	Lead Agency/ Sponsor	Type of Action	Estuary Module Action (Project Subactions Addressing Identified Limiting Factors)	Linear Miles of Riparian Stream/ Channel Improved	Acres Restored	Ocean SBUs	Stream SBUs	SBU Type
					CRE 10.1 Breach or lower the elevation of dikes and levees; create and/or restore tidal marshes, shallow-water habitats, and tide channels		35.5			
					CRE 15.3 Implement projects to address infestations on public and private lands		81.6			
A	Chinook River	2010-070-00	BPA / WDFW	Tidal Reconnection–Tidegate Replacement	CRE 1.4 Restore and maintain ecological benefits in riparian areas; this includes managing vegetation on dikes and levees to enhance ecological function and adding shoreline/instream complexity for juvenile salmonid refugia	7.9		0.76	0.32	Preliminary

Appendix A: Project Lists

Location (Reach A–H)	Project Name	Project Number	Lead Agency/ Sponsor	Type of Action	Estuary Module Action (Project Subactions Addressing Identified Limiting Factors)	Linear Miles of Riparian Stream/ Channel Improved	Acres Restored	Ocean SBUs	Stream SBUs	SBU Type
					CRE 9.3 Actively purchase off-channel habitats in urban and rural settings that (1) cannot be effectively protected through regulation, (2) are degraded but have good restoration potential, or (3) are highly degraded but could benefit from long-term restoration solutions		202			
					CRE 10.3 Upgrade tide gates where (1) no other options exist, (2) upgraded structures can provide appropriate access for juveniles, and (3) ecosystem function would be improved over current conditions		175.8			
					CRE 15.3 Implement projects to address infestations on public and private lands		490			

Appendix A: Project Lists

Location (Reach A–H)	Project Name	Project Number	Lead Agency/ Sponsor	Type of Action	Estuary Module Action (Project Subactions Addressing Identified Limiting Factors)	Linear Miles of Riparian Stream/ Channel Improved	Acres Restored	Ocean SBUs	Stream SBUs	SBU Type
A	Youngs Bay/River Tidal Floodplain Reconnection	TBD	COE / BPA	Tidal Reconnection - Dike Breach	CRE 9.3 Actively purchase off-channel habitats in urban and rural settings that (1) cannot be effectively protected through regulation, (2) are degraded but have good restoration potential, or (3) are highly degraded but could benefit from long- term restoration solutions		251	3.04	1.0	Preliminary
					CRE 10.1 Breach or lower the elevation of dikes and levees; create and/or restore tidal marshes, shallow- water habitats, and tide channels		500			
A	Walluski Bottomlands	2010-004- 00	BPA / CREST	Tidal Reconnection - Dike Breach	CRE 9.4 restore degraded off- channel habitats with high intrinsic potential for increasing habitat quality		2.6	0.14	0.05	Preliminary

Appendix A: Project Lists

Location (Reach A–H)	Project Name	Project Number	Lead Agency/ Sponsor	Type of Action	Estuary Module Action (Project Subactions Addressing Identified Limiting Factors)	Linear Miles of Riparian Stream/ Channel Improved	Acres Restored	Ocean SBUs	Stream SBUs	SBU Type
					CRE 10.1 Breach or lower the elevation of dikes and levees; create and/or restore tidal marshes, shallow-water habitats, and tide channels		20.5			
A	Trestle Bay Jetty Breach	TBD	COE / BPA	Tidal Reconnection - Dike Breach	CRE 10.1 Breach or lower the elevation of dikes and levees; create and/or restore tidal marshes, shallow-water habitats, and tide channels		274.3	2.07	0.64	Preliminary
A	Port of Astoria (Skipanon)	2010-004-00	BPA / CREST	Tidal Reconnection - Dike Breach	CRE 1.4 Restore and maintain ecological benefits in riparian areas; this includes managing vegetation on dikes and levees to enhance ecological function and adding shoreline/instream complexity for juvenile salmonid refugia	0.5		0.30	0.10	Preliminary

Appendix A: Project Lists

Location (Reach A–H)	Project Name	Project Number	Lead Agency/ Sponsor	Type of Action	Estuary Module Action (Project Subactions Addressing Identified Limiting Factors)	Linear Miles of Riparian Stream/ Channel Improved	Acres Restored	Ocean SBUs	Stream SBUs	SBU Type
					CRE 9.4 restore degraded off-channel habitats with high intrinsic potential for increasing habitat quality		0.5			
					CRE 10.1 Breach or lower the elevation of dikes and levees; create and/or restore tidal marshes, shallow-water habitats, and tide channels		54.6			
A	Port of Astoria – Phase 2	2010-004-00	BPA / CREST	Tidal Reconnection - Dike Breach	CRE 9.4 restore degraded off-channel habitats with high intrinsic potential for increasing habitat quality		1.3	0.22	0.07	Preliminary
					CRE 10.1 Breach or lower the elevation of dikes and levees; create and/or restore tidal marshes, shallow-water habitats, and tide channels		41			

Appendix A: Project Lists

Location (Reach A–H)	Project Name	Project Number	Lead Agency/ Sponsor	Type of Action	Estuary Module Action (Project Subactions Addressing Identified Limiting Factors)	Linear Miles of Riparian Stream/ Channel Improved	Acres Restored	Ocean SBUs	Stream SBUs	SBU Type
A	Skipanon Slough 8 th Street Dam – Phase 2 Tidegate Removal	2010-004- 00	BPA / CREST	Tidal Reconnection - Dike Breach	CRE 10.1 Breach or lower the elevation of dikes and levees; create and/or restore tidal marshes, shallow- water habitats, and tide channels		299.3	1.31	0.40	Preliminary
A	Lewis & Clark River Upper #1	2010-073- 00 2010-004- 00	BPA / Columbia Land Trust / CREST	Tidal Reconnection - Dike Breach	CRE 9.3 Actively purchase off-channel habitats in urban and rural settings that (1) cannot be effectively protected through regulation, (2) are degraded but have good restoration potential, or (3) are highly degraded but could benefit from long- term restoration solutions		37.0	0.21	0.07	Preliminary
					CRE 9.4 restore degraded off- channel habitats with high intrinsic potential for increasing habitat quality		1.3			

Appendix A: Project Lists

Location (Reach A–H)	Project Name	Project Number	Lead Agency/ Sponsor	Type of Action	Estuary Module Action (Project Subactions Addressing Identified Limiting Factors)	Linear Miles of Riparian Stream/ Channel Improved	Acres Restored	Ocean SBUs	Stream SBUs	SBU Type
					CRE 10.1 Breach or lower the elevation of dikes and levees; create and/or restore tidal marshes, shallow-water habitats, and tide channels		34.3			
A	Walooski-Young's Bay Confluence Restoration	2012-015-00	BPA / Cowlitz Tribe	Tidal Reconnection - Dike Breach	CRE 9.3 Actively purchase off-channel habitats in urban and rural settings that (1) cannot be effectively protected through regulation, (2) are degraded but have good restoration potential, or (3) are highly degraded but could benefit from long-term restoration solutions (163.4 Acres anticipated in 2013)			2.07	0.71	ERTG Preliminary

Appendix A: Project Lists

Location (Reach A–H)	Project Name	Project Number	Lead Agency/ Sponsor	Type of Action	Estuary Module Action (Project Subactions Addressing Identified Limiting Factors)	Linear Miles of Riparian Stream/ Channel Improved	Acres Restored	Ocean SBUs	Stream SBUs	SBU Type
					CRE 1.4 Restore and maintain ecological benefits in riparian areas; this includes managing vegetation on dikes and levees to enhance ecological function and adding shoreline/instream complexity for juvenile salmonid refugia	0.7				
					CRE 9.4 restore degraded off-channel habitats with high intrinsic potential for increasing habitat quality		13.2			
					CRE 10.1 Breach or lower the elevation of dikes and levees; create and/or restore tidal marshes, shallow-water habitats, and tide channels		164.5			
					CRE 15.3 Implement projects to address infestations on public and private lands		164.5			

Appendix A: Project Lists

Location (Reach A–H)	Project Name	Project Number	Lead Agency/ Sponsor	Type of Action	Estuary Module Action (Project Subactions Addressing Identified Limiting Factors)	Linear Miles of Riparian Stream/ Channel Improved	Acres Restored	Ocean SBUs	Stream SBUs	SBU Type
Reach B -- River Miles 14 - 38										
B	Grays Bay, Deep River Confluence – Phase 2 & 3	2010-073- 00	BPA / Columbia Land Trust	Tidal Reconnection	CRE 9.3 Actively purchase off-channel habitats in urban and rural settings that (1) cannot be effectively protected through regulation, (2) are degraded but have good restoration potential, or (3) are highly degraded but could benefit from long- term restoration solutions (3 properties: #1 (55 acres) purchased in 2012; #2 & #3 (49.7 total acres) anticipated in 2014)		49.7	0.87	0.37	Preliminary
					CRE 1.4 Restore and maintain ecological benefits in riparian areas; this includes managing vegetation on dikes and levees to enhance ecological function and adding shoreline/instream complexity for juvenile salmonid refugia	3.5				

Appendix A: Project Lists

Location (Reach A–H)	Project Name	Project Number	Lead Agency/ Sponsor	Type of Action	Estuary Module Action (Project Subactions Addressing Identified Limiting Factors)	Linear Miles of Riparian Stream/ Channel Improved	Acres Restored	Ocean SBUs	Stream SBUs	SBU Type
					CRE 9.4 restore degraded off-channel habitats with high intrinsic potential for increasing habitat quality		10.4			
					CRE 10.2 Remove tide gates to improve the hydrology between wetlands and the channel and to provide juveniles with physical access to off-channel habitat; use a habitat connectivity index to prioritize projects		159.5			
					CRE 15.3 Implement projects to address infestations on public and private lands		185.1			

Appendix A: Project Lists

Location (Reach A–H)	Project Name	Project Number	Lead Agency/ Sponsor	Type of Action	Estuary Module Action (Project Subactions Addressing Identified Limiting Factors)	Linear Miles of Riparian Stream/ Channel Improved	Acres Restored	Ocean SBUs	Stream SBUs	SBU Type
B	Elochoman Slough – Phase 3	2010-073- 00 2010-070- 00	BPA / WDFW / Columbia Land Trust	Tidal Reconnection– Tidegate Replacement	CRE 1.4 Restore and maintain ecological benefits in riparian areas; this includes managing vegetation on dikes and levees to enhance ecological function and adding shoreline/instream complexity for juvenile salmonid refugia	0.9		0.34	0.15	Preliminary
					CRE 9.4 restore degraded off-channel habitats with high intrinsic potential for increasing habitat quality		9.2			
					CRE 10.3 Upgrade tide gates where (1) no other options exist, (2) upgraded structures can provide appropriate access for juveniles, and (3) ecosystem function would be improved over current conditions		222.8			

Appendix A: Project Lists

Location (Reach A–H)	Project Name	Project Number	Lead Agency/ Sponsor	Type of Action	Estuary Module Action (Project Subactions Addressing Identified Limiting Factors)	Linear Miles of Riparian Stream/ Channel Improved	Acres Restored	Ocean SBUs	Stream SBUs	SBU Type
					CRE 15.3 Implement projects to address infestations on public and private lands		296.5			
B	Karlson Island	2010-004-00	BPA / CREST	Tidal Reconnection - Dike Breach	CRE 9.4 restore degraded off-channel habitats with high intrinsic potential for increasing habitat quality		4.7	0.52	0.17	Preliminary
					CRE 10.1 Breach or lower the elevation of dikes and levees; create and/or restore tidal marshes, shallow-water habitats, and tide channels		81			
					CRE 15.3 Implement projects to address infestations on public and private lands		160			

Appendix A: Project Lists

Location (Reach A–H)	Project Name	Project Number	Lead Agency/ Sponsor	Type of Action	Estuary Module Action (Project Subactions Addressing Identified Limiting Factors)	Linear Miles of Riparian Stream/ Channel Improved	Acres Restored	Ocean SBUs	Stream SBUs	SBU Type
B	Rangila Slough South			Tidal Reconnection - Dike Breach	CRE 9.3 Actively purchase off-channel habitats in urban and rural settings that (1) cannot be effectively protected through regulation, (2) are degraded but have good restoration potential, or (3) are highly degraded but could benefit from long- term restoration solutions		179.29	1.43	0.49	Preliminary
					CRE 9.4 restore degraded off- channel habitats with high intrinsic potential for increasing habitat quality		14			
					CRE 10.1 Breach or lower the elevation of dikes and levees; create and/or restore tidal marshes, shallow- water habitats, and tide channels		144.1			

Appendix A: Project Lists

Location (Reach A–H)	Project Name	Project Number	Lead Agency/ Sponsor	Type of Action	Estuary Module Action (Project Subactions Addressing Identified Limiting Factors)	Linear Miles of Riparian Stream/ Channel Improved	Acres Restored	Ocean SBUs	Stream SBUs	SBU Type
					CRE 10.2 Remove tide gates to improve the hydrology between wetlands and the channel and to provide juveniles with physical access to off-channel habitat; use a habitat connectivity index to prioritize projects		27.4			
B	Miller Sands	TBD	COE / Oregon Division of State Lands	Restore degraded off-channel habitats	CRE 6.3 Dispose of dredged materials using techniques identified through the demonstration projects and region-wide planning		325.8	0.61	0.35	Preliminary
					CRE 9.4 restore degraded off-channel habitats with high intrinsic potential for increasing habitat quality		48.2			

Appendix A: Project Lists

Location (Reach A–H)	Project Name	Project Number	Lead Agency/ Sponsor	Type of Action	Estuary Module Action (Project Subactions Addressing Identified Limiting Factors)	Linear Miles of Riparian Stream/ Channel Improved	Acres Restored	Ocean SBUs	Stream SBUs	SBU Type
B	Grays Bay – Matteson Road	2010-073- 00	BPA / Columbia Land Trust	Tidal Reconnection - Dike Breach	CRE 9.3 Actively purchase off-channel habitats in urban and rural settings that (1) cannot be effectively protected through regulation, (2) are degraded but have good restoration potential, or (3) are highly degraded but could benefit from long- term restoration solutions		129.5	1.01	0.34	Preliminary
					CRE 9.4 restore degraded off- channel habitats with high intrinsic potential for increasing habitat quality		6.0			
					CRE 10.1 Breach or lower the elevation of dikes and levees; create and/or restore tidal marshes, shallow- water habitats, and tide channels		102.0			

Appendix A: Project Lists

Location (Reach A–H)	Project Name	Project Number	Lead Agency/ Sponsor	Type of Action	Estuary Module Action (Project Subactions Addressing Identified Limiting Factors)	Linear Miles of Riparian Stream/ Channel Improved	Acres Restored	Ocean SBUs	Stream SBUs	SBU Type
B	Crooked Creek Upstream	2010-073- 00	BPA / Columbia Land Trust	Tidal Reconnection - Dike Breach	CRE 9.3 Actively purchase off-channel habitats in urban and rural settings that (1) cannot be effectively protected through regulation, (2) are degraded but have good restoration potential, or (3) are highly degraded but could benefit from long- term restoration solutions		73.4	0.24	0.08	Preliminary
					CRE 9.4 restore degraded off- channel habitats with high intrinsic potential for increasing habitat quality		1			
					CRE 10.1 Breach or lower the elevation of dikes and levees; create and/or restore tidal marshes, shallow- water habitats, and tide channels		25.40			

Appendix A: Project Lists

Location (Reach A–H)	Project Name	Project Number	Lead Agency/ Sponsor	Type of Action	Estuary Module Action (Project Subactions Addressing Identified Limiting Factors)	Linear Miles of Riparian Stream/ Channel Improved	Acres Restored	Ocean SBUs	Stream SBUs	SBU Type
B	Mary's Creek	2010-004-00	BPA / CREST	Tidal Reconnection - Dike Breach	CRE 10.1 Breach or lower the elevation of dikes and levees; create and/or restore tidal marshes, shallow-water habitats, and tide channels		10.5	0.06	0.02	Preliminary
B	Jim Crow Creek	2010-004-00	BPA / CREST	Tidal Reconnection - Dike Breach	CRE 9.4 restore degraded off-channel habitats with high intrinsic potential for increasing habitat quality		0.6	0.08	0.03	Preliminary
					CRE 10.1 Breach or lower the elevation of dikes and levees; create and/or restore tidal marshes, shallow-water habitats, and tide channels		11.3			
B	Wallace Island Complex (not proper)	TBD	COE	Restore degraded off- channel habitats	CRE 6.3 Dispose of dredged materials using techniques identified through the demonstration projects and region-wide planning		688	1.13	0.64	Preliminary

Appendix A: Project Lists

Location (Reach A–H)	Project Name	Project Number	Lead Agency/ Sponsor	Type of Action	Estuary Module Action (Project Subactions Addressing Identified Limiting Factors)	Linear Miles of Riparian Stream/ Channel Improved	Acres Restored	Ocean SBUs	Stream SBUs	SBU Type
					CRE 9.4 restore degraded off-channel habitats with high intrinsic potential for increasing habitat quality		76.6			
B	Svensen Island-Cathlamet Bay	2010-073-00	BPA / COE / Columbia Land Trust	Tidal Reconnection - Dike Breach	CRE 9.3 Actively purchase off-channel habitats in urban and rural settings that (1) cannot be effectively protected through regulation, (2) are degraded but have good restoration potential, or (3) are highly degraded but could benefit from long-term restoration solutions		306.76	2.17	0.78	Preliminary
					CRE 9.4 restore degraded off-channel habitats with high intrinsic potential for increasing habitat quality		20.8			

Appendix A: Project Lists

Location (Reach A–H)	Project Name	Project Number	Lead Agency/ Sponsor	Type of Action	Estuary Module Action (Project Subactions Addressing Identified Limiting Factors)	Linear Miles of Riparian Stream/ Channel Improved	Acres Restored	Ocean SBUs	Stream SBUs	SBU Type
					CRE 10.1 Breach or lower the elevation of dikes and levees; create and/or restore tidal marshes, shallow-water habitats, and tide channels		148.8			
					CRE 10.2 Remove tide gates to improve the hydrology between wetlands and the channel and to provide juveniles with physical access to off-channel habitat; use a habitat connectivity index to prioritize projects		17.22			
B	Julia Butler Hansen NWR-Tenasilahe Island Phase 2 (TK Slough)	TBD	COE / USFWS	Tidal Reconnection - Dike Breach	CRE 9.4 restore degraded off-channel habitats with high intrinsic potential for increasing habitat quality		22.2	0.90	0.32	Preliminary

Appendix A: Project Lists

Location (Reach A–H)	Project Name	Project Number	Lead Agency/ Sponsor	Type of Action	Estuary Module Action (Project Subactions Addressing Identified Limiting Factors)	Linear Miles of Riparian Stream/ Channel Improved	Acres Restored	Ocean SBUs	Stream SBUs	SBU Type
					CRE 10.1 Breach or lower the elevation of dikes and levees; create and/or restore tidal marshes, shallow-water habitats, and tide channels		122.5			
					CRE 15.3 Implement projects to address infestations on public and private lands		111.2			
Reach C -- River Miles 38 - 64										
C	Westport Slough, USFWS	2010-004-00	BPA / CREST	Tidal Reconnection - Dike Breach	CRE 10.1 Breach or lower the elevation of dikes and levees; create and/or restore tidal marshes, shallow-water habitats, and tide channel		40.9	0.21	0.06	Preliminary

Appendix A: Project Lists

Location (Reach A–H)	Project Name	Project Number	Lead Agency/ Sponsor	Type of Action	Estuary Module Action (Project Subactions Addressing Identified Limiting Factors)	Linear Miles of Riparian Stream/ Channel Improved	Acres Restored	Ocean SBUs	Stream SBUs	SBU Type
C	Westport Levee Setback	2010-073- 00	BPA / Columbia Land Trust	Tidal Reconnection - Dike Breach	CRE 9.3 Actively purchase off-channel habitats in urban and rural settings that (1) cannot be effectively protected through regulation, (2) are degraded but have good restoration potential, or (3) are highly degraded but could benefit from long- term restoration solutions		204.8	1.59	0.50	Preliminary
					CRE 9.4 restore degraded off- channel habitats with high intrinsic potential for increasing habitat quality		3.03			
					CRE 10.1 Breach or lower the elevation of dikes and levees; create and/or restore tidal marshes, shallow- water habitats, and tide channels		182.2			

Appendix A: Project Lists

Location (Reach A–H)	Project Name	Project Number	Lead Agency/ Sponsor	Type of Action	Estuary Module Action (Project Subactions Addressing Identified Limiting Factors)	Linear Miles of Riparian Stream/ Channel Improved	Acres Restored	Ocean SBUs	Stream SBUs	SBU Type
C	Reach C/D Rinearson Tidegate Upgrade	2012-015- 00	BPA / Cowlitz Tribe	Tidal Reconnection– Tidegate Replacement	CRE 1.4 Restore and maintain ecological benefits in riparian areas; this includes managing vegetation on dikes and levees to enhance ecological function and adding shoreline/instream complexity for juvenile salmonid refugia	11.65		0.32	0.20	Preliminary
					CRE 9.4 restore degraded off-channel habitats with high intrinsic potential for increasing habitat quality		39.84			
					CRE 10.3 Upgrade tide gates where (1) no other options exist, (2) upgraded structures can provide appropriate access for juveniles, and (3) ecosystem function would be improved over current conditions		31.17			

Appendix A: Project Lists

Location (Reach A–H)	Project Name	Project Number	Lead Agency/ Sponsor	Type of Action	Estuary Module Action (Project Subactions Addressing Identified Limiting Factors)	Linear Miles of Riparian Stream/ Channel Improved	Acres Restored	Ocean SBUs	Stream SBUs	SBU Type
					CRE 15.3 Implement projects to address infestations on public and private lands		68.15			
C	Klatskanie Levee Setback	2010-073-00	BPA / Columbia Land Trust	Tidal Reconnection - Dike Breach	CRE 9.3 Actively purchase off-channel habitats in urban and rural settings that (1) cannot be effectively protected through regulation, (2) are degraded but have good restoration potential, or (3) are highly degraded but could benefit from long-term restoration solutions		171.6	1.36	0.43	Preliminary
					CRE 9.4 restore degraded off-channel habitats with high intrinsic potential for increasing habitat quality		3.70			

Appendix A: Project Lists

Location (Reach A–H)	Project Name	Project Number	Lead Agency/ Sponsor	Type of Action	Estuary Module Action (Project Subactions Addressing Identified Limiting Factors)	Linear Miles of Riparian Stream/ Channel Improved	Acres Restored	Ocean SBUs	Stream SBUs	SBU Type
					CRE 10.1 Breach or lower the elevation of dikes and levees; create and/or restore tidal marshes, shallow-water habitats, and tide channels		171.7			
C	Kerry Island	2010-073-00	BPA / Columbia Land Trust	Tidal Reconnection - Dike Breach	CRE 9.3 Actively purchase off-channel habitats in urban and rural settings that (1) cannot be effectively protected through regulation, (2) are degraded but have good restoration potential, or (3) are highly degraded but could benefit from long-term restoration solutions (110 Acres anticipated in 2013)			0.76	0.25	Preliminary

Appendix A: Project Lists

Location (Reach A–H)	Project Name	Project Number	Lead Agency/ Sponsor	Type of Action	Estuary Module Action (Project Subactions Addressing Identified Limiting Factors)	Linear Miles of Riparian Stream/ Channel Improved	Acres Restored	Ocean SBUs	Stream SBUs	SBU Type
					CRE 1.4 Restore and maintain ecological benefits in riparian areas; this includes managing vegetation on dikes and levees to enhance ecological function and adding shoreline/instream complexity for juvenile salmonid refugia	2				
					CRE 9.4 restore degraded off-channel habitats with high intrinsic potential for increasing habitat quality		4.9			
					CRE 10.1 Breach or lower the elevation of dikes and levees; create and/or restore tidal marshes, shallow-water habitats, and tide channels		95.5			
					CRE 15.3 Implement projects to address infestations on public and private lands		107.6			

Appendix A: Project Lists

Location (Reach A–H)	Project Name	Project Number	Lead Agency/ Sponsor	Type of Action	Estuary Module Action (Project Subactions Addressing Identified Limiting Factors)	Linear Miles of Riparian Stream/ Channel Improved	Acres Restored	Ocean SBUs	Stream SBUs	SBU Type
Reach E -- River Miles 74 - 85										
E	Columbia Stock Ranch – Phase 2	2010-073- 00	BPA / COE / Columbia Land Trust	Tidal Reconnection - Dike Breach	CRE 1.4 Restore and maintain ecological benefits in riparian areas; this includes managing vegetation on dikes and levees to enhance ecological function and adding shoreline/instream complexity for juvenile salmonid refugia	7.4		4.44	1.43	ERTG Preliminary
					CRE 6.2 Identify and implement dredged material beneficial use demonstration projects, including the notching and scrape-down of previously disposed materials and placement of new materials for habitat enhancement and/or creation		16.3			

Appendix A: Project Lists

Location (Reach A–H)	Project Name	Project Number	Lead Agency/ Sponsor	Type of Action	Estuary Module Action (Project Subactions Addressing Identified Limiting Factors)	Linear Miles of Riparian Stream/ Channel Improved	Acres Restored	Ocean SBUs	Stream SBUs	SBU Type
					CRE 9.4 restore degraded off-channel habitats with high intrinsic potential for increasing habitat quality		3			
					CRE 10.1 Breach or lower the elevation of dikes and levees; create and/or restore tidal marshes, shallow-water habitats, and tide channels		360.3			
					CRE 10.2 Remove tide gates to improve the hydrology between wetlands and the channel and to provide juveniles with physical access to off-channel habitat; use a habitat connectivity index to prioritize projects		9.9			
					CRE 15.3 Implement projects to address infestations on public and private lands		746.6			

Appendix A: Project Lists

Location (Reach A–H)	Project Name	Project Number	Lead Agency/ Sponsor	Type of Action	Estuary Module Action (Project Subactions Addressing Identified Limiting Factors)	Linear Miles of Riparian Stream/ Channel Improved	Acres Restored	Ocean SBUs	Stream SBUs	SBU Type
E	RM-81 Island	2010-073-00	BPA / Columbia Land Trust	Tidal Reconnection - Dike Breach	CRE 9.3 Actively purchase off-channel habitats in urban and rural settings that (1) cannot be effectively protected through regulation, (2) are degraded but have good restoration potential, or (3) are highly degraded but could benefit from long- term restoration solutions		160.12	0.84	0.26	Preliminary
					CRE 10.1 Breach or lower the elevation of dikes and levees; create and/or restore tidal marshes, shallow- water habitats, and tide channels		82.33			

Appendix A: Project Lists

Location (Reach A–H)	Project Name	Project Number	Lead Agency/ Sponsor	Type of Action	Estuary Module Action (Project Subactions Addressing Identified Limiting Factors)	Linear Miles of Riparian Stream/ Channel Improved	Acres Restored	Ocean SBUs	Stream SBUs	SBU Type
E	Lewis River East Fork – Site 43	2003-011- 00	BPA / Estuary Partnershi p	Tidal Reconnection - Dike Breach	CRE 9.3 Actively purchase off-channel habitats in urban and rural settings that (1) cannot be effectively protected through regulation, (2) are degraded but have good restoration potential, or (3) are highly degraded but could benefit from long- term restoration solutions		109.6	0.8	0.25	Preliminary
					CRE 10.1 Breach or lower the elevation of dikes and levees; create and/or restore tidal marshes, shallow- water habitats, and tide channels		150			

Appendix A: Project Lists

Location (Reach A–H)	Project Name	Project Number	Lead Agency/ Sponsor	Type of Action	Estuary Module Action (Project Subactions Addressing Identified Limiting Factors)	Linear Miles of Riparian Stream/ Channel Improved	Acres Restored	Ocean SBUs	Stream SBUs	SBU Type
E	Large Dike Breach – Reach E	n/a	Corps / BPA / Columbia Land Trust	Tidal Reconnection - Dike Breach	CRE 1.4 Restore and maintain ecological benefits in riparian areas; this includes managing vegetation on dikes and levees to enhance ecological function and adding shoreline/instream complexity for juvenile salmonid refugia	38		31.0	11.08	ERTG Preliminary
					CRE 9.4 restore degraded off-channel habitats with high intrinsic potential for increasing habitat quality		272.8			
					CRE 10.1 Breach or lower the elevation of dikes and levees; create and/or restore tidal marshes, shallow-water habitats, and tide channels		2063			

Appendix A: Project Lists

Location (Reach A–H)	Project Name	Project Number	Lead Agency/ Sponsor	Type of Action	Estuary Module Action (Project Subactions Addressing Identified Limiting Factors)	Linear Miles of Riparian Stream/ Channel Improved	Acres Restored	Ocean SBUs	Stream SBUs	SBU Type
Reach F -- River Miles 85 - 102.5										
F	Smith and Bybee	2003-011- 00	BPA / Estuary Partnershi p	Riparian Plantings	CRE 1.4 Restore and maintain ecological benefits in riparian areas; this includes managing vegetation on dikes and levees to enhance ecological function and adding shoreline/instream complexity for juvenile salmonid refugia	6.5		0.01	0.01	Preliminary
					CRE 15.3 Implement projects to address infestations on public and private lands		50			
F	Scapposse Landing	2003-011- 00	BPA / Estuary Partnershi p / SBWC	Tidal Reconnection - Dike Breach	CRE 9.4 restore degraded off-channel habitats with high intrinsic potential for increasing habitat quality		7	0.08	0.03	Preliminary

Appendix A: Project Lists

Location (Reach A–H)	Project Name	Project Number	Lead Agency/ Sponsor	Type of Action	Estuary Module Action (Project Subactions Addressing Identified Limiting Factors)	Linear Miles of Riparian Stream/ Channel Improved	Acres Restored	Ocean SBUs	Stream SBUs	SBU Type
					CRE 10.1 Breach or lower the elevation of dikes and levees; create and/or restore tidal marshes, shallow-water habitats, and tide channels		18			
					CRE 15.3 Implement projects to address infestations on public and private lands		125			
F	Sauvie Island, North Unit Phase 2	2010-004-00	BPA / CREST	Tidal Reconnection - Dike Breach	CRE 1.4 Restore and maintain ecological benefits in riparian areas; this includes managing vegetation on dikes and levees to enhance ecological function and adding shoreline/instream complexity for juvenile salmonid refugia	1.9		1.09	0.35	Preliminary
					CRE 9.4 restore degraded off-channel habitats with high intrinsic potential for increasing habitat quality		3.6			

Appendix A: Project Lists

Location (Reach A–H)	Project Name	Project Number	Lead Agency/ Sponsor	Type of Action	Estuary Module Action (Project Subactions Addressing Identified Limiting Factors)	Linear Miles of Riparian Stream/ Channel Improved	Acres Restored	Ocean SBUs	Stream SBUs	SBU Type
					CRE 10.1 Breach or lower the elevation of dikes and levees; create and/or restore tidal marshes, shallow-water habitats, and tide channels		137.9			
					CRE 15.3 Implement projects to address infestations on public and private lands		20.1			
F	Ridgefield NWR: Ridgeport Dairy Unit-Post Office Lake	P2#331430	Corps / USFWS	Tidal Reconnection - Dike Breach	CRE 10.1 Breach or lower the elevation of dikes and levees; create and/or restore tidal marshes, shallow-water habitats, and tide channels		142.6	1.10	0.35	Preliminary
					CRE 9.4 restore degraded off-channel habitats with high intrinsic potential for increasing habitat quality		5.6			

Appendix A: Project Lists

Location (Reach A–H)	Project Name	Project Number	Lead Agency/ Sponsor	Type of Action	Estuary Module Action (Project Subactions Addressing Identified Limiting Factors)	Linear Miles of Riparian Stream/ Channel Improved	Acres Restored	Ocean SBUs	Stream SBUs	SBU Type
F	Oaks Bottom Section 536			Tidal Reconnection	CRE 10.2 Remove tide gates to improve the hydrology between wetlands and the channel and to provide juveniles with physical access to off-channel habitat; use a habitat connectivity index to prioritize projects		88	0.16	0.08	ERTG Final
					CRE 15.3 Implement projects to address infestations on public and private lands		30			
					CRE 9.4 restore degraded off-channel habitats with high intrinsic potential for increasing habitat quality		33			
F	Ridgefield NWR – Ridgeport Dairy Campbell Lake & Slough	TBD	Corps / USFWS	Tidal Reconnection	CRE 9.4 restore degraded off-channel habitats with high intrinsic potential for increasing habitat quality		1.5	0.54	0.22	Preliminary

Appendix A: Project Lists

Location (Reach A–H)	Project Name	Project Number	Lead Agency/ Sponsor	Type of Action	Estuary Module Action (Project Subactions Addressing Identified Limiting Factors)	Linear Miles of Riparian Stream/ Channel Improved	Acres Restored	Ocean SBUs	Stream SBUs	SBU Type
					CRE 10.2 Remove tide gates to improve the hydrology between wetlands and the channel and to provide juveniles with physical access to off-channel habitat; use a habitat connectivity index to prioritize projects		157.5			
					CRE 15.3 Implement projects to address infestations on public and private lands		222.3			
F	Large Dike Breach – Reach F	2010-073-00	BPA / COE / CLT	Tidal Reconnection - Dike Breach	CRE 9.3 Actively purchase off-channel habitats in urban and rural settings that (1) cannot be effectively protected through regulation, (2) are degraded but have good restoration potential, or (3) are highly degraded but could benefit from long-term restoration solutions		726.2	5.67	1.80	Preliminary

Appendix A: Project Lists

Location (Reach A–H)	Project Name	Project Number	Lead Agency/ Sponsor	Type of Action	Estuary Module Action (Project Subactions Addressing Identified Limiting Factors)	Linear Miles of Riparian Stream/ Channel Improved	Acres Restored	Ocean SBUs	Stream SBUs	SBU Type
					CRE 9.4 restore degraded off-channel habitats with high intrinsic potential for increasing habitat quality		6.51			
					CRE 10.1 Breach or lower the elevation of dikes and levees; create and/or restore tidal marshes, shallow-water habitats, and tide channels		662.6			
F	Buckmire Slough	2010-004-00 2010-070-00	BPA /COE / CREST / WDFW	Tidal Reconnection - Dike Breach	CRE 10.1 Breach or lower the elevation of dikes and levees; create and/or restore tidal marshes, shallow-water habitats, and tide channels		241.7	1.29	0.40	Preliminary

Appendix A: Project Lists

Location (Reach A–H)	Project Name	Project Number	Lead Agency/ Sponsor	Type of Action	Estuary Module Action (Project Subactions Addressing Identified Limiting Factors)	Linear Miles of Riparian Stream/ Channel Improved	Acres Restored	Ocean SBUs	Stream SBUs	SBU Type
F	Shillapoo Wildlife Area	P2#32386 3 2009-016- 00	Corps / BPA / WDFW	Tidal Reconnection - Dike Breach	CRE 1.4 Restore and maintain ecological benefits in riparian areas; this includes managing vegetation on dikes and levees to enhance ecological function and adding shoreline/instream complexity for juvenile salmonid refugia		TBD	TBD	TBD	TBD
					CRE 9.4 restore degraded off-channel habitats with high intrinsic potential for increasing habitat quality		TBD			
					CRE 10.1 Breach or lower the elevation of dikes and levees; create and/or restore tidal marshes, shallow-water habitats, and tide channels		TBD			

Appendix A: Project Lists

Location (Reach A–H)	Project Name	Project Number	Lead Agency/ Sponsor	Type of Action	Estuary Module Action (Project Subactions Addressing Identified Limiting Factors)	Linear Miles of Riparian Stream/ Channel Improved	Acres Restored	Ocean SBUs	Stream SBUs	SBU Type
					CRE 10.2 Remove tide gates to improve the hydrology between wetlands and the channel and to provide juveniles with physical access to off-channel habitat; use a habitat connectivity index to prioritize projects		TBD			
					CRE 15.3 Implement projects to address infestations on public and private lands		TBD			
Reach G -- River Miles 102.5 – 127										
G	Steigerwald NWR	TBD	BPA / COE	Tidal Reconnection - Dike Breach	CRE 9.4 restore degraded off-channel habitats with high intrinsic potential for increasing habitat quality		84	4.31	1.58	ERTG Preliminary

Appendix A: Project Lists

Location (Reach A–H)	Project Name	Project Number	Lead Agency/ Sponsor	Type of Action	Estuary Module Action (Project Subactions Addressing Identified Limiting Factors)	Linear Miles of Riparian Stream/ Channel Improved	Acres Restored	Ocean SBUs	Stream SBUs	SBU Type
					CRE 10.1 Breach or lower the elevation of dikes and levees; create and/or restore tidal marshes, shallow-water habitats, and tide channels		510			
					CRE 15.3 Implement projects to address infestations on public and private lands		1060			
G	Sandy Delta – Sun Dial Island Tidal Restoration	2003-011-00	BPA / Estuary Partnership	Restore degraded off-channel habitats	CRE 9.4 restore degraded off-channel habitats with high intrinsic potential for increasing habitat quality		22	0.17	0.11	Preliminary
G	Thousand Acres, Sandy River Delta	2003-011-00	BPA / Estuary Partnership	Tidal Reconnection	CRE 1.4 Restore and maintain ecological benefits in riparian areas; this includes managing vegetation on dikes and levees to enhance ecological function and adding shoreline/instream complexity for juvenile salmonid refugia	4.5		0.36	0.21	Preliminary

Appendix A: Project Lists

Location (Reach A–H)	Project Name	Project Number	Lead Agency/ Sponsor	Type of Action	Estuary Module Action (Project Subactions Addressing Identified Limiting Factors)	Linear Miles of Riparian Stream/ Channel Improved	Acres Restored	Ocean SBUs	Stream SBUs	SBU Type
					CRE 6.2 Identify and implement dredged material beneficial use demonstration projects, including the notching and scrape-down of previously disposed materials and placement of new materials for habitat enhancement and/or creation		13			
					CRE 9.4 restore degraded off-channel habitats with high intrinsic potential for increasing habitat quality		29			
					CRE 10.2 Remove tide gates to improve the hydrology between wetlands and the channel and to provide juveniles with physical access to off-channel habitat; use a habitat connectivity index to prioritize projects		52			

Appendix A: Project Lists

Location (Reach A–H)	Project Name	Project Number	Lead Agency/ Sponsor	Type of Action	Estuary Module Action (Project Subactions Addressing Identified Limiting Factors)	Linear Miles of Riparian Stream/ Channel Improved	Acres Restored	Ocean SBUs	Stream SBUs	SBU Type
					CRE 15.3 Implement projects to address infestations on public and private lands		400			

Hatchery Projects

BPA Hatchery Projects

BiOp Strategy	Action #	Sub Action #	End FY	Project #	Project Title	Project URL
Ensure Funded Hatchery Programs are not Impeding Recovery	40	All	2018	2008-712-00	Implement Hatchery Reform Action	http://www.cbfish.org/Project.mvc/Display/2008-712-00
Execute on Safety Net and Conservation Objectives	41	1	2018	2010-076-00	Characterizing migration and survival for juvenile Snake River sockeye salmon between the upper Salmon River Basin and Lower Granite Dam	http://www.cbfish.org/Project.mvc/Display/2010-076-00
Execute on Safety Net and Conservation Objectives	41	All	2018	1996-043-00	Johnson Creek Artificial Propagation Enhancement	http://www.cbfish.org/Project.mvc/Display/1996-043-00
Execute on Safety Net and Conservation Objectives	41	All	2018	1997-038-00	Listed Stock Chinook Salmon Gamete Preservation	http://www.cbfish.org/Project.mvc/Display/1997-038-00
Execute on Safety Net and Conservation Objectives	41	All	2018	2007-402-00	SNAKE RIVER SOCKEYE CAPTIVE PROPAGATION	http://www.cbfish.org/Project.mvc/Display/2007-402-00
Execute on Safety Net and Conservation Objectives	41	All	2018	2007-403-00	Spring Chinook Captive Propagation-Idaho	http://www.cbfish.org/Project.mvc/Display/2007-403-00

BPA Hatchery Projects

BiOp Strategy	Action #	Sub Action #	End FY	Project #	Project Title	Project URL
Execute on Safety Net and Conservation Objectives	41	All	2018	2007-404-00	Spring Chinook Captive Propagation-Oregon	http://www.cbfish.org/Project.mvc/Display/2007-404-00
Execute on Safety Net and Conservation Objectives	42	6	2018	1988-053-01	Northeast Oregon Hatchery Master Plan	http://www.cbfish.org/Project.mvc/Display/1988-053-01
Execute on Safety Net and Conservation Objectives	42	9	2018	2008-710-00	Development of an Integrated strategy for Chum Salmon Restoration in the tributaries below Bonneville Dam	http://www.cbfish.org/Project.mvc/Display/2008-710-00
Execute on Safety Net and Conservation Objectives	42	10	2018	2008-710-00	Development of an Integrated strategy for Chum Salmon Restoration in the tributaries below Bonneville Dam	http://www.cbfish.org/Project.mvc/Display/2008-710-00
Execute on Safety Net and Conservation Objectives	42	All	2018	2003-023-00	Chief Joseph Hatchery Program	http://www.cbfish.org/Project.mvc/Display/2003-023-00
Execute on Safety Net and Conservation Objectives	42	All	2018	2007-212-00	Okanogan Basin Locally Adapted Steelhead Broodstock Step 1 and 2 (Casimer Bar)	http://www.cbfish.org/Project.mvc/Display/2007-212-00

BPA Hatchery Projects

BiOp Strategy	Action #	Sub Action #	End FY	Project #	Project Title	Project URL
Execute on Safety Net and Conservation Objectives	42	All	2018	2007-401-00	Kelt Reconditioning and Reproductive Success Evaluation Research	http://www.cbfish.org/Project.mvc/Display/2007-401-00
Execute on Safety Net and Conservation Objectives	42	All	2018	2007-402-00	Snake River Sockeye Captive Propagation	http://www.cbfish.org/Project.mvc/Display/2007-402-00
Execute on Safety Net and Conservation Objectives	42	All	2018	2008-458-00	Steelhead Kelt Reconditioning	http://www.cbfish.org/Project.mvc/Display/2008-458-00

Reclamation Hatchery Projects

BiOp Strategy	Action #	Sub Action #	Project #	Project title	Project URL
Ensure Hatchery Programs Funded are not Impeding Recovery	40	4	N/A	Project Alternative Solutions Study: Winthrop National Fish Hatchery Steelhead Management – RPA Action 40 Implementation Proposals	http://www.salmonrecovery.gov/Files/2011%20APR%20files/Corrections/Reclamation_2012_Winthrop_PASS_Rpt_Fnl.pdf

Predation Management Projects

BPA Predation Projects

BiOp Strategy	Action #	Sub Action #	End FY	Project #	Project Title	Project URL
Implement Piscivorous Predation Control Measures	43	All	2018	1990-077-00	Development of System-wide Predator Control	http://www.cbfish.org/Project.mvc/Display/1990-077-00
Implement Piscivorous Predation Control Measures	44	All	2018	2008-718-00	Non-Native Fish Hot Spots	http://www.cbfish.org/Project.mvc/Display/2008-718-00
Implement Piscivorous Predation Control Measures	44	All	2018	2008-719-00	Research Non-Indigenous Actions	http://www.cbfish.org/Project.mvc/Display/2008-719-00
Implement Avian Predation Control Measures	45	All	2018	1997-024-00	Avian Predation on Juvenile Salmon and steelhead	http://www.cbfish.org/Project.mvc/Display/1997-024-00
Implement Avian Predation Control Measures	46	All	2018	1997-024-00	Avian Predation on Juvenile Salmon and steelhead	http://www.cbfish.org/Project.mvc/Display/1997-024-00
Implement Avian Predation Control Measures	47	All	2018	1997-024-00	Avian Predation on Juvenile Salmon and steelhead	http://www.cbfish.org/Project.mvc/Display/1997-024-00
Implement Marine Mammal Control Measures	49	All	2017	2008-004-00	Sea Lion Non-Lethal Hazing	http://www.cbfish.org/Project.mvc/Display/2008-004-00

COE Predation Projects

BiOp Strategy	Action #	Project Location	Project ID	Project Title
Implement Avian Predation Control Measures	47	System	328188	Inland Avian Predation Management Plan Development

Reclamation Predation Projects

BiOp Strategy	Action #	Sub Action #	Project #	Project title	Project Link
Implement Avian Predation Control Measures	47	N/A	N/A	Avian Predation Management at Potholes Reservoir (Implement Inland Avian Predation Management Plan, if appropriate)	N/A

Research Monitoring and Evaluation Projects

BPA Research, Monitoring & Evaluation Projects

BiOp Strategy	Action #	Sub Action #	Project #	Project Title	Project URL
Monitor Fish Populations	50	1	1990-080-00	Columbia Basin Pit-Tag Information	http://www.cbfish.org/Project.mvc/Display/1990-080-00
Monitor Fish Populations	50	1	2003-017-00	Integrated Status and Effectiveness Monitoring Program (ISEMP)	http://www.cbfish.org/Project.mvc/Display/1990-080-00
Monitor Fish Populations	50	2	2005-002-00	Lower Granite Dam Adult Trap Operations	http://www.cbfish.org/Project.mvc/Display/2005-002-00
Monitor Fish Populations	50	3	1987-127-00	Smolt Monitoring by Non-Federal Entities	http://www.cbfish.org/Project.mvc/Display/1987-127-00
Monitor Fish Populations	50	3	1989-107-00	Statistical Support For Salmon	http://www.cbfish.org/Project.mvc/Display/1989-107-00
Monitor Fish Populations	50	3	1990-055-00	Idaho Steelhead Monitoring and Evaluation (M&E) Studies	http://www.cbfish.org/Project.mvc/Display/1990-055-00
Monitor Fish Populations	50	3	1991-029-00	Research, monitoring, and evaluation of emerging issues and measures to recover the Snake River fall Chinook salmon ESU	http://www.cbfish.org/Project.mvc/Display/1991-029-00
Monitor Fish Populations	50	3	1994-033-00	Fish Passage Center	http://www.cbfish.org/Project.mvc/Display/1994-033-00
Monitor Fish Populations	50	3	1996-020-00	Comparative Survival Study (CSS)	http://www.cbfish.org/Project.mvc/Display/1996-020-00
Monitor Fish Populations	50	3	2007-083-00	Grande Ronde Supplementation Monitoring and Evaluation (M&E) on Catherine Creek/Upper Grande Ronde River	http://www.cbfish.org/Project.mvc/Display/2007-083-00

BPA Research, Monitoring & Evaluation Projects

BiOp Strategy	Action #	Sub Action #	Project #	Project Title	Project URL
Monitor Fish Populations	50	3	2007-132-00	NEOH Monitoring & Evaluation Implementation (Formerly a component of 198805301)	http://www.cbfish.org/Project.mvc/Display/2007-132-00
Monitor Fish Populations	50	3	2008-311-00	Natural Production Management and Monitoring	http://www.cbfish.org/Project.mvc/Display/2008-311-00
Monitor Fish Populations	50	4	1987-127-00	Smolt Monitoring by Non-Federal Entities	http://www.cbfish.org/Project.mvc/Display/1987-127-00
Monitor Fish Populations	50	4	1991-073-00	Idaho Natural Production Monitoring and Evaluation (M&E)	http://www.cbfish.org/Project.mvc/Display/1991-073-00
Monitor Fish Populations	50	4	1998-016-00	Escapement and Productivity of Spring Chinook and Steelhead	http://www.cbfish.org/Project.mvc/Display/1998-016-00
Monitor Fish Populations	50	4	2002-060-00	Nez Perce Harvest Monitoring on Snake and Clearwater Rivers	http://www.cbfish.org/Project.mvc/Display/2002-060-00
Monitor Fish Populations	50	4	2003-017-00	Integrated Status and Effectiveness Monitoring Program (ISEMP)	http://www.cbfish.org/Project.mvc/Display/2003-017-00
Monitor Fish Populations	50	4	2010-034-00	Upper Columbia Spring Chinook and Steelhead Juvenile and Adult Abundance, Productivity and Spatial Structure Monitoring	http://www.cbfish.org/Project.mvc/Display/2010-034-00
Monitor Fish Populations	50	4	2010-036-00	Lower Columbia Coded Wire Tag (CWT) Recovery Project	http://www.cbfish.org/Project.mvc/Display/2010-036-00
Monitor Fish Populations	50	5	1983-350-03	Nez Perce Tribal Hatchery Monitoring and Evaluation (M&E)	http://www.cbfish.org/Project.mvc/Display/1989-098-00

BPA Research, Monitoring & Evaluation Projects

BiOp Strategy	Action #	Sub Action #	Project #	Project Title	Project URL
Monitor Fish Populations	50	5	1989-098-00	Salmon Studies in Idaho Rivers-Idaho Department of Fish and Game (IDFG)	http://www.cbfish.org/Project.mvc/Display/1989-098-00
Monitor Fish Populations	50	5	1990-055-00	Idaho Steelhead Monitoring and Evaluation (M&E) Studies	http://www.cbfish.org/Project.mvc/Display/1990-055-00
Monitor Fish Populations	50	5	1991-073-00	Idaho Natural Production Monitoring and Evaluation (M&E)	http://www.cbfish.org/Project.mvc/Display/1991-073-00
Monitor Fish Populations	50	5	2003-017-00	Integrated Status and Effectiveness Monitoring Program (ISEMP)	http://www.cbfish.org/Project.mvc/Display/2003-017-00
Monitor Fish Populations	50	5	2005-002-00	Lower Granite Dam Adult Trap Operations	http://www.cbfish.org/Project.mvc/Display/2005-002-00
Monitor Fish Populations	50	5	2009-005-00	Influence of Environment and Landscape on Salmon and steelhead Genetics	http://www.cbfish.org/Project.mvc/Display/2009-005-00
Monitor Fish Populations	50	5	2010-026-00	Chinook and Steelhead Genotyping for Genetic Stock Identification (GSI) at Lower Granite Dam	http://www.cbfish.org/Project.mvc/Display/2010-026-00
Monitor Fish Populations	50	5	2010-031-00	Snake River Chinook and Steelhead Parental Based Tagging	http://www.cbfish.org/Project.mvc/Display/2010-031-00
Monitor Fish Populations	50	5	2010-038-00	Lolo Creek Permanent Weir Construction	http://www.cbfish.org/Project.mvc/Display/2010-038-00
Monitor Fish Populations	50	5	2010-057-00	B-run steelhead supplementation effectiveness research	http://www.cbfish.org/Project.mvc/Display/2010-038-00

BPA Research, Monitoring & Evaluation Projects

BiOp Strategy	Action #	Sub Action #	Project #	Project Title	Project URL
Monitor Fish Populations	50	6	1983-350-03	Nez Perce Tribal Hatchery Monitoring and Evaluation (M&E)	http://www.cbfish.org/Project.mvc/Display/1983-350-03
Monitor Fish Populations	50	6	1987-127-00	Smolt Monitoring by Non-Federal Entities	http://www.cbfish.org/Project.mvc/Display/1987-127-00
Monitor Fish Populations	50	6	1988-022-00	Umatilla Fish Passage Operations	http://www.cbfish.org/Project.mvc/Display/1988-022-00
Monitor Fish Populations	50	6	1988-053-03	Hood River Production Monitoring and Evaluation (M&E)-Warm Springs	http://www.cbfish.org/Project.mvc/Display/1988-053-03
Monitor Fish Populations	50	6	1988-053-04	Hood River Production Monitor and Evaluation (M&E)-Oregon Department of Fish and Wildlife (ODFW)	http://www.cbfish.org/Project.mvc/Display/1988-053-04
Monitor Fish Populations	50	6	1988-053-08	Hood River Production Operations and Maintenance (O&M) and Powerdale	http://www.cbfish.org/Project.mvc/Display/1988-053-08
Monitor Fish Populations	50	6	1989-024-01	Evaluate Umatilla Juvenile Salmon and steelhead Outmigration	http://www.cbfish.org/Project.mvc/Display/1989-024-01
Monitor Fish Populations	50	6	1989-098-00	Salmon Studies in Idaho Rivers-Idaho Department of Fish and Game (IDFG)	http://www.cbfish.org/Project.mvc/Display/1989-098-00
Monitor Fish Populations	50	6	1990-005-00	Umatilla Hatchery Monitoring and Evaluation (M&E)	http://www.cbfish.org/Project.mvc/Display/1990-005-00
Monitor Fish Populations	50	6	1990-005-01	Umatilla Basin Natural Production Monitoring and Evaluation (M&E)	http://www.cbfish.org/Project.mvc/Display/1990-005-01

BPA Research, Monitoring & Evaluation Projects

BiOp Strategy	Action #	Sub Action #	Project #	Project Title	Project URL
Monitor Fish Populations	50	6	1990-055-00	Idaho Steelhead Monitoring and Evaluation (M&E) Studies	http://www.cbfish.org/Project.mvc/Display/1990-055-00
Monitor Fish Populations	50	6	1991-028-00	Pit Tagging Wild Chinook	http://www.cbfish.org/Project.mvc/Display/1991-028-00
Monitor Fish Populations	50	6	1991-073-00	Idaho Natural Production Monitoring and Evaluation (M&E)	http://www.cbfish.org/Project.mvc/Display/1991-073-00
Monitor Fish Populations	50	6	1992-026-04	Grande Ronde Early Life History of Spring Chinook and Steelhead	http://www.cbfish.org/Project.mvc/Display/1992-026-04
Monitor Fish Populations	50	6	1995-063-25	Yakima River Monitoring and Evaluation- Yakima/Klickitat Fisheries Project (YKFP)	http://www.cbfish.org/Project.mvc/Display/1995-063-25
Monitor Fish Populations	50	6	1995-063-35	Klickitat River Monitoring and Evaluation- Yakima/Klickitat Fisheries Project (YKFP)	http://www.cbfish.org/Project.mvc/Display/1995-063-35
Monitor Fish Populations	50	6	1996-019-00	Data Access in Real Time (DART)	http://www.cbfish.org/Project.mvc/Display/1996-019-00
Monitor Fish Populations	50	6	1996-035-01	Yakama Reservation Watershed Project	http://www.cbfish.org/Project.mvc/Display/1996-035-01
Monitor Fish Populations	50	6	1996-043-00	Johnson Creek Artificial Propagation Enhancement	http://www.cbfish.org/Project.mvc/Display/1996-043-00
Monitor Fish Populations	50	6	1997-015-01	Imnaha River Smolt Monitoring	http://www.cbfish.org/Project.mvc/Display/1997-015-01

BPA Research, Monitoring & Evaluation Projects

BiOp Strategy	Action #	Sub Action #	Project #	Project Title	Project URL
Monitor Fish Populations	50	6	1998-007-02	Grande Ronde Supplementation Operations and Maintenance (O&M) and Monitoring and Evaluation (M&E) on Lostine River	http://www.cbfish.org/Project.mvc/Display/1998-007-02
Monitor Fish Populations	50	6	1998-007-03	Grande Ronde Supplementation O&M on Catherine Creek/Upper Grande Ronde River	http://www.cbfish.org/Project.mvc/Display/1998-007-03
Monitor Fish Populations	50	6	1998-016-00	Escapement and Productivity of Spring Chinook and Steelhead	http://www.cbfish.org/Project.mvc/Display/1998-016-00
Monitor Fish Populations	50	6	1998-019-00	Wind River Watershed	http://www.cbfish.org/Project.mvc/Display/1998-019-00
Monitor Fish Populations	50	6	1999-020-00	Analyze Persistence and Dynamics in Chinook Redds	http://www.cbfish.org/Project.mvc/Display/1999-020-00
Monitor Fish Populations	50	6	2002-032-00	Snake River Fall Chinook Salmon Life History Investigations	http://www.cbfish.org/Project.mvc/Display/2002-032-00
Monitor Fish Populations	50	6	2002-053-00	Asotin Creek Salmon Population Assessment	http://www.cbfish.org/Project.mvc/Display/2002-053-00
Monitor Fish Populations	50	6	2002-060-00	Nez Perce Harvest Monitoring on Snake and Clearwater Rivers	http://www.cbfish.org/Project.mvc/Display/2002-060-00
Monitor Fish Populations	50	6	2003-017-00	Integrated Status and Effectiveness Monitoring Program (ISEMP)	http://www.cbfish.org/Project.mvc/Display/2003-017-00
Monitor Fish Populations	50	6	2003-022-00	Okanogan Basin Monitoring & Evaluation Program (OBMEP)	http://www.cbfish.org/Project.mvc/Display/2003-022-00

BPA Research, Monitoring & Evaluation Projects

BiOp Strategy	Action #	Sub Action #	Project #	Project Title	Project URL
Monitor Fish Populations	50	6	2007-083-00	Grande Ronde Supplementation Monitoring and Evaluation (M&E) on Catherine Creek/Upper Grande Ronde River	http://www.cbfish.org/Project.mvc/Display/2007-083-00
Monitor Fish Populations	50	6	2007-402-00	Snake River Sockeye Captive Propagation	http://www.cbfish.org/Project.mvc/Display/2007-402-00
Monitor Fish Populations	50	6	2009-004-00	Monitoring Recovery Trends in Key Spring Chinook Habitat Variables and Validation of Population Viability Indicators	http://www.cbfish.org/Project.mvc/Display/2009-004-00
Monitor Fish Populations	50	6	2010-028-00	Estimate Adult Steelhead Abundance in Small Streams Associated with Tucannon & Asotin Populations	http://www.cbfish.org/Project.mvc/Display/2010-028-00
Monitor Fish Populations	50	6	2010-030-00	Project to provided VSP Estimates for Yakima Steelhead MPG	http://www.cbfish.org/Project.mvc/Display/2010-030-00
Monitor Fish Populations	50	6	2010-032-00	Imnaha River Steelhead Status Monitoring	http://www.cbfish.org/Project.mvc/Display/2010-032-00
Monitor Fish Populations	50	6	2010-034-00	Upper Columbia Spring Chinook and Steelhead Juvenile and Adult Abundance, Productivity and Spatial Structure Monitoring	http://www.cbfish.org/Project.mvc/Display/2010-034-00

BPA Research, Monitoring & Evaluation Projects

BiOp Strategy	Action #	Sub Action #	Project #	Project Title	Project URL
Monitor Fish Populations	50	6	2010-035-00	Abundance, Productivity and Life History of Fifteenmile Creek Winter Steelhead	http://www.cbfish.org/Project.mvc/Display/2010-035-00
Monitor Fish Populations	50	6	2010-037-00	Toppenish Creek Steelhead Status & Trend Monitoring	http://www.cbfish.org/Project.mvc/Display/2010-037-00
Monitor Fish Populations	50	6	2010-038-00	Lolo Creek Permanent Weir Construction	http://www.cbfish.org/Project.mvc/Display/2010-038-00
Monitor Fish Populations	50	6	2010-042-00	Tucannon Expanded Pit Tagging	http://www.cbfish.org/Project.mvc/Display/2010-042-00
Monitor Fish Populations	50	7	1982-013-02	Coded Wire Tag-Oregon Department of Fish and Wildlife (ODFW)	http://www.cbfish.org/Project.mvc/Display/1982-013-02
Monitor Fish Populations	50	7	1982-013-03	Coded Wire Tag-US Fish and Wildlife Service (USFWS)	http://www.cbfish.org/Project.mvc/Display/1982-013-03
Monitor Fish Populations	50	7	1982-013-04	Coded Wire Tag-Washington Department of Fish and Wildlife (WDFW)	http://www.cbfish.org/Project.mvc/Display/1982-013-04
Monitor Fish Populations	50	7	1983-350-03	Nez Perce Tribal Hatchery Monitoring and Evaluation (M&E)	http://www.cbfish.org/Project.mvc/Display/1983-350-03
Monitor Fish Populations	50	7	1988-053-07	Hood River Production Operations and Maintenance (O&M)- Warm Springs	http://www.cbfish.org/Project.mvc/Display/1988-053-07
Monitor Fish Populations	50	7	1988-053-08	Hood River Production Operations and Maintenance (O&M) and Powerdale	http://www.cbfish.org/Project.mvc/Display/1988-053-08

BPA Research, Monitoring & Evaluation Projects

BiOp Strategy	Action #	Sub Action #	Project #	Project Title	Project URL
Monitor Fish Populations	50	7	1989-098-00	Salmon Studies in Idaho Rivers-Idaho Department of Fish and Game (IDFG)	http://www.cbfish.org/Project.mvc/Display/1989-098-00
Monitor Fish Populations	50	7	1990-005-00	Umatilla Hatchery Monitoring and Evaluation (M&E)	http://www.cbfish.org/Project.mvc/Display/1990-005-00
Monitor Fish Populations	50	7	1995-063-25	Yakima River Monitoring and Evaluation-Yakima/Klickitat Fisheries Project (YKFP)	http://www.cbfish.org/Project.mvc/Display/1995-063-25
Monitor Fish Populations	50	7	1995-063-35	Klickitat River Monitoring and Evaluation-Yakima/Klickitat Fisheries Project (YKFP)	http://www.cbfish.org/Project.mvc/Display/1995-063-35
Monitor Fish Populations	50	7	1996-020-00	Comparative Survival Study (CSS)	http://www.cbfish.org/Project.mvc/Display/1996-020-00
Monitor Fish Populations	50	7	1996-043-00	Johnson Creek Artificial Propagation Enhancement	http://www.cbfish.org/Project.mvc/Display/1996-043-00
Monitor Fish Populations	50	7	1998-007-03	Grande Ronde Supplementation O&M on Catherine Creek/Upper Grande Ronde River	http://www.cbfish.org/Project.mvc/Display/1998-007-03
Monitor Fish Populations	50	7	2007-083-00	Grande Ronde Supplementation Monitoring and Evaluation (M&E) on Catherine Creek/Upper Grande Ronde River	http://www.cbfish.org/Project.mvc/Display/2007-083-00
Monitor Fish Populations	50	7	2007-404-00	Spring Chinook Captive Propagation-Oregon	http://www.cbfish.org/Project.mvc/Display/2007-404-00

BPA Research, Monitoring & Evaluation Projects

BiOp Strategy	Action #	Sub Action #	Project #	Project Title	Project URL
Monitor Fish Populations	50	7	2008-710-00	Development of an Integrated strategy for Chum Salmon Restoration in the tributaries below Bonneville Dam	http://www.cbfish.org/Project.mvc/Display/2008-710-00
Monitor Fish Populations	50	7	2010-028-00	Estimate Adult Steelhead Abundance in Small Streams Associated with Tucannon & Asotin Populations	http://www.cbfish.org/Project.mvc/Display/2010-028-00
Monitor Fish Populations	50	7	2010-032-00	Imnaha River Steelhead Status Monitoring	http://www.cbfish.org/Project.mvc/Display/2010-032-00
Monitor Fish Populations	51	1	1988-108-04	StreamNet - Coordinated Information System (CIS)/ Northwest Environmental Database (NED)	http://www.cbfish.org/Project.mvc/Display/1988-108-04
Monitor Fish Populations	51	1	1989-098-00	Salmon Studies in Idaho Rivers-Idaho Department of Fish and Game (IDFG)	http://www.cbfish.org/Project.mvc/Display/1989-098-00
Monitor Fish Populations	51	1	1994-033-00	Fish Passage Center	http://www.cbfish.org/Project.mvc/Display/1994-033-00
Monitor Fish Populations	51	1	1996-019-00	Data Access in Real Time (DART)	http://www.cbfish.org/Project.mvc/Display/1996-019-00
Monitor Fish Populations	51	1	1996-043-00	Johnson Creek Artificial Propagation Enhancement	http://www.cbfish.org/Project.mvc/Display/1996-043-00
Monitor Fish Populations	51	1	1997-030-00	Chinook Salmon Adult Abundance Monitoring	http://www.cbfish.org/Project.mvc/Display/1997-030-00

BPA Research, Monitoring & Evaluation Projects

BiOp Strategy	Action #	Sub Action #	Project #	Project Title	Project URL
Monitor Fish Populations	51	1	1999-020-00	Analyze Persistence and Dynamics in Chinook Redds	http://www.cbfish.org/Project.mvc/Display/1999-020-00
Monitor Fish Populations	51	1	2003-017-00	Integrated Status and Effectiveness Monitoring Program (ISEMP)	http://www.cbfish.org/Project.mvc/Display/2003-017-00
Monitor Fish Populations	51	1	2004-002-00	Pacific Northwest Aquatic Monitoring Program (PNAMP) Coordination	http://www.cbfish.org/Project.mvc/Display/2004-002-00
Monitor Fish Populations	51	1	2007-407-00	Upper Snake River Tribe (USRT) Coordination	http://www.cbfish.org/Project.mvc/Display/2007-407-00
Monitor Fish Populations	51	1	2008-507-00	Tribal Data Network	http://www.cbfish.org/Project.mvc/Display/2008-507-00
Monitor Fish Populations	51	1	2010-036-00	Lower Columbia Coded Wire Tag (CWT) Recovery Project	http://www.cbfish.org/Project.mvc/Display/2010-036-00
Monitor Fish Populations	51	2	1989-107-00	Statistical Support For Salmon	http://www.cbfish.org/Project.mvc/Display/1989-107-00
Monitor Fish Populations	51	2	2004-002-00	Pacific Northwest Aquatic Monitoring Program (PNAMP) Coordination	http://www.cbfish.org/Project.mvc/Display/2004-002-00
Monitor Fish Populations	51	2	2010-026-00	Chinook and Steelhead Genotyping for Genetic Stock Identification (GSI) at Lower Granite Dam	http://www.cbfish.org/Project.mvc/Display/2010-026-00
Monitor Fish Populations	51	3	1989-107-00	Statistical Support For Salmon	http://www.cbfish.org/Project.mvc/Display/1989-107-00
Monitor Fish Populations	51	3	1994-033-00	Fish Passage Center	http://www.cbfish.org/Project.mvc/Display/1994-033-00

BPA Research, Monitoring & Evaluation Projects

BiOp Strategy	Action #	Sub Action #	Project #	Project Title	Project URL
Monitor Fish Populations	51	3	1996-043-00	Johnson Creek Artificial Propagation Enhancement	http://www.cbfish.org/Project.mvc/Display/1996-043-00
Monitor Fish Populations	51	3	2004-002-00	Pacific Northwest Aquatic Monitoring Program (PNAMP) Coordination	http://www.cbfish.org/Project.mvc/Display/2004-002-00
Hydrosystem RM&E	52	1	1987-127-00	Smolt Monitoring by Non-Federal Entities	http://www.cbfish.org/Project.mvc/Display/1987-127-00
Hydrosystem RM&E	52	1	1989-107-00	Statistical Support For Salmon	http://www.cbfish.org/Project.mvc/Display/1989-107-00
Hydrosystem RM&E	52	1	1991-051-00	Modeling and Evaluation Statistical Support for Life-Cycle Studies	http://www.cbfish.org/Project.mvc/Display/1991-051-00
Hydrosystem RM&E	52	1	1997-015-01	Imnaha River Smolt Monitoring	http://www.cbfish.org/Project.mvc/Display/1997-015-01
Hydrosystem RM&E	52	1	2003-041-00	Evaluate Delayed (Extra) Mortality Associated with Passage of Yearling Chinook Salmon through Snake River Dams	http://www.cbfish.org/Project.mvc/Display/2003-041-00
Hydrosystem RM&E	52	2	1989-107-00	Statistical Support For Salmon	http://www.cbfish.org/Project.mvc/Display/1989-107-00
Hydrosystem RM&E	52	2	1993-029-00	Survival Estimate for Passage through Snake and Columbia River Dams and Reservoirs	http://www.cbfish.org/Project.mvc/Display/1993-029-00
Hydrosystem RM&E	52	2	1996-020-00	Comparative Survival Study (CSS)	http://www.cbfish.org/Project.mvc/Display/1996-020-00
Hydrosystem RM&E	52	3	1991-051-00	Modeling and Evaluation Statistical Support for Life-Cycle Studies	http://www.cbfish.org/Project.mvc/Display/1991-051-00

BPA Research, Monitoring & Evaluation Projects

BiOp Strategy	Action #	Sub Action #	Project #	Project Title	Project URL
Hydrosystem RM&E	52	3	2005-002-00	Lower Granite Dam Adult Trap Operations	http://www.cbfish.org/Project.mvc/Display/2005-002-00
Hydrosystem RM&E	52	3	2008-508-00	Power Analysis Catch Sampling Rates	http://www.cbfish.org/Project.mvc/Display/2008-508-00
Hydrosystem RM&E	52	3	2008-908-00	FCRPS Water Studies & Passage of Adult Salmon & Steelhead	http://www.cbfish.org/Project.mvc/Display/2008-908-00
Hydrosystem RM&E	52	4	1987-127-00	Smolt Monitoring by Non-Federal Entities	http://www.cbfish.org/Project.mvc/Display/1987-127-00
Hydrosystem RM&E	52	4	2003-017-00	Integrated Status and Effectiveness Monitoring Program (ISEMP)	http://www.cbfish.org/Project.mvc/Display/1987-127-00
Hydrosystem RM&E	52	5	1987-127-00	Smolt Monitoring by Non-Federal Entities	http://www.cbfish.org/Project.mvc/Display/1987-127-00
Hydrosystem RM&E	52	5	2010-076-00	Characterizing migration and survival for juvenile Snake River sockeye salmon between the upper Salmon River Basin and Lower Granite Dam	http://www.cbfish.org/Project.mvc/Display/2010-076-00
Hydrosystem RM&E	52	7	1987-127-00	Smolt Monitoring by Non-Federal Entities	http://www.cbfish.org/Project.mvc/Display/1987-127-00
Hydrosystem RM&E	52	7	2008-105-00	Selective Gear Deployment	http://www.cbfish.org/Project.mvc/Display/2008-105-00
Hydrosystem RM&E	52	7	2008-908-00	FCRPS Water Studies & Passage of Adult Salmon & Steelhead	http://www.cbfish.org/Project.mvc/Display/2008-908-00
Hydrosystem RM&E	53	1	1987-127-00	Smolt Monitoring by Non-Federal Entities	http://www.cbfish.org/Project.mvc/Display/1987-127-00

BPA Research, Monitoring & Evaluation Projects

BiOp Strategy	Action #	Sub Action #	Project #	Project Title	Project URL
Hydrosystem RM&E	53	1	1991-029-00	Research, monitoring, and evaluation of emerging issues and measures to recover the Snake River fall Chinook salmon ESU	http://www.cbfish.org/Project.mvc/Display/1991-029-00
Hydrosystem RM&E	53	1	1991-051-00	Modeling and Evaluation Statistical Support for Life-Cycle Studies	http://www.cbfish.org/Project.mvc/Display/1991-051-00
Hydrosystem RM&E	53	1	1994-033-00	Fish Passage Center	http://www.cbfish.org/Project.mvc/Display/1994-033-00
Hydrosystem RM&E	53	2	1987-127-00	Smolt Monitoring by Non-Federal Entities	http://www.cbfish.org/Project.mvc/Display/1987-127-00
Hydrosystem RM&E	53	2	1991-028-00	Pit Tagging Wild Chinook	http://www.cbfish.org/Project.mvc/Display/1991-028-00
Hydrosystem RM&E	53	2	1991-029-00	Research, monitoring, and evaluation of emerging issues and measures to recover the Snake River fall Chinook salmon ESU	http://www.cbfish.org/Project.mvc/Display/1991-029-00
Hydrosystem RM&E	53	2	1991-051-00	Modeling and Evaluation Statistical Support for Life-Cycle Studies	http://www.cbfish.org/Project.mvc/Display/1991-051-00
Hydrosystem RM&E	53	2	1994-033-00	Fish Passage Center	http://www.cbfish.org/Project.mvc/Display/1994-033-00
Hydrosystem RM&E	53	2	1996-020-00	Comparative Survival Study (CSS)	http://www.cbfish.org/Project.mvc/Display/1996-020-00
Hydrosystem RM&E	53	3	1987-127-00	Smolt Monitoring by Non-Federal Entities	http://www.cbfish.org/Project.mvc/Display/1987-127-00
Hydrosystem RM&E	53	4	1987-127-00	Smolt Monitoring by Non-Federal Entities	http://www.cbfish.org/Project.mvc/Display/1987-127-00

BPA Research, Monitoring & Evaluation Projects

BiOp Strategy	Action #	Sub Action #	Project #	Project Title	Project URL
Hydrosystem RM&E	54	1	1989-107-00	Statistical Support For Salmon	http://www.cbfish.org/Project.mvc/Display/1989-107-00
Hydrosystem RM&E	54	1	2003-041-00	Evaluate Delayed (Extra) Mortality Associated with Passage of Yearling Chinook Salmon through Snake River Dams	http://www.cbfish.org/Project.mvc/Display/2003-041-00
Hydrosystem RM&E	54	2	1989-107-00	Statistical Support For Salmon	http://www.cbfish.org/Project.mvc/Display/1989-107-00
Hydrosystem RM&E	54	2	1993-029-00	Survival Estimate for Passage through Snake and Columbia River Dams and Reservoirs	http://www.cbfish.org/Project.mvc/Display/1993-029-00
Hydrosystem RM&E	54	3	2001-003-00	Adult PIT Detector Installation	http://www.cbfish.org/Project.mvc/Display/2001-003-00
Hydrosystem RM&E	54	4	1989-107-00	Statistical Support For Salmon	http://www.cbfish.org/Project.mvc/Display/1989-107-00
Hydrosystem RM&E	54	5	1987-127-00	Smolt Monitoring by Non-Federal Entities	http://www.cbfish.org/Project.mvc/Display/1987-127-00
Hydrosystem RM&E	54	5	1990-055-00	Idaho Steelhead Monitoring and Evaluation (M&E) Studies	http://www.cbfish.org/Project.mvc/Display/1990-055-00
Hydrosystem RM&E	54	5	2003-041-00	Evaluate Delayed (Extra) Mortality Associated with Passage of Yearling Chinook Salmon through Snake River Dams	http://www.cbfish.org/Project.mvc/Display/2003-041-00
Hydrosystem RM&E	54	6	1987-127-00	Smolt Monitoring by Non-Federal Entities	http://www.cbfish.org/Project.mvc/Display/1987-127-00

BPA Research, Monitoring & Evaluation Projects

BiOp Strategy	Action #	Sub Action #	Project #	Project Title	Project URL
Hydrosystem RM&E	54	6	1989-098-00	Salmon Studies in Idaho Rivers-Idaho Department of Fish and Game (IDFG)	http://www.cbfish.org/Project.mvc/Display/1989-098-00
Hydrosystem RM&E	54	6	1990-055-00	Idaho Steelhead Monitoring and Evaluation (M&E) Studies	http://www.cbfish.org/Project.mvc/Display/1990-055-00
Hydrosystem RM&E	54	6	1996-020-00	Comparative Survival Study (CSS)	http://www.cbfish.org/Project.mvc/Display/1996-020-00
Hydrosystem RM&E	54	6	2001-003-00	Adult PIT Detector Installation	http://www.cbfish.org/Project.mvc/Display/2001-003-00
Hydrosystem RM&E	54	6	2003-041-00	Evaluate Delayed (Extra) Mortality Associated with Passage of Yearling Chinook Salmon through Snake River Dams	http://www.cbfish.org/Project.mvc/Display/2003-041-00
Hydrosystem RM&E	54	7	1996-020-00	Comparative Survival Study (CSS)	http://www.cbfish.org/Project.mvc/Display/1996-020-00
Hydrosystem RM&E	54	7	1989-108-00	Modeling and Evaluation Support/Columbia River Integrated Statistical Program (CRISP)	http://www.cbfish.org/Project.mvc/Display/1991-051-00
Hydrosystem RM&E	54	7	1989-107-00	Statistical Support For Salmon	http://www.cbfish.org/Project.mvc/Display/1989-107-00
Hydrosystem RM&E	54	7	1993-029-00	Survival Estimate for Passage through Snake and Columbia River Dams and Reservoirs	http://www.cbfish.org/Project.mvc/Display/1993-029-00

BPA Research, Monitoring & Evaluation Projects

BiOp Strategy	Action #	Sub Action #	Project #	Project Title	Project URL
Hydrosystem RM&E	54	7	2003-041-00	Evaluate Delayed (Extra) Mortality Associated with Passage of Yearling Chinook Salmon through Snake River Dams	http://www.cbfish.org/Project.mvc/Display/2003-041-00
Hydrosystem RM&E	54	8	1989-098-00	Salmon Studies in Idaho Rivers-Idaho Department of Fish and Game (IDFG)	http://www.cbfish.org/Project.mvc/Display/1989-098-00
Hydrosystem RM&E	54	8	1990-077-00	Development of Systemwide Predator Control	http://www.cbfish.org/Project.mvc/Display/1990-077-00
Hydrosystem RM&E	54	8	2003-041-00	Evaluate Delayed (Extra) Mortality Associated with Passage of Yearling Chinook Salmon through Snake River Dams	http://www.cbfish.org/Project.mvc/Display/2003-041-00
Hydrosystem RM&E	54	9	1983-319-00	New Marking and Monitoring Technologies	http://www.cbfish.org/Project.mvc/Display/1983-319-00
Hydrosystem RM&E	54	11	2001-003-00	Adult PIT Detector Installation	http://www.cbfish.org/Project.mvc/Display/2001-003-00
Hydrosystem RM&E	54	12	1996-020-00	Comparative Survival Study (CSS)	http://www.cbfish.org/Project.mvc/Display/1996-020-00
Hydrosystem RM&E	54	12	2003-041-00	Evaluate Delayed (Extra) Mortality Associated with Passage of Yearling Chinook Salmon through Snake River Dams	http://www.cbfish.org/Project.mvc/Display/2003-041-00
Hydrosystem RM&E	54	13	1994-033-00	Fish Passage Center	http://www.cbfish.org/Project.mvc/Display/1994-033-00

BPA Research, Monitoring & Evaluation Projects

BiOp Strategy	Action #	Sub Action #	Project #	Project Title	Project URL
Hydrosystem RM&E	55	1	1987-127-00	Smolt Monitoring by Non-Federal Entities	http://www.cbfish.org/Project.mvc/Display/1987-127-00
Hydrosystem RM&E	55	1	1989-098-00	Salmon Studies in Idaho Rivers-Idaho Department of Fish and Game (IDFG)	http://www.cbfish.org/Project.mvc/Display/1989-098-00
Hydrosystem RM&E	55	1	1991-028-00	Pit Tagging Wild Chinook	http://www.cbfish.org/Project.mvc/Display/1991-028-00
Hydrosystem RM&E	55	1	1996-020-00	Comparative Survival Study (CSS)	http://www.cbfish.org/Project.mvc/Display/1996-020-00
Hydrosystem RM&E	55	1	2003-114-00	Coastal Ocean Acoustic Salmon Tracking (COAST)	http://www.cbfish.org/Project.mvc/Display/2003-114-00
Hydrosystem RM&E	55	2	1987-127-00	Smolt Monitoring by Non-Federal Entities	http://www.cbfish.org/Project.mvc/Display/1987-127-00
Hydrosystem RM&E	55	2	1991-028-00	Pit Tagging Wild Chinook	http://www.cbfish.org/Project.mvc/Display/1987-127-00
Hydrosystem RM&E	55	2	1991-051-00	Modeling and Evaluation Statistical Support for Life-Cycle Studies	http://www.cbfish.org/Project.mvc/Display/1987-127-00
Hydrosystem RM&E	55	2	1993-029-00	Survival Estimate for Passage through Snake and Columbia River Dams and Reservoirs	http://www.cbfish.org/Project.mvc/Display/1990-055-00
Hydrosystem RM&E	55	2	2003-041-00	Evaluate Delayed (Extra) Mortality Associated with Passage of Yearling Chinook Salmon through Snake River Dams	http://www.cbfish.org/Project.mvc/Display/2003-041-00
Hydrosystem RM&E	55	2	2003-114-00	Coastal Ocean Acoustic Salmon Tracking (COAST)	http://www.cbfish.org/Project.mvc/Display/2003-114-00

BPA Research, Monitoring & Evaluation Projects

BiOp Strategy	Action #	Sub Action #	Project #	Project Title	Project URL
Hydrosystem RM&E	55	3	1989-107-00	Statistical Support For Salmon	http://www.cbfish.org/Project.mvc/Display/1989-107-00
Hydrosystem RM&E	55	4	1989-108-00	Modeling and Evaluation Support/Columbia River Integrated Statistical Program (CRISP)	http://www.cbfish.org/Project.mvc/Display/1987-127-00
Hydrosystem RM&E	55	4	1987-127-00	Smolt Monitoring by Non-Federal Entities	http://www.cbfish.org/Project.mvc/Display/1987-127-00
Hydrosystem RM&E	55	4	1989-107-00	Statistical Support For Salmon	http://www.cbfish.org/Project.mvc/Display/1989-107-00
Hydrosystem RM&E	55	4	1991-029-00	Research, monitoring, and evaluation of emerging issues and measures to recover the Snake River fall Chinook salmon ESU	http://www.cbfish.org/Project.mvc/Display/1991-029-00
Hydrosystem RM&E	55	4	2002-032-00	Snake River Fall Chinook Salmon Life History Investigations	http://www.cbfish.org/Project.mvc/Display/2002-032-00
Hydrosystem RM&E	55	7	1983-319-00	New Marking and Monitoring Technologies	http://www.cbfish.org/Project.mvc/Display/1983-319-00
Hydrosystem RM&E	55	8	1983-319-00	New Marking and Monitoring Technologies	http://www.cbfish.org/Project.mvc/Display/1983-319-00
Hydrosystem RM&E	55	8	1989-107-00	Statistical Support For Salmon	http://www.cbfish.org/Project.mvc/Display/1989-107-00
Hydrosystem RM&E	55	8	2003-114-00	Coastal Ocean Acoustic Salmon Tracking (COAST)	http://www.cbfish.org/Project.mvc/Display/2003-114-00
Hydrosystem RM&E	55	9	1983-319-00	New Marking and Monitoring Technologies	http://www.cbfish.org/Project.mvc/Display/1983-319-00

BPA Research, Monitoring & Evaluation Projects

BiOp Strategy	Action #	Sub Action #	Project #	Project Title	Project URL
Tributary Habitat RM&E	56	1	1989-098-00	Salmon Studies in Idaho Rivers-Idaho Department of Fish and Game (IDFG)	http://www.cbfish.org/Project.mvc/Display/1989-098-00
Tributary Habitat RM&E	56	1	1990-055-00	Idaho Steelhead Monitoring and Evaluation (M&E) Studies	http://www.cbfish.org/Project.mvc/Display/1990-055-00
Tributary Habitat RM&E	56	1	1998-016-00	Escapement and Productivity of Spring Chinook and Steelhead	http://www.cbfish.org/Project.mvc/Display/1998-016-00
Tributary Habitat RM&E	56	1	2003-017-00	Integrated Status and Effectiveness Monitoring Program (ISEMP)	http://www.cbfish.org/Project.mvc/Display/2003-017-00
Tributary Habitat RM&E	56	1	2008-471-00	Upper Columbia Nutrient Supplementation	http://www.cbfish.org/Project.mvc/Display/2008-471-00
Tributary Habitat RM&E	56	1	2010-034-00	Upper Columbia Spring Chinook and Steelhead Juvenile and Adult Abundance, Productivity and Spatial Structure Monitoring	http://www.cbfish.org/Project.mvc/Display/2010-034-00
Tributary Habitat RM&E	56	1	2011-006-00	Columbia Habitat and Monitoring Program - Pilot (CHaMP-P)	http://www.cbfish.org/Project.mvc/Display/2011-006-00
Tributary Habitat RM&E	56	2	2003-017-00	Integrated Status and Effectiveness Monitoring Program (ISEMP)	http://www.cbfish.org/Project.mvc/Display/2003-017-00
Tributary Habitat RM&E	56	2	2008-471-00	Upper Columbia Nutrient Supplementation	http://www.cbfish.org/Project.mvc/Display/2008-471-00

BPA Research, Monitoring & Evaluation Projects

BiOp Strategy	Action #	Sub Action #	Project #	Project Title	Project URL
Tributary Habitat RM&E	56	2	2011-006-00	Columbia Habitat and Monitoring Program - Pilot (CHaMP-P)	http://www.cbfish.org/Project.mvc/Display/2011-006-00
Tributary Habitat RM&E	56	3	2003-017-00	Integrated Status and Effectiveness Monitoring Program (ISEMP)	http://www.cbfish.org/Project.mvc/Display/2003-017-00
Tributary Habitat RM&E	56	3	2003-022-00	Okanogan Basin Monitoring & Evaluation Program (OBMEP)	http://www.cbfish.org/Project.mvc/Display/2003-022-00
Tributary Habitat RM&E	56	3	2004-002-00	Pacific Northwest Aquatic Monitoring Program (PNAMP) Coordination	http://www.cbfish.org/Project.mvc/Display/2004-002-00
Tributary Habitat RM&E	56	3	2009-004-00	Monitoring Recovery Trends in Key Spring Chinook Habitat Variables and Validation of Population Viability Indicators	http://www.cbfish.org/Project.mvc/Display/2009-004-00
Tributary Habitat RM&E	56	3	2011-006-00	Columbia Habitat and Monitoring Program - Pilot (CHaMP-P)	http://www.cbfish.org/Project.mvc/Display/2011-006-00
Tributary Habitat RM&E	57	1	2003-017-00	Integrated Status and Effectiveness Monitoring Program (ISEMP)	http://www.cbfish.org/Project.mvc/Display/2003-017-00
Tributary Habitat RM&E	57	1	2009-004-00	Monitoring Recovery Trends in Key Spring Chinook Habitat Variables and Validation of Population Viability Indicators	http://www.cbfish.org/Project.mvc/Display/2009-004-00

BPA Research, Monitoring & Evaluation Projects

BiOp Strategy	Action #	Sub Action #	Project #	Project Title	Project URL
Tributary Habitat RM&E	57	1	2010-034-00	Upper Columbia Spring Chinook and Steelhead Juvenile and Adult Abundance, Productivity and Spatial Structure Monitoring	http://www.cbfish.org/Project.mvc/Display/2010-034-00
Tributary Habitat RM&E	57	1	2011-006-00	Columbia Habitat and Monitoring Program - Pilot (CHaMP-P)	http://www.cbfish.org/Project.mvc/Display/2011-006-00
Tributary Habitat RM&E	57	2	2003-017-00	Integrated Status and Effectiveness Monitoring Program (ISEMP)	http://www.cbfish.org/Project.mvc/Display/2003-017-00
Tributary Habitat RM&E	57	2	2011-006-00	Columbia Habitat and Monitoring Program - Pilot (CHaMP-P)	http://www.cbfish.org/Project.mvc/Display/2011-006-00
Tributary Habitat RM&E	57	3	1998-016-00	Escapement and Productivity of Spring Chinook and Steelhead	http://www.cbfish.org/Project.mvc/Display/1998-016-00
Tributary Habitat RM&E	57	3	2003-017-00	Integrated Status and Effectiveness Monitoring Program (ISEMP)	http://www.cbfish.org/Project.mvc/Display/2003-017-00
Tributary Habitat RM&E	57	3	2011-006-00	Columbia Habitat and Monitoring Program - Pilot (CHaMP-P)	http://www.cbfish.org/Project.mvc/Display/2011-006-00
Tributary Habitat RM&E	57	4	2003-017-00	Integrated Status and Effectiveness Monitoring Program (ISEMP)	http://www.cbfish.org/Project.mvc/Display/2003-017-00
Tributary Habitat RM&E	57	4	2010-034-00	Upper Columbia Spring Chinook and Steelhead Juvenile and Adult Abundance, Productivity and Spatial Structure Monitoring	http://www.cbfish.org/Project.mvc/Display/2010-034-00

BPA Research, Monitoring & Evaluation Projects

BiOp Strategy	Action #	Sub Action #	Project #	Project Title	Project URL
Tributary Habitat RM&E	57	4	2011-006-00	Columbia Habitat and Monitoring Program - Pilot (CHaMP-P)	http://www.cbfish.org/Project.mvc/Display/2011-006-00
Tributary Habitat RM&E	57	5	2004-002-00	Pacific Northwest Aquatic Monitoring Program (PNAMP) Coordination	http://www.cbfish.org/Project.mvc/Display/2004-002-00
Tributary Habitat RM&E	57	5	2009-004-00	Monitoring Recovery Trends in Key Spring Chinook Habitat Variables and Validation of Population Viability Indicators	http://www.cbfish.org/Project.mvc/Display/2009-004-00
Estuary Habitat RM&E	58	1	2003-007-00	Lower Columbia River Estuary Ecosystem Monitoring	http://www.cbfish.org/Project.mvc/Display/2003-007-00
Estuary Habitat RM&E	58	1	2003-114-00	Coastal Ocean Acoustic Salmon Tracking (COAST)	http://www.cbfish.org/Project.mvc/Display/2003-114-00
Estuary Habitat RM&E	58	3	1989-107-00	Statistical Support For Salmon	http://www.cbfish.org/Project.mvc/Display/1989-107-00
Estuary Habitat RM&E	58	3	1998-014-00	Ocean Survival Of Salmon and steelhead	http://www.cbfish.org/Project.mvc/Display/1998-014-00
Estuary Habitat RM&E	58	3	2003-007-00	Lower Columbia River Estuary Ecosystem Monitoring	http://www.cbfish.org/Project.mvc/Display/2003-007-00
Estuary Habitat RM&E	58	3	2003-009-00	Canada-USA Shelf Salmon Survival Study	http://www.cbfish.org/Project.mvc/Display/2003-010-00
Estuary Habitat RM&E	58	4	1998-014-00	Ocean Survival Of Salmon and steelhead	http://www.cbfish.org/Project.mvc/Display/1998-014-00
Estuary Habitat RM&E	59	1	2003-007-00	Lower Columbia River Estuary Ecosystem Monitoring	http://www.cbfish.org/Project.mvc/Display/2003-007-00

BPA Research, Monitoring & Evaluation Projects

BiOp Strategy	Action #	Sub Action #	Project #	Project Title	Project URL
Estuary Habitat RM&E	59	2	2003-007-00	Lower Columbia River Estuary Ecosystem Monitoring	http://www.cbfish.org/Project.mvc/Display/2003-007-00
Estuary Habitat RM&E	59	4	2004-002-00	Pacific Northwest Aquatic Monitoring Program (PNAMP) Coordination	http://www.cbfish.org/Project.mvc/Display/2004-002-00
Estuary Habitat RM&E	59	5	1998-014-00	Ocean Survival Of Salmon and steelhead	http://www.cbfish.org/Project.mvc/Display/1998-014-00
Estuary Habitat RM&E	59	5	2003-007-00	Lower Columbia River Estuary Ecosystem Monitoring	http://www.cbfish.org/Project.mvc/Display/2003-007-00
Estuary Habitat RM&E	59	5	2004-002-00	Pacific Northwest Aquatic Monitoring Program (PNAMP) Coordination	http://www.cbfish.org/Project.mvc/Display/2004-002-00
Estuary Habitat RM&E	60	1	2003-007-00	Lower Columbia River Estuary Ecosystem Monitoring	http://www.cbfish.org/Project.mvc/Display/2003-007-00
Estuary Habitat RM&E	61	1	1989-107-00	Statistical Support For Salmon	http://www.cbfish.org/Project.mvc/Display/1998-014-00
Estuary Habitat RM&E	61	1	1998-014-00	Ocean Survival Of Salmon and steelhead	http://www.cbfish.org/Project.mvc/Display/1998-014-00
Estuary Habitat RM&E	61	1	2003-007-00	Lower Columbia River Estuary Ecosystem Monitoring	http://www.cbfish.org/Project.mvc/Display/2003-007-00
Estuary Habitat RM&E	61	1	2003-009-00	Canada-USA Shelf Salmon Survival Study	http://www.cbfish.org/Project.mvc/Display/2003-009-00
Estuary Habitat RM&E	61	1	2003-114-00	Coastal Ocean Acoustic Salmon Tracking (COAST)	http://www.cbfish.org/Project.mvc/Display/2003-114-00
Estuary Habitat RM&E	61	2	1998-014-00	Ocean Survival Of Salmon and steelhead	http://www.cbfish.org/Project.mvc/Display/1998-014-00

BPA Research, Monitoring & Evaluation Projects

BiOp Strategy	Action #	Sub Action #	Project #	Project Title	Project URL
Estuary Habitat RM&E	61	2	2003-009-00	Canada-USA Shelf Salmon Survival Study	http://www.cbfish.org/Project.mvc/Display/2003-009-00
Estuary Habitat RM&E	61	2	2003-114-00	Coastal Ocean Acoustic Salmon Tracking (COAST)	http://www.cbfish.org/Project.mvc/Display/2003-114-00
Estuary Habitat RM&E	61	3	1989-107-00	Statistical Support For Salmon	http://www.cbfish.org/Project.mvc/Display/1989-107-00
Estuary Habitat RM&E	61	3	2003-007-00	Lower Columbia River Estuary Ecosystem Monitoring	http://www.cbfish.org/Project.mvc/Display/2003-007-00
Estuary Habitat RM&E	61	4	1998-014-00	Ocean Survival Of Salmon and steelhead	http://www.cbfish.org/Project.mvc/Display/1998-014-00
Harvest RM&E	62	1	2008-502-00	Expanded Tribal Catch Sampling	http://www.cbfish.org/Project.mvc/Display/2008-502-00
Harvest RM&E	62	1	2008-508-00	Power Analysis Catch Sampling Rates	http://www.cbfish.org/Project.mvc/Display/2008-508-00
Harvest RM&E	62	1	2008-908-00	FCRPS Water Studies & Passage of Adult Salmon & Steelhead	http://www.cbfish.org/Project.mvc/Display/2008-908-00
Harvest RM&E	62	2	2007-249-00	Evaluation of Live Capture Gear	http://www.cbfish.org/Project.mvc/Display/2007-249-00
Harvest RM&E	62	2	2008-105-00	Selective Gear Deployment	http://www.cbfish.org/Project.mvc/Display/2008-105-00
Harvest RM&E	62	3	2008-105-00	Selective Gear Deployment	http://www.cbfish.org/Project.mvc/Display/2008-105-00
Harvest RM&E	62	4	1982-013-01	Coded Wire Tag-Pacific States Marine Fisheries Commission (PSMFC)	http://www.cbfish.org/Project.mvc/Display/1982-013-01
Harvest RM&E	62	4	1982-013-02	Coded Wire Tag-Oregon Department of Fish and Wildlife (ODFW)	http://www.cbfish.org/Project.mvc/Display/1982-013-02

BPA Research, Monitoring & Evaluation Projects

BiOp Strategy	Action #	Sub Action #	Project #	Project Title	Project URL
Harvest RM&E	62	4	1982-013-03	Coded Wire Tag-US Fish and Wildlife Service (USFWS)	http://www.cbfish.org/Project.mvc/Display/1982-013-03
Harvest RM&E	62	4	1982-013-04	Coded Wire Tag-Washington Department of Fish and Wildlife (WDFW)	http://www.cbfish.org/Project.mvc/Display/1982-013-04
Harvest RM&E	62	4	1983-350-03	Nez Perce Tribal Hatchery Monitoring and Evaluation (M&E)	http://www.cbfish.org/Project.mvc/Display/1983-350-03
Harvest RM&E	62	4	1988-053-03	Hood River Production Monitoring and Evaluation (M&E)-Warm Springs	http://www.cbfish.org/Project.mvc/Display/1988-053-03
Harvest RM&E	62	4	1995-063-25	Yakima River Monitoring and Evaluation-Yakima/Klickitat Fisheries Project (YKFP)	http://www.cbfish.org/Project.mvc/Display/1995-063-25
Harvest RM&E	62	4	1997-015-01	Imnaha River Smolt Monitoring	http://www.cbfish.org/Project.mvc/Display/1997-015-01
Harvest RM&E	62	4	2002-060-00	Nez Perce Harvest Monitoring on Snake and Clearwater Rivers	http://www.cbfish.org/Project.mvc/Display/2002-060-00
Harvest RM&E	62	4	2010-028-00	Estimate Adult Steelhead Abundance in Small Streams Associated with Tucannon & Asotin Populations	http://www.cbfish.org/Project.mvc/Display/2010-028-00
Harvest RM&E	62	4	2010-036-00	Lower Columbia Coded Wire Tag (CWT) Recovery Project	http://www.cbfish.org/Project.mvc/Display/2010-036-00

BPA Research, Monitoring & Evaluation Projects

BiOp Strategy	Action #	Sub Action #	Project #	Project Title	Project URL
Harvest RM&E	62	5	1983-350-03	Nez Perce Tribal Hatchery Monitoring and Evaluation (M&E)	http://www.cbfish.org/Project.mvc/Display/1983-350-03
Harvest RM&E	62	5	1989-096-00	Genetic Monitoring and Evaluation (M&E) Program for Salmon and Steelhead	http://www.cbfish.org/Project.mvc/Display/1989-096-00
Harvest RM&E	62	5	1989-098-00	Salmon Studies in Idaho Rivers-Idaho Department of Fish and Game (IDFG)	http://www.cbfish.org/Project.mvc/Display/1989-098-00
Harvest RM&E	62	5	1990-055-00	Idaho Steelhead Monitoring and Evaluation (M&E) Studies	http://www.cbfish.org/Project.mvc/Display/1990-055-00
Harvest RM&E	62	5	1991-073-00	Idaho Natural Production Monitoring and Evaluation (M&E)	http://www.cbfish.org/Project.mvc/Display/1991-073-00
Harvest RM&E	62	5	1995-063-25	Yakima River Monitoring and Evaluation-Yakima/Klickitat Fisheries Project (YKFP)	http://www.cbfish.org/Project.mvc/Display/1995-063-25
Harvest RM&E	62	5	1995-063-35	Klickitat River Monitoring and Evaluation-Yakima/Klickitat Fisheries Project (YKFP)	http://www.cbfish.org/Project.mvc/Display/1995-063-35
Harvest RM&E	62	5	1996-043-00	Johnson Creek Artificial Propagation Enhancement	http://www.cbfish.org/Project.mvc/Display/1996-043-00
Harvest RM&E	62	5	1997-015-01	Imnaha River Smolt Monitoring	http://www.cbfish.org/Project.mvc/Display/1997-015-01
Harvest RM&E	62	5	1997-030-00	Chinook Salmon Adult Abundance Monitoring	http://www.cbfish.org/Project.mvc/Display/1997-030-00

BPA Research, Monitoring & Evaluation Projects

BiOp Strategy	Action #	Sub Action #	Project #	Project Title	Project URL
Harvest RM&E	62	5	1997-038-00	Listed Stock Chinook Salmon Gamete Preservation	http://www.cbfish.org/Project.mvc/Display/1997-038-00
Harvest RM&E	62	5	1998-007-02	Grande Ronde Supplementation Operations and Maintenance (O&M) and Monitoring and Evaluation (M&E) on Lostine River	http://www.cbfish.org/Project.mvc/Display/1998-007-02
Harvest RM&E	62	5	1998-016-00	Escapement and Productivity of Spring Chinook and Steelhead	http://www.cbfish.org/Project.mvc/Display/1998-016-00
Harvest RM&E	62	5	2002-030-00	Salmon and steelhead Progeny Markers	http://www.cbfish.org/Project.mvc/Display/2002-030-00
Harvest RM&E	62	5	2002-053-00	Asotin Creek Salmon Population Assessment	http://www.cbfish.org/Project.mvc/Display/2002-053-00
Harvest RM&E	62	5	2003-050-00	Evaluate the Reproductive Success of Wild and Hatchery Steelhead in Natural and Hatchery Environments	http://www.cbfish.org/Project.mvc/Display/2003-050-00
Harvest RM&E	62	5	2003-054-00	Evaluate the Relative Reproductive Success of Hatchery-Origin and Wild-Origin Steelhead Spawning Naturally in the Hood River	http://www.cbfish.org/Project.mvc/Display/2003-054-00

BPA Research, Monitoring & Evaluation Projects

BiOp Strategy	Action #	Sub Action #	Project #	Project Title	Project URL
Harvest RM&E	62	5	2003-063-00	Natural Reproductive Success and Demographic Effects of Hatchery-Origin Steelhead in Abernathy Creek, Washington	http://www.cbfish.org/Project.mvc/Display/2003-063-00
Harvest RM&E	62	5	2007-404-00	Spring Chinook Captive Propagation-Oregon	http://www.cbfish.org/Project.mvc/Display/2007-404-00
Harvest RM&E	62	5	2008-310-00	White River Supplementation	http://www.cbfish.org/Project.mvc/Display/2008-310-00
Harvest RM&E	62	5	2008-907-00	Genetic Assessment of Columbia River Stocks	http://www.cbfish.org/Project.mvc/Display/2008-907-00
Harvest RM&E	62	5	2009-005-00	Influence of Environment and Landscape on Salmon and steelhead Genetics	http://www.cbfish.org/Project.mvc/Display/2009-005-00
Harvest RM&E	62	5	2010-026-00	Chinook and Steelhead Genotyping for Genetic Stock Identification (GSI) at Lower Granite Dam	http://www.cbfish.org/Project.mvc/Display/2010-026-00
Harvest RM&E	62	5	2010-028-00	Estimate Adult Steelhead Abundance in Small Streams Associated with Tucannon & Asotin Populations	http://www.cbfish.org/Project.mvc/Display/2010-028-00
Harvest RM&E	62	5	2010-030-00	Project to provided VSP Estimates for Yakima Steelhead MPG	http://www.cbfish.org/Project.mvc/Display/2010-030-00
Harvest RM&E	62	5	2010-031-00	Snake River Chinook and Steelhead Parental Based Tagging	http://www.cbfish.org/Project.mvc/Display/2010-031-00

BPA Research, Monitoring & Evaluation Projects

BiOp Strategy	Action #	Sub Action #	Project #	Project Title	Project URL
Harvest RM&E	62	5	2010-032-00	Imnaha River Steelhead Status Monitoring	http://www.cbfish.org/Project.mvc/Display/2010-032-00
Hatchery RM&E	63	1	1989-096-00	Genetic Monitoring and Evaluation (M&E) Program for Salmon and Steelhead	http://www.cbfish.org/Project.mvc/Display/1989-096-00
Hatchery RM&E	63	1	1989-098-00	Salmon Studies in Idaho Rivers-Idaho Department of Fish and Game (IDFG)	http://www.cbfish.org/Project.mvc/Display/1989-098-00
Hatchery RM&E	63	1	1992-026-04	Grande Ronde Early Life History of Spring Chinook and Steelhead	http://www.cbfish.org/Project.mvc/Display/1992-026-04
Hatchery RM&E	63	1	1996-043-00	Johnson Creek Artificial Propagation Enhancement	http://www.cbfish.org/Project.mvc/Display/1996-043-00
Hatchery RM&E	63	1	1998-007-02	Grande Ronde Supplementation Operations and Maintenance (O&M) and Monitoring and Evaluation (M&E) on Lostine River	http://www.cbfish.org/Project.mvc/Display/1998-007-02
Hatchery RM&E	63	1	1998-007-03	Grande Ronde Supplementation O&M on Catherine Creek/Upper Grande Ronde River	http://www.cbfish.org/Project.mvc/Display/1998-007-03
Hatchery RM&E	63	1	1998-007-04	Grande Ronde Spring Chinook on Lostine/Catherine Creek/ Upper Grande Ronde Rivers	http://www.cbfish.org/Project.mvc/Display/1998-007-04

BPA Research, Monitoring & Evaluation Projects

BiOp Strategy	Action #	Sub Action #	Project #	Project Title	Project URL
Hatchery RM&E	63	1	1998-016-00	Escapement and Productivity of Spring Chinook and Steelhead	http://www.cbfish.org/Project.mvc/Display/1998-016-00
Hatchery RM&E	63	1	2007-083-00	Grande Ronde Supplementation Monitoring and Evaluation (M&E) on Catherine Creek/Upper Grande Ronde River	http://www.cbfish.org/Project.mvc/Display/2007-083-00
Hatchery RM&E	63	1	2007-132-00	NEOH Monitoring & Evaluation Implementation (Formerly a component of 198805301)	http://www.cbfish.org/Project.mvc/Display/2007-132-00
Hatchery RM&E	63	1	2007-402-00	Snake River Sockeye Captive Propagation	http://www.cbfish.org/Project.mvc/Display/2007-402-00
Hatchery RM&E	63	1	2008-710-00	Development of an Integrated strategy for Chum Salmon Restoration in the tributaries below Bonneville Dam	http://www.cbfish.org/Project.mvc/Display/2008-710-00
Hatchery RM&E	63	1	2010-042-00	Tucannon Expanded Pit Tagging	http://www.cbfish.org/Project.mvc/Display/2010-042-00
Hatchery RM&E	63	1	2010-057-00	B-run steelhead supplementation effectiveness research	http://www.cbfish.org/Project.mvc/Display/2010-042-00
Hatchery RM&E	63	1	2010-076-00	Characterizing migration and survival for juvenile Snake River sockeye salmon between the upper Salmon River Basin and Lower Granite Dam	http://www.cbfish.org/Project.mvc/Display/2010-076-00

BPA Research, Monitoring & Evaluation Projects

BiOp Strategy	Action #	Sub Action #	Project #	Project Title	Project URL
Hatchery RM&E	63	2	1993-056-00	Advance Hatchery Reform Research	http://www.cbfish.org/Project.mvc/Display/1993-056-00
Hatchery RM&E	63	2	2010-042-00	Tucannon Expanded Pit Tagging	http://www.cbfish.org/Project.mvc/Display/2010-042-00
Hatchery RM&E	63	2	2010-050-00	Evaluation of the Tucannon endemic program	http://www.cbfish.org/Project.mvc/Display/2010-050-00
Hatchery RM&E	64	1	1988-053-04	Hood River Production Monitor and Evaluation (M&E)-Oregon Department of Fish and Wildlife (ODFW)	http://www.cbfish.org/Project.mvc/Display/1988-053-04
Hatchery RM&E	64	1	1998-007-03	Grande Ronde Supplementation O&M on Catherine Creek/Upper Grande Ronde River	http://www.cbfish.org/Project.mvc/Display/1998-007-03
Hatchery RM&E	64	1	2003-054-00	Evaluate the Relative Reproductive Success of Hatchery-Origin and Wild-Origin Steelhead Spawning Naturally in the Hood River	http://www.cbfish.org/Project.mvc/Display/2003-054-00
Hatchery RM&E	64	1	2007-083-00	Grande Ronde Supplementation Monitoring and Evaluation (M&E) on Catherine Creek/Upper Grande Ronde River	http://www.cbfish.org/Project.mvc/Display/2007-083-00
Hatchery RM&E	64	2	1983-350-03	Nez Perce Tribal Hatchery Monitoring and Evaluation (M&E)	http://www.cbfish.org/Project.mvc/Display/1983-350-03
Hatchery RM&E	64	2	1988-053-01	Northeast Oregon Hatchery Master Plan	http://www.cbfish.org/Project.mvc/Display/1988-053-01

BPA Research, Monitoring & Evaluation Projects

BiOp Strategy	Action #	Sub Action #	Project #	Project Title	Project URL
Hatchery RM&E	64	2	1988-053-03	Hood River Production Monitoring and Evaluation (M&E)-Warm Springs	http://www.cbfish.org/Project.mvc/Display/1988-053-03
Hatchery RM&E	64	2	1988-053-04	Hood River Production Monitor and Evaluation (M&E)-Oregon Department of Fish and Wildlife (ODFW)	http://www.cbfish.org/Project.mvc/Display/1988-053-04
Hatchery RM&E	64	2	1988-053-15	Hood River Artificial Production-Parkdale	http://www.cbfish.org/Project.mvc/Display/1988-053-04
Hatchery RM&E	64	2	1989-096-00	Genetic Monitoring and Evaluation (M&E) Program for Salmon and Steelhead	http://www.cbfish.org/Project.mvc/Display/1989-096-00
Hatchery RM&E	64	2	1989-098-00	Salmon Studies in Idaho Rivers-Idaho Department of Fish and Game (IDFG)	http://www.cbfish.org/Project.mvc/Display/1989-098-00
Hatchery RM&E	64	2	1990-005-00	Umatilla Hatchery Monitoring and Evaluation (M&E)	http://www.cbfish.org/Project.mvc/Display/1989-098-00
Hatchery RM&E	64	2	1991-029-00	Research, monitoring, and evaluation of emerging issues and measures to recover the Snake River fall Chinook salmon ESU	http://www.cbfish.org/Project.mvc/Display/1991-029-00
Hatchery RM&E	64	2	1992-026-04	Grande Ronde Early Life History of Spring Chinook and Steelhead	http://www.cbfish.org/Project.mvc/Display/1992-026-04
Hatchery RM&E	64	2	1993-056-00	Advance Hatchery Reform Research	http://www.cbfish.org/Project.mvc/Display/1993-056-00

BPA Research, Monitoring & Evaluation Projects

BiOp Strategy	Action #	Sub Action #	Project #	Project Title	Project URL
Hatchery RM&E	64	2	1995-063-25	Yakima River Monitoring and Evaluation- Yakima/Klickitat Fisheries Project (YKFP)	http://www.cbfish.org/Project.mvc/Display/1995-063-25
Hatchery RM&E	64	2	1996-043-00	Johnson Creek Artificial Propagation Enhancement	http://www.cbfish.org/Project.mvc/Display/1996-043-00
Hatchery RM&E	64	2	1997-015-01	Imnaha River Smolt Monitoring	http://www.cbfish.org/Project.mvc/Display/1997-015-01
Hatchery RM&E	64	2	1997-030-00	Chinook Salmon Adult Abundance Monitoring	http://www.cbfish.org/Project.mvc/Display/1997-030-00
Hatchery RM&E	64	2	1998-007-02	Grande Ronde Supplementation Operations and Maintenance (O&M) and Monitoring and Evaluation (M&E) on Lostine River	http://www.cbfish.org/Project.mvc/Display/1998-007-02
Hatchery RM&E	64	2	1998-007-03	Grande Ronde Supplementation O&M on Catherine Creek/Upper Grande Ronde River	http://www.cbfish.org/Project.mvc/Display/1998-007-03
Hatchery RM&E	64	2	1998-007-04	Grande Ronde Spring Chinook on Lostine/Catherine Creek/ Upper Grande Ronde Rivers	http://www.cbfish.org/Project.mvc/Display/1998-007-04
Hatchery RM&E	64	2	1998-010-04	Monitor and Evaluate (M&E) Performance of Juvenile Snake River Fall Chinook Salmon from Fall Chinook Acclimation Project	http://www.cbfish.org/Project.mvc/Display/1998-010-04

BPA Research, Monitoring & Evaluation Projects

BiOp Strategy	Action #	Sub Action #	Project #	Project Title	Project URL
Hatchery RM&E	64	2	2000-039-00	Walla Walla River Basin Monitoring and Evaluation (M&E)	http://www.cbfish.org/Project.mvc/Display/2000-039-00
Hatchery RM&E	64	2	2003-039-00	Monitor and Evaluate (M&E) Reproductive Success and Survival in Wenatchee River	http://www.cbfish.org/Project.mvc/Display/2003-039-00
Hatchery RM&E	64	2	2003-050-00	Evaluate the Reproductive Success of Wild and Hatchery Steelhead in Natural and Hatchery Environments	http://www.cbfish.org/Project.mvc/Display/2003-050-00
Hatchery RM&E	64	2	2003-063-00	Natural Reproductive Success and Demographic Effects of Hatchery-Origin Steelhead in Abernathy Creek, Washington	http://www.cbfish.org/Project.mvc/Display/2003-063-00
Hatchery RM&E	64	2	2007-083-00	Grande Ronde Supplementation Monitoring and Evaluation (M&E) on Catherine Creek/Upper Grande Ronde River	http://www.cbfish.org/Project.mvc/Display/2007-083-00
Hatchery RM&E	64	2	2007-132-00	NEOH Monitoring & Evaluation Implementation (Formerly a component of 198805301)	http://www.cbfish.org/Project.mvc/Display/2007-132-00

BPA Research, Monitoring & Evaluation Projects

BiOp Strategy	Action #	Sub Action #	Project #	Project Title	Project URL
Hatchery RM&E	64	2	2007-299-00	Investigation of Relative Reproductive Success of Stray Hatchery & Wild Steelhead & Influence of Hatchery Strays on Natural Productivity in Deschutes	http://www.cbfish.org/Project.mvc/Display/2007-299-00
Hatchery RM&E	64	2	2007-401-00	Kelt Reconditioning and Reproductive Success Evaluation Research	http://www.cbfish.org/Project.mvc/Display/2007-401-00
Hatchery RM&E	64	2	2007-402-00	Snake River Sockeye Captive Propagation	http://www.cbfish.org/Project.mvc/Display/2007-402-00
Hatchery RM&E	64	2	2007-403-00	Spring Chinook Captive Propagation-Idaho	http://www.cbfish.org/Project.mvc/Display/2007-403-00
Hatchery RM&E	64	2	2007-404-00	Spring Chinook Captive Propagation-Oregon	http://www.cbfish.org/Project.mvc/Display/2007-404-00
Hatchery RM&E	64	2	2008-458-00	Steelhead Kelt Reconditioning	http://www.cbfish.org/Project.mvc/Display/2008-458-00
Hatchery RM&E	64	2	2010-031-00	Snake River Chinook and Steelhead Parental Based Tagging	http://www.cbfish.org/Project.mvc/Display/2010-031-00
Hatchery RM&E	64	2	2010-032-00	Imnaha River Steelhead Status Monitoring	http://www.cbfish.org/Project.mvc/Display/2010-032-00
Hatchery RM&E	64	2	2010-033-00	Study Reproductive Success of Hatchery and Natural Origin Steelhead in the Methow	http://www.cbfish.org/Project.mvc/Display/2010-033-00
Hatchery RM&E	64	2	2010-042-00	Tucannon Expanded Pit Tagging	http://www.cbfish.org/Project.mvc/Display/2010-042-00

BPA Research, Monitoring & Evaluation Projects

BiOp Strategy	Action #	Sub Action #	Project #	Project Title	Project URL
Hatchery RM&E	64	2	2010-085-00	Columbia River Hatchery Effects Evaluation Team (CRHEET)	http://www.cbfish.org/Project.mvc/Display/2010-085-00
Hatchery RM&E	64	3	2010-033-00	Study Reproductive Success of Hatchery and Natural Origin Steelhead in the Methow	http://www.cbfish.org/Project.mvc/Display/2010-033-00
Hatchery RM&E	65	1	1983-350-03	Nez Perce Tribal Hatchery Monitoring and Evaluation (M&E)	http://www.cbfish.org/Project.mvc/Display/1983-350-03
Hatchery RM&E	65	1	1991-029-00	Research, monitoring, and evaluation of emerging issues and measures to recover the Snake River fall Chinook salmon ESU	http://www.cbfish.org/Project.mvc/Display/1991-029-00
Hatchery RM&E	65	1	1998-010-04	Monitor and Evaluate (M&E) Performance of Juvenile Snake River Fall Chinook Salmon from Fall Chinook Acclimation Project	http://www.cbfish.org/Project.mvc/Display/1998-010-04
Hatchery RM&E	65	2	1983-350-03	Nez Perce Tribal Hatchery Monitoring and Evaluation (M&E)	http://www.cbfish.org/Project.mvc/Display/1983-350-03
Hatchery RM&E	65	2	1991-029-00	Research, monitoring, and evaluation of emerging issues and measures to recover the Snake River fall Chinook salmon ESU	http://www.cbfish.org/Project.mvc/Display/1991-029-00

BPA Research, Monitoring & Evaluation Projects

BiOp Strategy	Action #	Sub Action #	Project #	Project Title	Project URL
Hatchery RM&E	65	2	1998-010-04	Monitor and Evaluate (M&E) Performance of Juvenile Snake River Fall Chinook Salmon from Fall Chinook Acclimation Project	http://www.cbfish.org/Project.mvc/Display/1998-010-04
Predation Management RM&E	66	All	1997-024-00	Avian Predation on Juvenile Salmon and steelhead	http://www.cbfish.org/Project.mvc/Display/1997-024-00
Predation Management RM&E	67	All	1997-024-00	Avian Predation on Juvenile Salmon and steelhead	http://www.cbfish.org/Project.mvc/Display/1997-024-00
Predation Management RM&E	68	All	1997-024-00	Avian Predation on Juvenile Salmon and steelhead	http://www.cbfish.org/Project.mvc/Display/1997-024-00
Predation Management RM&E	69	All	2008-004-00	Sea Lion Non-Lethal Hazing	http://www.cbfish.org/Project.mvc/Display/2008-004-00
Predation Management RM&E	70	1	1990-077-00	Development of Systemwide Predator Control	http://www.cbfish.org/Project.mvc/Display/1990-077-00
Predation Management RM&E	70	2	1990-077-00	Development of Systemwide Predator Control	http://www.cbfish.org/Project.mvc/Display/1990-077-00
Predation Management RM&E	70	3	1990-077-00	Development of Systemwide Predator Control	http://www.cbfish.org/Project.mvc/Display/1990-077-00
Predation Management RM&E	70	4	2008-719-00	Research Non-Indigenous Actions	http://www.cbfish.org/Project.mvc/Display/2008-719-00

BPA Research, Monitoring & Evaluation Projects

BiOp Strategy	Action #	Sub Action #	Project #	Project Title	Project URL
Predation Management RM&E	70	4	2010-076-00	Characterizing migration and survival for juvenile Snake River sockeye salmon between the upper Salmon River Basin and Lower Granite Dam	http://www.cbfish.org/Project.mvc/Display/2010-076-00
Coordination and Data Management	71	3	2004-002-00	Pacific Northwest Aquatic Monitoring Program (PNAMP) Coordination	http://www.cbfish.org/Project.mvc/Display/2004-002-00
Coordination and Data Management	71	4	1988-108-04	StreamNet - Coordinated Information System (CIS)/ Northwest Environmental Database (NED)	http://www.cbfish.org/Project.mvc/Display/1988-108-04
Coordination and Data Management	71	4	2003-007-00	Lower Columbia River Estuary Ecosystem Monitoring	http://www.cbfish.org/Project.mvc/Display/2003-007-00
Coordination and Data Management	71	4	2003-017-00	Integrated Status and Effectiveness Monitoring Program (ISEMP)	http://www.cbfish.org/Project.mvc/Display/2003-017-00
Coordination and Data Management	71	4	2003-022-00	Okanogan Basin Monitoring & Evaluation Program (OBMEP)	http://www.cbfish.org/Project.mvc/Display/2003-022-00
Coordination and Data Management	71	4	2004-002-00	Pacific Northwest Aquatic Monitoring Program (PNAMP) Coordination	http://www.cbfish.org/Project.mvc/Display/2004-002-00

BPA Research, Monitoring & Evaluation Projects

BiOp Strategy	Action #	Sub Action #	Project #	Project Title	Project URL
Coordination and Data Management	71	4	2007-083-00	Grande Ronde Supplementation Monitoring and Evaluation (M&E) on Catherine Creek/Upper Grande Ronde River	http://www.cbfish.org/Project.mvc/Display/2007-083-00
Coordination and Data Management	71	4	2008-507-00	Tribal Data Network	http://www.cbfish.org/Project.mvc/Display/2008-507-00
Coordination and Data Management	71	4	2011-006-00	Columbia Habitat and Monitoring Program - Pilot (CHaMP-P)	http://www.cbfish.org/Project.mvc/Display/2011-006-00
Coordination and Data Management	71	5	2003-017-00	Integrated Status and Effectiveness Monitoring Program (ISEMP)	http://www.cbfish.org/Project.mvc/Display/2003-017-00
Coordination and Data Management	71	5	2004-002-00	Pacific Northwest Aquatic Monitoring Program (PNAMP) Coordination	http://www.cbfish.org/Project.mvc/Display/2004-002-00
Coordination and Data Management	72	1	1988-108-04	StreamNet - Coordinated Information System (CIS)/ Northwest Environmental Database (NED)	http://www.cbfish.org/Project.mvc/Display/1988-108-04
Coordination and Data Management	72	1	1989-062-01	Annual Work Plan for Columbia Basin Fish and Wildlife Authority (CBFWA)	http://www.cbfish.org/Project.mvc/Display/1989-062-01
Coordination and Data Management	72	1	1990-080-00	Columbia Basin Pit-Tag Information	http://www.cbfish.org/Project.mvc/Display/1990-080-00

BPA Research, Monitoring & Evaluation Projects

BiOp Strategy	Action #	Sub Action #	Project #	Project Title	Project URL
Coordination and Data Management	72	1	1996-019-00	Data Access in Real Time (DART)	http://www.cbfish.org/Project.mvc/Display/1996-019-00
Coordination and Data Management	72	1	2003-007-00	Lower Columbia River Estuary Ecosystem Monitoring	http://www.cbfish.org/Project.mvc/Display/2003-017-00
Coordination and Data Management	72	1	2003-017-00	Integrated Status and Effectiveness Monitoring Program (ISEMP)	http://www.cbfish.org/Project.mvc/Display/2003-017-00
Coordination and Data Management	72	1	2003-022-00	Okanogan Basin Monitoring & Evaluation Program (OBMEP)	http://www.cbfish.org/Project.mvc/Display/2003-022-00
Coordination and Data Management	72	1	2004-002-00	Pacific Northwest Aquatic Monitoring Program (PNAMP) Coordination	http://www.cbfish.org/Project.mvc/Display/2004-002-00
Coordination and Data Management	72	1	2007-083-00	Grande Ronde Supplementation Monitoring and Evaluation (M&E) on Catherine Creek/Upper Grande Ronde River	http://www.cbfish.org/Project.mvc/Display/2007-083-00
Coordination and Data Management	72	1	2008-507-00	Tribal Data Network	http://www.cbfish.org/Project.mvc/Display/2008-507-00
Coordination and Data Management	72	1	2011-006-00	Columbia Habitat and Monitoring Program - Pilot (CHaMP-P)	http://www.cbfish.org/Project.mvc/Display/2011-006-00
Coordination and Data Management	72	2	1988-108-04	StreamNet - Coordinated Information System (CIS)/ Northwest Environmental Database (NED)	http://www.cbfish.org/Project.mvc/Display/1988-108-04

BPA Research, Monitoring & Evaluation Projects

BiOp Strategy	Action #	Sub Action #	Project #	Project Title	Project URL
Coordination and Data Management	72	2	1989-062-01	Annual Work Plan for Columbia Basin Fish and Wildlife Authority (CBFWA)	http://www.cbfish.org/Project.mvc/Display/1989-062-01
Coordination and Data Management	72	2	1990-080-00	Columbia Basin Pit-Tag Information	http://www.cbfish.org/Project.mvc/Display/1990-080-00
Coordination and Data Management	72	2	1996-019-00	Data Access in Real Time (DART)	http://www.cbfish.org/Project.mvc/Display/1996-019-00
Coordination and Data Management	72	2	1997-015-01	Imnaha River Smolt Monitoring	http://www.cbfish.org/Project.mvc/Display/1997-015-01
Coordination and Data Management	72	2	2003-017-00	Integrated Status and Effectiveness Monitoring Program (ISEMP)	http://www.cbfish.org/Project.mvc/Display/2003-017-00
Coordination and Data Management	72	2	2008-507-00	Tribal Data Network	http://www.cbfish.org/Project.mvc/Display/2008-507-00
Coordination and Data Management	72	2	2011-006-00	Columbia Habitat and Monitoring Program - Pilot (CHaMP-P)	http://www.cbfish.org/Project.mvc/Display/2011-006-00
Coordination and Data Management	72	3	1988-108-04	StreamNet - Coordinated Information System (CIS)/ Northwest Environmental Database (NED)	http://www.cbfish.org/Project.mvc/Display/1988-108-04
Coordination and Data Management	72	3	1989-062-01	Annual Work Plan for Columbia Basin Fish and Wildlife Authority (CBFWA)	http://www.cbfish.org/Project.mvc/Display/1989-062-01

BPA Research, Monitoring & Evaluation Projects

BiOp Strategy	Action #	Sub Action #	Project #	Project Title	Project URL
Coordination and Data Management	72	3	2003-007-00	Lower Columbia River Estuary Ecosystem Monitoring	http://www.cbfish.org/Project.mvc/Display/2003-007-00
Coordination and Data Management	72	3	2004-002-00	Pacific Northwest Aquatic Monitoring Program (PNAMP) Coordination	http://www.cbfish.org/Project.mvc/Display/2004-002-00
Coordination and Data Management	72	3	2008-507-00	Tribal Data Network	http://www.cbfish.org/Project.mvc/Display/2008-507-00
Coordination and Data Management	72	3	2011-006-00	Columbia Habitat and Monitoring Program - Pilot (CHaMP-P)	http://www.cbfish.org/Project.mvc/Display/2011-006-00
Implementation and Compliance Monitoring	73	1	2010-075-00	Upper Columbia Implementation and Action Effectiveness Monitoring	http://www.cbfish.org/Project.mvc/Display/2010-075-00

Appendix A: Project Lists

Note: The projects below are those scheduled for implementation in 2014 only. Projects are determined on a year-by-year basis, using existing regional processes.

COE Research, Monitoring & Evaluation Projects

BiOp Strategy	Action #	Sub-Action #	Project Location	Project ID	Project Title	Project URL
	Accords		System-wide	118738	Lamprey passage studies	Not available online
Monitor the Status of Selected Fish Populations Related to FCRPS Actions	50		System-wide	O&M	Adult fish counting at dams	Not available online
Hydrosystem Research, Monitoring, and Evaluation	52		John Day	156117	Performance verification monitoring (subyearling fall Chinook only)	Not available online
Hydrosystem Research, Monitoring, and Evaluation	52		Little Goose	370855	Lower Snake River Adult Passage Evaluation	Not available online
Hydrosystem Research, Monitoring, and Evaluation	52		Lower Granite	394768	Seasonal Effects of Transportation	Not available online
Hydrosystem Research, Monitoring, and Evaluation	52		McNary	334889	Performance Verification Monitoring	Not available online
Hydrosystem Research, Monitoring, and Evaluation	52		System-wide	O&M	Adult fish counting at dams	Not available online

COE Research, Monitoring & Evaluation Projects

BiOp Strategy	Action #	Sub-Action #	Project Location	Project ID	Project Title	Project URL
Hydrosystem Research, Monitoring, and Evaluation	52		System-wide	118618	Lower Columbia River adult migration studies	Not available online
Hydrosystem Research, Monitoring, and Evaluation	53		System-wide	O&M	Smolt monitoring facilities fish condition monitoring	Not available online
Hydrosystem Research, Monitoring, and Evaluation	53		System-wide	118618	Lower Columbia River adult migration studies	Not available online
Hydrosystem Research, Monitoring, and Evaluation	54		John Day	156117	Performance verification monitoring (subyearling fall Chinook only)	Not available online
Hydrosystem Research, Monitoring, and Evaluation	54		Little Goose	370855	Lower Snake River Adult Passage Evaluation	Not available online
Hydrosystem Research, Monitoring, and Evaluation	54		Lower Granite	394768	Seasonal Effects of Transportation	Not available online
Hydrosystem Research, Monitoring, and Evaluation	54		Lower Granite	372857	Lower Granite enlarged orifice & Overflow weir evaluation – Juvenile Fish Facility Upgrade Prototype Testing.	Not available online

COE Research, Monitoring & Evaluation Projects

BiOp Strategy	Action #	Sub-Action #	Project Location	Project ID	Project Title	Project URL
Hydrosystem Research, Monitoring, and Evaluation	54		McNary	397664	Direct Survival through TSWs and Turbine Units at McNary Dam for Overwintering Adult Steelhead	Not available online
Hydrosystem Research, Monitoring, and Evaluation	54		McNary	334889	Performance Verification Monitoring	Not available online
Hydrosystem Research, Monitoring, and Evaluation	54		System-wide	O&M	Avian deterrence at dams	Not available online
Hydrosystem Research, Monitoring, and Evaluation	54		System-wide	118618	Lower Columbia River adult migration studies	Not available online
Hydrosystem Research, Monitoring, and Evaluation	55		Lower Granite	394768	Seasonal Effects of Transportation	Not available online
Estuary Habitat and Ocean Research, Monitoring, and Evaluation	58-61		Estuary		Estuary Restoration: Creation and restoration of shallow water habitat	Not available online
Estuary Habitat and Ocean Research, Monitoring, and Evaluation	58-61		Estuary		Estuary Restoration: Improvements to fish passage	Not available online

COE Research, Monitoring & Evaluation Projects

BiOp Strategy	Action #	Sub-Action #	Project Location	Project ID	Project Title	Project URL
Estuary Habitat and Ocean Research, Monitoring, and Evaluation	58-61		Estuary		Estuary Restoration: Restoration of floodplain function	Not available online
Estuary Habitat and Ocean Research, Monitoring, and Evaluation	58-61		Estuary		Estuary Restoration: Restoration of wetlands	Not available online
Predation Management Research, Monitoring, and Evaluation	66		Estuary	122681	Estuary avian predation: terns and cormorants	http://www.birdresearchnw.org/
Predation Management Research, Monitoring, and Evaluation	66		Estuary	107844	Estuary avian PIT tag recovery	http://www.birdresearchnw.org/
Predation Management Research, Monitoring, and Evaluation	67		Estuary	122681	Estuary avian predation: terns and cormorants	http://www.birdresearchnw.org/
Predation Management Research, Monitoring, and Evaluation	67		Estuary	107844	Estuary avian PIT tag recovery	http://www.birdresearchnw.org/

COE Research, Monitoring & Evaluation Projects

BiOp Strategy	Action #	Sub-Action #	Project Location	Project ID	Project Title	Project URL
Predation Management Research, Monitoring, and Evaluation	68		System-Wide		Inland Avian RM&E Based Upon Management Plan Recommendations	Not available online
Predation Management Research, Monitoring, and Evaluation	69		Bonneville	O&M	Pinniped management and monitoring	http://www.nwd-wc.usace.army.mil/tmt/documents/fish/
	Accords		System-wide	118738	Lamprey passage studies	Not available online

Reclamation Research, Monitoring & Evaluation Projects

BiOp Strategy	Action #	Sub Action #	Project #	Project Name	Project URL
Tributary Habitat RME	57	All	4887	Methow Channel Restoration Fish Productivity Response	http://www.usbr.gov/pn/fcrps/rme/methowimw/MethowIMW032013.pdf
Tributary Habitat RME	57	All	4806	Landscape Influences on Stream Condition	http://www.usbr.gov/pn/fcrps/rme/methowimw/MethowIMW032013.pdf
Tributary Habitat RME	56, 57	All	4445	Methow River Basin Demonstration	http://www.usbr.gov/pn/fcrps/rme/methowimw/MethowIMW032013.pdf
Coord & Data Management RME	71	All	4930	PNAMP	Not available online
Coord & Data Management RME	72	All	4445	Integrated Data Modeling, Analyst and Management Activities	Not available online

Appendix B: Tributary Habitat Supplemental Projects

Table B-1 summarizes limiting factors, metrics, and estimated habitat quality improvements (HQIs) for Snake River Chinook and steelhead and Upper Columbia Chinook populations associated with a menu of 2013 to 2018 supplemental projects²⁰. The Action Agencies developed the menu of proposed supplemental projects together with Fish Accord and other tribal partners in order to assure enough projects to meet or exceed HQIs for all RPA Action 35 Table 5 populations. Metrics can address one or more limiting factors in adjacent columns shown between horizontal lines.

The following metric definitions and units are used in this table.

Flow: Water protected by efficiency improvements and water purchase/lease projects, reported as either volume in acre-feet per year (AF) or as river flow in cubic feet per second (cfs).

Entrainment: Number of screens addressed can include new screens installed, existing screens improved for compliance with criteria, or entrainment issues addressed by elimination/consolidation of diversions.

Passage: Number of barriers addressed by providing passage or removing the barrier, reported to include number of miles of access improved by addressing the barriers.

Complexity: Miles of instream channel improved by adding habitat features via wood or boulder structures, or reconnecting existing habitat such as side channels.

WQ/Riparian: Projects undertaken to improve water quality by enhancing or protecting instream habitat or riparian function are reported in four different ways as described below.

- Stream miles protected: Miles of stream habitat protected, typically by land purchases, conservation easements, or fencing projects that improve land use practices such as excluding cattle from the stream.
- Stream miles improved: Miles of stream habitat improved, typically by projects that enhance the function of the streambank such as planting native vegetation on the streambanks.
- Riparian acres protected: Acres of riparian habitat protected by purchases or conservation easements that improve land use practices, allowing natural processes to reestablish riparian habitat.
- Riparian acres improved: Acres of riparian habitat improved by projects to improve riparian habitat such as planting native vegetation or control of noxious weeds.

The 2018 Habitat Quality Improvement Estimates column depicts the 2018 RPA Action 35, Table 5 HQI and the status of progress on meeting or exceeding 2018 RPA Action 35, Table 5 HQIs with:

- HQIs determined from expert panel results for actions completed from 2007 to 2011 and for the menu of 2012 to 2018 projects (Appendix A) evaluated by expert panels for each population.
- HQIs from the 2008 Columbia Basin Fish Accords between the Three Treaty Tribes and FCRPS Action Agencies. The Fish Accords included menus of habitat improvement projects. At the time the Accords were negotiated, the Umatilla, Warms Springs, and Yakama Tribes developed

²⁰ Supplemental projects will be reviewed by the 2015 expert panels to confirm estimated metric benefits. Unlike the table of projects evaluated by the expert panels that includes a column with BPA project numbers (Appendix A), this supplemental project table will be associated with BPA projects when the expert panels reconvene in 2015. Therefore, this table does not include a project column like that in Appendix A.

Appendix B: Tributary Habitat Supplemental Projects

population-level habitat improvement estimates (the “2018 Accord estimates”) for the menu of Accord projects through 2018, using the same methodology applied by the expert panels. These estimates denote the anticipated benefits from Accord projects and are reported separately in this table. Subsequently, the expert panels have evaluated these Accord projects alongside other proposed and completed tributary habitat projects. Therefore, the expert-panel generated HQIs in the following table reflect habitat improvements associated with the Accord projects as well as other tributary habitat projects supported by the Action Agencies.

HQIs for the menu of supplemental projects identified by Fish Accord partners and the Action Agencies for completion from 2013 to 2018 are provided (see Draft CE, Appendix A).

Supplemental projects were not evaluated by the 2012 expert panels. HQIs for metrics associated with the supplemental projects were estimated by the Action Agencies from the relation between HQIs and metrics for projects evaluated by the expert panels (see Draft CE, Appendix B). Projects not evaluated by the 2012 expert panels will be evaluated by the panels in 2015. Supplemental projects have been developed only for those six priority populations that the 2012 expert panels identified as needing additional habitat improvement actions.

Entries in the “2018 Habitat Quality Improvement Estimates” column in this table and in the “Tributary Habitat Projects” table in Appendix A are the same and are repeated in each table for convenience.

❖ Indicates populations with Reclamation involvement. Reclamation provides technical assistance to states, tribes, federal agencies, and other local partners for identification, design, and construction of stream habitat improvement projects that primarily address streamflow, access, entrainment, and channel complexity limiting factors.

Table B-1.

Population	Metric Category	Limiting Factors to Be Addressed in 2013-2018	2013-2018 Project Metrics	Source of Projects and Metrics	2018 Habitat Quality Improvement Estimates
❖Catherine Creek	Flow:	9.2: Decreased Water Quantity	Improve flow by 3 cfs	Confederated Tribes of the Umatilla Indian Reservation	2018 Table 5 HQI: 23% 2007-11 Accomplishment: 5% 2012-18 Estimate: 6% Supplemental Estimate: 4% 2018 Fish Accord Estimate: 10%
	Passage:	1.1: Anthropogenic Barriers	Address 1 barrier		
	Complexity:	6.1: Bed and Channel Form 6.2: Instream Structural Complexity	Improve 12.45 instream miles		
		4.2: LWD Recruitment 5.1: Side Channel and Wetland Conditions 5.2: Floodplain Condition 7.2: Increased Sediment Quantity 8.1: Temperature 8.2: Oxygen 8.4: Turbidity			
❖Grande Ronde River Upper Mainstem	Flow:	9.2: Decreased Water Quantity	Improve flow by 14 cfs	Confederated Tribes of the Umatilla Indian Reservation	2018 Table 5 HQI: 23% 2007-11 Accomplishment: 4% 2012-18 Estimate: 1% Supplemental Estimate: 18% 2018 Fish Accord Estimate: 18%
	Passage:	1.1: Anthropogenic Barriers	Address 2 barriers, improve 12 mi.; address 2 screens		
	Complexity:	6.1: Bed and Channel Form 6.2: Instream Structural Complexity	Improve 38 instream mi.		
	WQ/Riparian:	4.1: Riparian Condition 4.2: LWD Recruitment 7.2: Increased Sediment Quantity 8.1 Temperature	Improve 17.4 riparian miles		

Appendix B: Tributary Habitat Supplemental Projects

Population	Metric Category	Limiting Factors to Be Addressed in 2013-2018	2013-2018 Project Metrics	Source of Projects and Metrics	2018 Habitat Quality Improvement Estimates
❖Yankee Fork	Complexity:	6.1: Bed and Channel Form 6.2: Instream Structural Complexity	Improve 7 instream miles	Yankee Fork Interdisciplinary Team ²¹	2018 Table 5 HQI: 30% 2007-11 Accomplishment: 0% 2012-18 Estimate: 21% Supplemental Estimate: 22%
❖Entiat	Complexity:	6.1: Bed and Channel Form	Improve 12.5 instream miles	Yakama Nation	2018 Table 5 HQI: 22% 2007-11 Accomplishment: 3% 2012-18 Estimate: 6% Supplemental Estimate: 15% 2018 Fish Accord Estimate: 19%
		6.2: Instream Structural Complexity	Address 100 structures		
❖Lochsa River	WQ/Riparian:	4.1: Riparian Condition 5.1: Side Channel and Wetland Conditions 5.2: Floodplain Condition 7.2: Increased Sediment Quantity		Nez Perce Tribe	2018 Table 5 HQI: 16% 2007-11 Accomplishment: 6% 2012-18 Estimate: 2% Supplemental Estimate: 9%
	Passage:	1.1: Anthropogenic Barriers	Address 31 barriers, improve 12 mi.		
	Complexity:	6.2: Instream Structural Complexity	Improve 0.25 instream miles		
	WQ/Riparian:	4.1: Riparian Condition 4.2: LWD Recruitment 7.2: Increased Sediment Quantity 8.1: Temperature	Improve 4,000 riparian acres Improve 385 road miles		

²¹ Includes Shoshone-Bannock Tribes, Idaho Office of Species Conservation, Idaho Department of Fish and Game, Upper Salmon Basin Watershed Project, Trout Unlimited, U.S. Forest Service.

Appendix B: Tributary Habitat Supplemental Projects

Population	Metric Category	Limiting Factors to Be Addressed in 2013-2018	2013-2018 Project Metrics	Source of Projects and Metrics	2018 Habitat Quality Improvement Estimates
South Fork Clearwater River	Passage:	1.1: Anthropogenic Barriers	Address 3 barriers, improve 150 mi.	Nez Perce Tribe	2018 Table 5 HQI: 14% 2007-11 Accomplishment: 4% 2012-18 Estimate: 9% Supplemental Estimate: 4%
	Complexity:	6.2: Instream Structural Complexity	Improve 0.25 instream miles, address 35 structures		
	WQ/Riparian:	4.1: Riparian Condition			
		4.2: LWD Recruitment	Improve 0.34 riparian miles		
		5.1: Side Channel and Wetland Conditions			
		5.2: Floodplain Condition	Improve 10.6 wetland acres		
		7.2: Increased Sediment Quantity	Improve 63 road miles		
		8.1: Temperature			

Appendix C: Tributary Habitat Adaptive Management Plan

The Action Agencies continue to implement an extensive tributary habitat program addressing 56 individual populations of salmon and steelhead described in the 2008/2010 FCRPS BiOp (RPA Action 35, Table 5).

Significant progress has been made in the Action Agencies and regional partners' ability to plan and implement habitat improvement projects that address key limiting factors with the greatest benefit for salmon and steelhead. The tributary habitat program has always used an adaptive management approach, incorporating new information, science, and technical advances into project selection, prioritization, and implementation. This plan builds on that program-wide effort and is focused on explaining, for transparency purposes, the specific steps that were taken to adjust the program based on the 2013 Comprehensive Evaluation (CE) findings.

In the CE analysis, the Action Agencies found that results from the expert panel evaluations of tributary habitat improvements projected that HQI's would be met or exceeded for all RPA Action 35, Table 5, populations by 2018, except for six priority populations. This plan, in the context of on-going adaptive management, explains the adjustments the Action Agencies made to meet the HQIs for these six populations.

Specific components to stay on track to meet BiOp goals include:

- *Habitat projects reviewed for benefits by the 2012 expert panels.* Results from the 2012 expert panels indicate that 12 of 18 priority populations evaluated by the expert panels and 37 of 38 remaining populations have either already or are projected to meet or exceed the FCRPS BiOp RPA Action 35, Table 5 HQIs for Chinook and steelhead by 2018 (2013 Draft CE, Table 35). The Action Agencies have committed to implement projects from a "menu of projects" as necessary to meet or exceed the RPA Action 35, Table 5 HQIs. The menu of projects evaluated by the expert panels is presented in Implementation Plan (IP) Appendix A— Tributary Habitat Projects table.
- *Supplemental habitat projects for the six priority populations where 2012 expert panel results were not projected to reach Table 5 HQIs.* The Action Agencies, with Fish Accord and other partners, have identified and evaluated a menu of additional habitat projects where they may be necessary to meet the 2018 Table 5 HQIs for four priority and one other Chinook populations and for two priority steelhead populations (2013 Draft CE, Table 35). These supplemental habitat projects will be implemented as necessary to meet the 2018 targets under the Fish Accords or through existing contracts. All the supplemental projects took limiting factors for each population into consideration and built from geomorphic analysis or tributary and reach assessments completed by federal and local entities. Supplemental projects are presented in IP Appendix B. The Action Agencies estimated the benefits of these supplemental habitat projects using results from the expert panels as a basis for an interim estimate. Supplemental projects will be reviewed by the expert panels as they perform their evaluations in 2015.
- *Insurance Plan.* As an added precaution for meeting BiOp commitments, a "replacement project strategy" may be implemented in the event that the program is not projected in 2015 to meet the 2018 target for any priority population. This would be determined after the 2015 expert panels evaluate progress and projections for implementation. The Action Agencies have coordinated with NOAA to develop a methodology for "replacement projects" as called for in RPA Action 35. The replacement project strategy is presented in IP Appendix D.

The single exception to identifying a complete suite of projects at this time to meet 2018 Table 5 HQIs is the Catherine Creek population of Snake River spring Chinook. Projects have been identified to achieve a significant portion of the HQI target and a strategy for achieving the complete target by 2018 has been adopted. This strategy includes methods already applied for other populations that accelerate the identification, planning, and development of additional habitat improvement projects to meet or exceed 2018 Table 5 HQIs as well as reforms completed for the Lookingglass Creek hatchery. Hatchery operations produced a 12 percent life-cycle survival improvement and provide benefits in the tributary habitat life-history stage comparable to those obtained from tributary habitat improvement

projects (see the section “Supplemental projects for the Catherine Creek Chinook priority population, Habitat Quality Improvement” in the Draft CE Appendix A and CE Appendix C).

On-going Adaptive Management

This summary of tributary habitat adaptive management is extracted from the full description located in Appendix A of the Draft CE. The Action Agencies will continue to incorporate new science findings regarding climate change to inform tributary and estuary habitat project selection and prioritization and other aspects of adaptive management [AMIP p. 25]. In addition, the Action Agencies will incorporate new pertinent information from NOAA’s life-cycle model development. The Action Agencies will continue to provide expert panels with new climate change or life cycle model information from NOAA Fisheries prior to the next round of workshops. This will allow information to be incorporated into expert panel consideration of the biological benefits of habitat improvement actions.

The Action Agencies facilitated the transition of limiting factors used by the expert panels prior to 2012 to a standardized set of limiting factors and limiting factor definitions provided by NOAA Fisheries’ Northwest Fisheries Science Center in October 2011. The standardized limiting factors provide a measure of consistency for evaluating projects proposed for populations addressed by the expert panels.

The Action Agencies developed Limiting Factor Pie Maps that illustrate which limiting factors are most important to address with habitat improvement projects and where those projects will provide the most benefit for anadromous fish. Information presented on the maps includes population assessment units²², limiting factors, and limiting factor habitat conditions. All data on the maps are developed or approved by expert panel members. Source data includes scientific reports and analyses (such as EDT - Ecosystem Diagnostic and Treatment modeling), NOAA Fisheries’ intrinsic potential analyses, research, and professional judgment of local biologists and members of the expert panel.

Extensive research, monitoring, and evaluation of fish populations and watershed conditions help demonstrate the benefits that tributary habitat improvement projects have on fish production, growth, and survival in the tributaries; establish and model relations among completion of habitat improvement projects, changes in habitat condition, and resulting changes in fish growth and survival; and tailor actions to maximize benefit for fish. The results are refining the region’s understanding of the relation among habitat improvement actions and resultant changes in habitat condition and fish response. This information and the summary and dissemination of information that follows will help refine planning and selection of habitat improvement projects that provide the greatest benefits for fish. The results also inform the expert panel assessment of the benefits of habitat improvements in the seven priority areas where expert panels convene. On-going research, monitoring, and evaluation work includes:

- *Fish status and trend monitoring*
- *Habitat status and trend monitoring*
- *Fish-habitat correlation and modeling, and*
- *Habitat project “action effectiveness” research and evaluation*

Habitat action effectiveness monitoring will inform conclusions regarding treatment and effect and will be used to guide project prioritization and funding decisions. In areas that could require more focused and strategic project development, action effectiveness monitoring will be used to inform these decisions. Habitat actions are anticipated to deliver benefits by improving limiting factors. Habitat status and trends and estimates of fish abundance will allow the Action Agencies to corroborate whether conclusions regarding treatment type approximate expectations. This input is critical to evaluating progress along the trajectory toward specified FCRPS BiOp HQIs and, ultimately, satisfaction of the Action Agencies’ responsibilities under the ESA.

The elements described above constitute an adaptive management approach that the Action Agencies and regional partners will use to adjust and tailor planned actions in the future. By evaluating

²² Assessment units are sub-areas within the designated population area that exhibit a common set of tributary habitat limiting factors.

Appendix C: Tributary Habitat Adaptive Management Plan

completed actions to determine how to improve on what worked and modify what didn't work, the approach will facilitate delivery of effective outcomes. The Action Agencies and partners will bring adaptive management outcomes to the attention of expert panels for their evaluation of completed and planned projects.

This adaptive management plan is anticipated to succeed for a number of reasons. First, tributary habitat improvement projects have been identified to meet the Table 5 HQIs for the full BiOp period. Second, the Action Agencies have established a strong track record demonstrating the ability to achieve the BiOp targets. As described in the Draft CE, the Action Agencies have achieved the FCRPS BiOp HQI's for 31 Chinook and steelhead populations with habitat improvement projects already completed between 2007 and 2011. This success is attributable in part to the tributary habitat program "ramp up" that has already occurred. For example, in 2007, there was little infrastructure in place in areas like Catherine Creek and the Yankee Fork to deliver the Table 5, HQIs. Today, stakeholder interests have been galvanized to a greater degree, funding is in place, and partners have developed the "know how" to get things done. New tools and increased understanding are providing the assurance that the best projects are being implemented. [Detailed descriptions of the technical tools can be found under RPA Action 35 in both Sections 2 of the Draft CE and this IP.] In addition to the implementation success, research and monitoring shows that habitat projects are beneficial to salmon and steelhead and there is a sufficient monitoring program in place to track habitat project effectiveness. The synergy that has developed among partners and local stakeholders, when supported by technical resources, facilitates planning, prioritization, development, and implementation of actions that address the limiting factors that will provide the most benefit for anadromous fish. Finally, a "replacement project strategy" is in place, if needed (see IP Appendix D for more details). Using this approach the Action Agencies are positioned to meet or exceed RPA Action 35, Table 5 HQIs for all priority populations by 2018.

Appendix D: Tributary Habitat Replacement Project Strategy

The Action Agencies and their partners will continue to strive to meet the 2018 RPA Action 35, Table 5 improvements at the population level. The discussion that follows outlines the “insurance” that is part of RPA Action 35 that would be called upon, if necessary, in 2015, 2016, or 2017. The Action Agencies would determine whether the strategy should be deployed if, after the 2015 expert panels convene, it appeared unlikely that the full RPA Action 35, Table 5, HQI could be achieved by 2018.

In developing this strategy, the Action Agencies relied upon certain guiding principles:

1. The Action Agencies are striving to achieve the commitments in Table 5 for all populations, at the population level. The Tributary Habitat Replacement Project Strategy will only be deployed if shortfalls remain after the 2015 expert panel “look forward” evaluations.
2. The 2008 BiOp Effects Analysis evaluated benefits at the MPG level and reached conclusions at the ESU/DPS level.
3. RPA Action 35 language – “If infeasible at the population level, then alternatively replacement projects will be found to provide benefits at the MPG or ESU/DPS level. Selection of replacement projects to ensure comparable survival benefits will be made based on input from expert panels, regional recovery planning groups, the NPCC, and NOAA Fisheries.”
4. Interior Columbia Technical Recovery Team population sizes were derived from km of weighted spawning/rearing habitat.

The Action Agencies and their partners will continue to strive to meet the 2018 RPA Action 35, Table 5 HQIs at the population level. The proposed replacement project strategy would be deployed only as necessary. Deployment would be guided by the objective to achieve improvements at the MPG and/or ESU/DPS level as directed in RPA Action 35. The Action Agencies will demonstrate that by relying solely on projects vetted through the expert panels they will meet or anticipate exceeding tributary habitat 2018 Table 5 HQIs for all ESUs/DPSs at the ESU/DPS level. Following any adaptive management, the 2015 expert panel evaluations, and in preparation for reporting through the 2016 CE, HQIs will be recalculated for each population. If necessary, where HQIs from tributary habitat actions exceed the Action Agency Table 5 commitments, they can be carried over to populations of the same species within the same MPG or ESU where the HQIs are below the 2018 Table 5 HQI.

The 2008 BiOp specifically analyzed the proposed action at the ESU/DPS level and anticipated the need to substitute projects in one population for another in the event benefits for one population were not attainable within the time frame anticipated in the BiOp. An approach to substitute projects between populations or MPG’s was not developed in the 2008 BiOp. The proposal herein is intended to advance thinking between NOAA and the Action Agencies on a method for putting this provision of the BiOp into operation, if needed, at some future time.

The Action Agencies propose to substitute HQI for projects that received expert panel evaluation and exceed 2018 Table 5 HQIs for projects in populations where expert panel results indicate shortfalls in 2018 RPA Action 35, Table 5 HQIs. For “basic” Chinook and steelhead populations in the same “size category”²³ as defined by the Interior Columbia Technical Recovery Team (ICTRT), the percentage habitat improvement would be exchanged at a ratio of 1:1. For populations of different sizes, a multiplier that is based on the ICTRT size category would be used to convert HQI to the “basic” population size category²⁴. In summary:

- Exchange “intermediate” Chinook population HQIs at a ratio of 1.5:1; “large” populations at a ratio of 2:1; and “very large” populations at a ratio of 4:1.

²³ In very few cases, population size categories are reduced based upon current condition (T. Cooney, Northwest Fisheries Science Center, Pers. comm.). This avoids attributing survival benefits for habitat improvement of degraded areas that are no longer occupied by listed fish. These areas can be added back in and habitat improvement projects implemented as the populations expand toward recovery and recolonize historic areas. Current conditions were taken into account in 2012 when the expert panels weighted the assessment units.

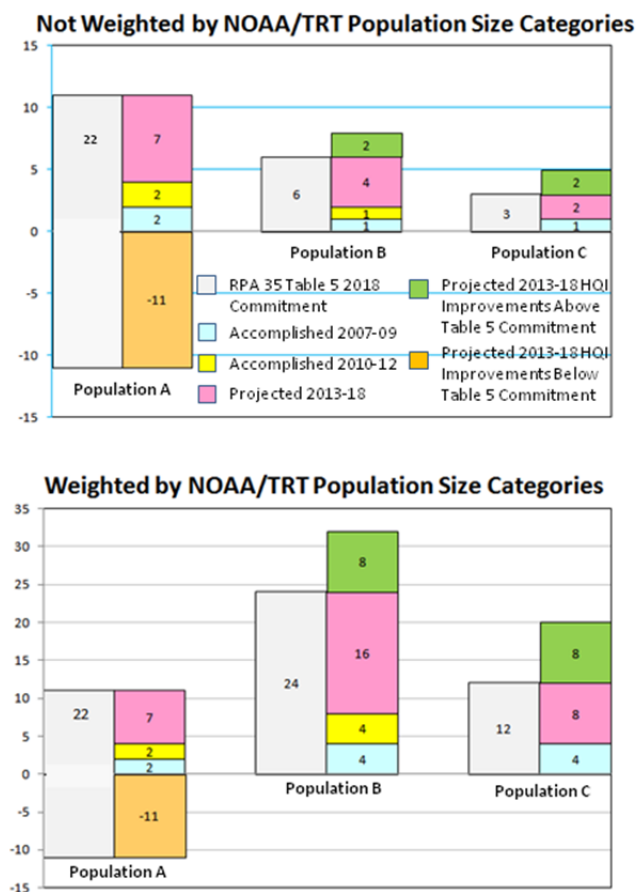
²⁴ See attached table of population size categories and multipliers for each of the expert panel populations.

Appendix D: Tributary Habitat Replacement Project Strategy

- Chinook multipliers correspond to the ICTRT population minimum adult spawner numbers of basic 500; intermediate 750; large 1000; and very large 2000.
- Exchange “intermediate” steelhead population HQIs at a ratio of 2:1; “large” populations at a ratio of 3:1; and “very large” populations at a ratio of 4.5:1.
- Steelhead multipliers correspond to the ICTRT population minimum adult spawner numbers of basic 500; intermediate 1000; large 1500; and very large 2250.
- The ICTRT size categories are based upon the km of spawning/rearing habitat within the population boundaries.

The concept is based on the idea that HQIs for populations of the same size can be “exchanged” at a ratio of 1:1. Different size populations use the above-referenced multipliers to convert to a “basic” size category that allows for exchanging HQIs for populations within the same MPG or ESU that exceed the 2018 Table 5 HQI for ones that do not. For example, for Chinook an exchange that involves a “large” to “basic” conversion, the exchange ratio is 2:1. If the “large” population is being used to replace shortfalls of a “basic” population, the HQI gained is 2% in the “basic” population for every extra 1% increment of HQI in the “large” population. Conversely, if gains in a “basic” population need to be exchanged for shortfalls in a “large” population, the HQI gained is 1% in the “large” population for every extra 2% increment of HQI in the “basic”. (“Extra” refers to improvements from the donor population above the 2018 Table 5 HQIs.)

Figure D-1. Example using the NOAA/TRT population size categories



This example represents three populations that comprise a hypothetical MPG. The values in the grey rectangles represent the 2018 RPA Action 35, Table 5 HQIs. Values in the green, pink, yellow, and

Appendix D: Tributary Habitat Replacement Project Strategy

blue rectangles represent HQI estimates based on expert panel results. This example uses the following hypothetical parameters:

2018 RPA Action 35 Table 5 HQI = 58 (total of values in grey rectangles)

Population size categories:

- Population A - basic
- Population B - very large
- Population C - very large

HQI estimated from expert panel results = 63 (total of values in green, pink, yellow, and blue rectangles)

$63/58 = 1.086$ times 2018 RPA Action 35, Table 5 HQI for the MPG. This indicates that HQIs are met at the MPG level when considering population size category weighting factors and applying the following steps.

Projects evaluated by the expert panel, for example populations B and C, result in comparable HQIs as contemplated in the RPA Action 35. This is represented by the comparison of the grey rectangle with the adjacent stacked pink, yellow, and blue rectangles in both the upper and lower charts. Projects evaluated by the expert panel for population A result in attaining only 11%, or half the Table 5 HQI. Because populations B and C are “very large” populations, the improvements denoted in the top chart are multiplied by four in all rectangles to arrive at an equivalent value to compare with the “basic” sized population A, as denoted in the lower chart. Thus, the 2% “extra” in both populations B and C (represented by the values in the green rectangle) are comparable to 16% (8 + 8) in “basic” population A units. The estimated 11% shortfall in population A is offset by the estimated 16% increase in the two “very large” populations. The survival benefits in populations B and C, in fact, exceed the Table 5 commitments in the two “very large” populations. At the MPG/ESU level, the Action Agencies and their partners will have exceeded the 2018 Table 5 HQIs for the MPG/ESU. This example illustrates how the replacement strategy could be applied for populations within the same MPG. This approach could also be applied at the ESU level, if needed.

The Action Agencies are continuing to work with the local watershed groups to develop the best projects (i.e. those that address the primary limiting factors in the most important areas for each population). They will continue to implement an adaptive management strategy as new information becomes available. For example, preliminary findings in the Entiat include greater densities of juvenile Chinook and steelhead during early summer at pools created by log structures. Higher densities of juvenile Chinook appear to be associated with increased water depth around the structures. Both Chinook and steelhead favored pools around installed structures compared to others. Steelhead around installed structures also had higher growth rates, but there were insufficient recaptures in untreated pools to make a comparison for Chinook (Karl M. Polivka, PNW Research Station, USDA Forest Service, Pers. comm.). Findings such as these demonstrate the viability of action types in improving habitat conditions for ESA-listed salmon and steelhead.

Conclusion

The Action Agencies are committed to implementing actions sufficient to meet the 2018 Table 5 HQIs for RPA Action 35. The infrastructure is in place to implement tributary habitat actions in all basins in which the Action Agencies are working. Local watershed groups are working to implement projects to improve habitat limiting factors which, in turn, will increase survival. Estimates based on results from the 2012 expert panels project that the Table 5 commitments will be met or exceeded by 2018 for all but a very few populations. For those few populations for which the 2012 expert panels predicted shortfalls, the Action Agencies, together with regional partners, have subsequently identified a menu of supplemental projects to fill those gaps in projected benefits. (Those projects are described in IP Appendix B.) As contemplated in the 2008 BiOp, the expert panels will reconvene in 2015 to reevaluate all remaining actions, including the Action Agencies’ list of supplemental projects. If at that time any shortfalls in individual populations remain, the proposed process for using replacement projects from other populations described in this appendix will be utilized. The current projections contained in CE Table 35 demonstrate that if this is utilized, the BiOp commitments for tributary habitat will be met or exceeded at the MPG and ESU/DPS level.

Table D-1. Population size categories and multipliers.

Snake River Spring/Summer Chinook ESU	Historic Size Category¹	Current Size Category	Multiplier
Lower Snake MPG			
Tucannon River	Intermediate	Intermediate	1.5
Asotin (Functionally Extirpated)	Basic	Basic	1
Grande Ronde/Imnaha MPG			
Wenaha River	Intermediate	Intermediate	1.5
Minam River	Intermediate	Intermediate	1.5
Lostine/Wallowa Rivers	Large	Large	4
Lookingglass Creek (functionally extirpated)	Basic	Basic	1
Catherine Creek	Large	Intermediate	1.5
Upper Grande Ronde	Large	Intermediate	1.5
Imnaha River	Intermediate	Intermediate	1.5
Big Sheep Creek (functionally extirpated)	Basic	Basic	1
South Fork Salmon MPG			
Little Salmon River	Intermediate	Intermediate	1.5
South Fork Salmon River	Large	Large	2
Secesh River	Intermediate	Intermediate	1.5
East Fork South Fork	Large	Large	2
Middle Fork Salmon MPG			
Middle Fork Salmon below Indian Creek	Basic	Basic	1
Big Creek	Large	Large	2
Camas Creek	Basic	Basic	1
Loon Creek	Basic	Basic	1
Middle Fork Salmon Above Indian Creek	Intermediate	Intermediate	1.5
Sulphur Creek	Basic	Basic	1
Bear Valley/Elk Creek	Intermediate	Intermediate	1.5
Marsh Creek	Basic	Basic	1
Chamberlain Creek	Intermediate	Intermediate	1.5
Upper Salmon MPG			
North Fork Salmon River	Basic	Basic	1
Panther Creek (Extirpated)	Intermediate	Intermediate	1.5
Lemhi River	Very Large	Very Large	4
Salmon R. Mainstem, below Redfish Lake	Very Large	Very Large	4
Pahsimeroi River	Large	Large	2
East Fork Salmon River	Large	Large	2
Yankee Fork	Basic	Basic	1
Valley Creek	Basic	Basic	1
Salmon R. Mainstem, above Redfish Lake	Large	Large	2

Table D-2. Population size categories and multipliers.

Snake River Steelhead DPS	Historic Size Category¹	Current Size Category	Multiplier
Lower Snake MPG		All the Same	
Tucannon	Intermediate		2
Asotin	Basic		1
Clearwater MPG			
Lower Clearwater	Large		3
South Fork Clearwater	Intermediate		2
North Fork Clearwater (Extirpated)	Large		3
Lolo Creek	Basic		1
Selway River	Intermediate		2
Lochsa River	Intermediate		2
Grande Ronde MPG			
Lower Grande Ronde mainstem	Intermediate		2
Joseph Creek	Basic		1
Wallowa River	Intermediate		2
Upper Grande Ronde mainstem	Large		3
Salmon River MPG			
Little Salmon and Rapid River	Intermediate		2
South Fork Salmon River	Intermediate		2
Secesh River	Basic		1
Lower Middle Fork Tributaries	Large		3
Upper Middle Fork Salmon River	Large		3
Chamberlain Creek	Basic		1
Panther Creek	Basic		1
North Fork Salmon River	Basic		1
Lemhi River	Intermediate		2
Pahsimeroi River	Intermediate		2
East Fork Salmon River	Intermediate		2
Upper Salmon River	Intermediate		2
Imnaha MPG			
Imnaha River	Intermediate		2
Hells Canyon MPG (largely Extirpated)			
Hells Canyon (limited to several small tribs)	-		

Table D-3. Population size categories and multipliers.

Upper Columbia Spring Chinook ESU	Historic Size Category ¹	Current Size Category	Multiplier
Upper C below Chief Joseph MPG			
Methow River	Very Large	Very Large	4
Wenatchee River	Very Large	Very Large	4
Entiat River	Basic	Basic	1
Okanogan River (Extirpated)	Basic (U.S. Only)	N/A	N/A

Table D-4. Population size categories and multipliers.

Upper Columbia Steelhead DPS	Historic Size Category ¹	Current Size Category	Multiplier
East Cascades MPG		All the Same	
Crab Creek (anadromous component Functionally extirpated)	Basic		1
Wenatchee River	Intermediate		2
Entiat River	Basic		1
Methow River	Intermediate		2
Okanogan River	Intermediate (Basic for U.S. Portion only)		1

¹ Appendix B: Population Size and Complexity – Interior Columbia Chinook and steelhead ESUs, Interior Columbia Technical Recovery Team, March 14, 2007.

http://www.nwfsc.noaa.gov/trt/trt_documents/appendix_b_viability_3_15_2007.pdf

Appendix E: Assessments - A Foundation for Successful Tributary Habitat Improvement Projects

Assessment is often a first step to getting a tributary habitat project on the ground. This is more often the case, given that relatively simple treatments to address important key limiting factors like screening to reduce entrainment or replacement of water diversions with structures that pass fish are dwindling. Habitat improvement efforts have moved to more complicated undertakings such as increasing “channel complexity” to improve instream conditions for spawning and rearing; side-channel and floodplain reconnection to increase available habitat; sediment aggradation and degradation to develop riffle, pool, and run habitat; and recruitment of large wood to provide cover and resting places for juveniles and adults. These projects aim to address things like “density dependence,” which represents too little available habitat for too many fish. These types of projects demand thoughtful consideration of entire watershed conditions and processes to be successful and to provide sustained benefits for fish.

For both simple and complicated projects, assessments characterize the physical, geomorphic, hydrologic, and biological baseline conditions necessary to plan, prioritize, implement, and monitor habitat improvement actions that work with natural river processes to provide sustainable benefits to listed fish. Assessments incorporate the latest available science and afford a process-based habitat improvement strategy upon which to build a successful program. Roni (2002), Roni (2005), Roni et al. (2008), Beechie et al. (2008), and Beechie et al. (2010) describe the virtues of an approach based on assessments.

Reclamation has produced a series of assessments that characterize stream condition and establish the potential for implementing successful habitat improvement projects. The assessments build from existing information and incorporate data and analysis to create a better understanding of watershed condition. A table of assessments completed by Reclamation since 2007 is presented in the Comprehensive Evaluation (CE) Section 3, Attachment 3.

Types of assessments are summarized below.

Tributary Assessments (TA) characterizes geomorphic, hydraulic, hydrologic, and vegetation characteristics for a number of reaches in a watershed at a coarse scale. These assessments are completed within a year and results are provided to Interdisciplinary Teams²⁵ (IT) that prioritizes reaches for further detailed study.

Reach Assessments (RA) characterize geomorphic, hydraulic, hydrologic, and vegetation characteristics of a specific reach or reaches prioritized by ITs. The RA is used to identify opportunities for specific habitat improvement projects.

Project Map Books identify a “menu” of geomorphically appropriate actions suitable for addressing limiting factors and maximizing habitat improvement potential based on a site’s intrinsic habitat potential (Reclamation 2013a, 2013b). A Project Map Book is produced with input from the IT who use results from RAs and other evaluations (e.g., land use, planning, zoning, and other non-technical information) to identify and prioritize project opportunities.

Rapid Site Assessments (RSA) provides consistent, scientific information about a site based on visual field indicators that are used to determine the condition of a site. RSAs facilitate cost-effective and efficient site evaluation. RSAs are usually conducted in conjunction with other more intensive assessments such as TAs or RAs.

Atlases draw on results from RAs and other information to develop a matrix of project opportunities for prioritization by local ITs and project sponsors. BPA is currently piloting an Atlas effort in the

²⁵ *Interdisciplinary teams are groups of discipline specialists from the Action Agencies and watershed partners who evaluate scientific, social, budgetary, logistical, and other related information to develop habitat improvement projects that address the most important limiting factors where they will do the most good for fish. They also advise watershed groups and project sponsors.*

Appendix E: Assessments- A Foundation for Successful Tributary Habitat Improvement Projects

Grande Ronde Basin; and with assistance from watershed partners and from Reclamation hopes to develop an Atlas of project opportunities for the Grande Ronde and Catherine Creek.

Although these products are different in scope, each provides reliable information necessary for planning and implementation of successful habitat improvement projects. The process to develop a TA, RA, RSA, or Atlas often links one product to another. For example, TAs identify reaches and general reach characteristics in some part of a watershed. The IT evaluates TA results and decides which reaches afford the greatest potential for project opportunities and warrant detailed investigation. One or more RAs build from the TA, and results are used to identify and prioritize project opportunities. Specific details from RAs can be captured in a Project Map Book. With or without what has been documented by the TA and RA and then captured in a Project Map Book, an RSA can be conducted to obtain information necessary for engineering designs and compliance documents. Because a sequence of events does not always follow this example, the assessment process is designed to be flexible and can commence or be completed using any combination of products that document local conditions.

The Action Agencies have developed the assessments described above to build upon the techniques employed by watershed partners to identify and prioritize habitat improvement projects over the last 30 years. Assessments provide a mechanism for watershed partners and the Action Agencies to develop closer working relationships and to communicate priorities for developing projects. Ultimately, what the assessments produce in terms of project opportunities are presented to the expert panels for evaluation. With these projects in hand, the expert panels determine how each contributes to reaching the 2018 RPA Action 35 Table 5 HQIs.

The following table presents the assessments currently in process. The Action Agencies plan to continue assessment work during the 2014-2018 period, if needed, to support sustainable on-the-ground tributary habitat projects. Because so much assessment work is already complete, most resources will be targeted at improving habitat directly.

Table E-1. Assessments in process by Reclamation and BPA

Assessment	Type	Populations addressed	Lead Agency
Upper Grande Ronde Tributary Assessment	Tributary Assessment	Upper Grande Ronde Chinook and steelhead	Reclamation
Upper Grande Ronde Atlas	Atlas	Upper Grande Ronde and Catherine Creek Chinook and steelhead	BPA

Literature Cited

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Appendix F: Hydrosystem Action Updates and Clarifications

A full description of the Federal Columbia River Power System (FCRPS) proposed action was provided in the 2007 FCRPS Biological Assessment (2007 BA) (Corps of Engineers et al., 2007). With this appendix, the Action Agencies are updating Appendix B of the 2007 BA entitled “Description of the Proposed Action.” to include additional information and provide clarifications related to the proposed action.

This appendix is organized following the 2007 BA Appendix B format, and associated attachments. Headings in this document are provided to allow the reader to quickly reference the section of the relevant BA appendix.

2007 BA, Appendix B.1 Operations for Flood Control, Irrigation, Navigation, and Power Generation and Transmission

B.1.1 FCRPS Facilities

B.1.1.4 Operations for Power Generation and Transmission

As described in the 2007 BA, Appendix B, Section B.1.1.4 – Operations for Power Generation and Transmission, on page B.1-9, one of the authorized purposes of the FCRPS is operations for hydro power generation. Transmission lines operated by BPA connect generators at the dams to the regional transmission grid, enabling the transmission of power produced at FCRPS dams to serve loads both locally and thousands of miles away. Similarly, BPA also integrates and transmits the electric power from existing or additional non-federal generating units in the Pacific Northwest.²⁶

As of June 2013, BPA has integrated about 4,500 megawatts of non-federal wind capacity into its balancing authority area (BAA)²⁷. Since the issuance of the 2008 Biological Opinion (BiOp), the amount of new wind generation integrated to BPA’s transmission system has increased by over 3000 MWs. This additional amount of wind generation can impact FCRPS hydro operations in two ways: 1) oversupply conditions; and 2) FCRPS provision of balancing reserves.

BPA Provision of Balancing Reserves

Balancing Reserves have always been necessary to deal with the inherent variability between scheduled and delivered energy and demand within BPA’s BAA. Like other utilities, BPA is required to “comply with reliability standards” developed in accordance with the Federal Power Act. 16 U.S.C. 824o(b)(1). As the balancing authority, BPA is required to carry reserves to meet unanticipated power demands and adjust power in response to unscheduled generation and load increases or decreases within its BAA. Having these reserves available is vital to maintain system reliability. These reserves “bridge the gap” when short-term energy supply or demand on the system changes relative to the level planned for. Without such reserves, system reliability issues necessitating power or schedule

²⁶ The Northwest Power Act directs BPA to “assure the Pacific Northwest of an adequate, efficient, economical, and reliable power supply,” encourage “the development of renewable resources within the Pacific Northwest,” and “protect, mitigate and enhance the fish and wildlife of the Columbia River.” 16 U.S.C. §§ 839(2), 839(1)(B), 839(6). The Federal Columbia River Transmission System Act directs BPA to “operate and maintain the Federal transmission system within the Pacific Northwest.” 16 U.S.C. § 838b. The Transmission System Act also directs BPA to construct improvements necessary to “integrate and transmit the electric power from existing or additional Federal or non-Federal generating units.” 16 U.S.C. §§ 838b(a) and maintain the electrical stability and electrical reliability of the Federal System.” 16 U.S.C. §838b(d).

²⁷ As the balancing authority, BPA is responsible for maintaining load-resource balance within the metered boundaries of the area known as the balancing authority area or BAA. The BAA is the collection of generation, transmission, and loads within the metered boundaries of the BPA transmission system.

Appendix F: Hydrosystem Action Updates and Clarifications

curtailments would be more common. Almost all loads and generators have some amount of variation between their actual hourly energy used or provided and the amount scheduled. Currently, BPA relies primarily on the FCRPS to meet its balancing reserve obligation.

The actual output of wind generation varies from the scheduled amount more frequently and in greater magnitude than loads or traditional thermal generators and requires more balancing reserves. In part due to this variability and the increase in wind generation in the system, the amount of FCRPS capacity that is set aside to provide balancing reserves has more than doubled since 2008.²⁸

Most of the time, the FCRPS can hold the balancing reserve requirements without interfering with BiOp operations, but there are a few hours each year when flow conditions combined with these balancing reserve requirements could impede fish operations. For example, maintaining balancing reserve capacity to increase generation when actual wind generation in BPA's balancing authority area is less than what was scheduled could result in spill at higher levels than required for fish passage, which in turn could increase TDG levels in the tailrace. This condition generally occurs during periods of high flows when spill levels result in TDG levels exceeding applicable water quality standards.

To assure the balancing reserve requirements do not interfere with BiOp operations, BPA can reduce the quantity of reserves held on the FCRPS when high-priority operational objectives, like fish operations and applicable water quality standards, are at risk. In such circumstances, if additional reserves cannot be obtained from non-FCRPS sources, BPA uses reliability and operational protocols, including generation curtailments, to maintain load and resource balance in the transmission system within the levels of the balancing reserves available. Thus, system reliability is maintained during those periods in which BPA reduces the amount of balancing reserve it can provide to maintain these high-priority operational objectives. BPA's ability to reduce balancing reserve from the FCRPS when necessary to meet fish operations and applicable water quality standards has helped ensure that BPA can accommodate the growth of the wind fleet and other non-federal generation in the region and continue to implement FCRPS operations as specified in the 2008 BiOp.

Oversupply Conditions

Large amounts of wind generation combined with hydropower, which is most likely during the spring run-off, can generate electricity in excess of total demand, leading to an oversupply of energy in the region. Oversupply occurs most frequently during hours of low electricity use, such as early in the morning. In these circumstances, the river flow in excess of generation needs that cannot be stored in reservoirs must be spilled. This can result in TDG levels that exceed applicable water quality standards and may be harmful to fish and other aquatic species.

To manage TDG levels in such circumstances, BPA maximizes the use of hydropower generation to meet load and offers the federal generation at low cost or for free to other power generators, such as coal, natural gas and other thermal power plants, as well as to wind generators. Typically under circumstances when federal power is available at low cost or free, the thermal plants shut down to save fuel costs. Even so, there are times when there is so much water that water quality standards are exceeded for relatively short periods. With renewable energy incentives²⁹ and the interconnection of wind to BPA's transmission system, many variable generators have chosen not to shut down voluntarily without receiving payment to take their generation offline.

²⁸ Balancing reserve capacity is either incremental (INC) or decremental (DEC). INC reserves are provided from generators that increase generation (or loads that can reduce consumption) when loads increase or other generation decreases. DEC reserves are provided from generators that can reduce generation when loads decrease or other generators increase. Through the rate case process, and in consultation with customers, BPA establishes an amount of INC and DEC reserves that it stands ready to provide to balance load, wind and thermal generation. BPA has determined 900 INC and -1100 DEC is the maximum balancing reserve requirement the FCRPS can accommodate on an average annual basis, given other hydraulic objectives on the system such as compliance with fish operations.

²⁹ Incentives with this impact include Production Tax Credits, State Tax Incentives and Renewable Energy Credits and Renewable Portfolio Standards.

Appendix F: Hydrosystem Action Updates and Clarifications

Therefore, in 2011 and 2012 BPA implemented protocols that allowed the agency to curtail wind generation within the BAA during periods of oversupply and serve the wind generators' loads with federal energy.³⁰ The protocols enabled BPA to reduce non-fish passage spill in these circumstances which reduces TDG production. Having the ability to reduce non-FCRPS generation within the BAA to a "pre-wind" level in these conditions has provided BPA with a tool to ensure that BPA can continue to implement the FCRPS operations as specified in the 2008 BiOp.

Review of 2008 BiOp Modeling

The FCRPS 2008 BiOp analysis evaluated a wide range of river flows and operating conditions to reflect the range of possible conditions faced by the FCRPS. The HYDSIM hydro modeling on which the biological analysis (Comprehensive Fish Passage - COMPASS) was based included spill in addition to voluntary spill for fish passage. The HYDSIM hydro modeling results included many instances where spill resulted in TDG levels that exceeded the applicable water quality standards and some that were in excess of 130%, though this occurred less frequently. BPA reviewed the spill estimates in the HYDSIM modeling and confirmed that the changes within the BPA BAA to generation characteristics, for example, additional variable generation (wind) in the BPA BAA, maintenance on the 3rd powerhouse at Grand Coulee, and changes to Canadian operations (Treaty and non-Treaty), were within the variability considered in the 2008 BiOp Analysis.

2007 BA, Appendix B.1 Operations for Flood Control, Irrigation, Navigation, and Power Generation and Transmission

Attachment B.1-4 U.S. Bureau of Reclamation Storage Projects

4.1 Columbia Basin Project

4.1.1 Operation and Maintenance

Contract Water Volumes Included in 2008 BiOp Modeling Efforts

The Columbia River mainstem effects of operation and maintenance of the Columbia Basin Project (CBP), a large irrigation project in Washington State, was part of the proposed action in the 2007 BA (see Attachment B.1-4 of the 2007 BA). Reclamation operates the CBP to satisfy several contracts with various water users. Generally, historic rates of diversion are the best available estimate of monthly water demand under these contracts. Where Reclamation and a District enter into an agreement for a new water supply, Reclamation must estimate demand under that contract until an adequate record of actual diversions becomes available.

Accordingly, the 2008 BiOp hydro-system modeling included an additional estimated 40,000 acre-feet above historic rates of diversion to address an anticipated increase in diversions under:

- 1) the Quincy Irrigation District Master Water Service Agreement; and
- 2) the CBP municipal and industrial (M&I) water service program

These estimated diversions were already considered in NOAA's 2008 analyses, and do not present any additional effects. Because the 2007 BA did not provide a clear explanation of the rationale behind these estimated diversions, however, we have included the following descriptions in this appendix (Postlethwait, 2008).

Quincy Irrigation District Master Water Service Agreement

The Quincy Irrigation District (QID) delivers CBP water pursuant to a master water service contract with Reclamation and water right permits, both issued in 1982. Due to facility limitations, QID had not been able to divert the full amount of allowed under their contract and water right. In 2008, QID was pursuing funding to allow them to divert this full amount by 2018. Accordingly, an additional 25,000

³⁰ The Federal Energy Regulatory Commission (FERC) approved the 2012 oversupply protocol on an interim basis, conditioned on the adoption of a FERC-approved cost allocation methodology in BPA's 2014 rate case. FERC has not yet ruled on the 2013-2015 protocol. Under these protocols, BPA pays the wind generators for the losses they incur from the failure to produce energy.

Appendix F: Hydrosystem Action Updates and Clarifications

acre-feet was added to the 2008 BiOp hydro-system model to assure the analysis reflected likely diversions within the BiOp period.

M&I Water Service Program

As part of the operation of the CBP, Reclamation markets water through an M&I Water Service Program. This program includes the execution, renewal and transfer of water service agreements between M&I water users and Reclamation of up to 27,522 acre feet of CBP water. All new agreements, renewals and transfers within this program contain provisions which reserve Reclamation's discretion to adjust available water supply or reduce deliveries of M&I water to comply with the ESA. The 2008 BiOp analyzed the M&I program in two ways: 1) Contracts for 12,522 acre feet – those existing prior to the 2008 BiOp - were included in the historic records; and 2) contracts for the remaining 15,000 acre feet were added to hydro-system models in 2008 and must be supplied from Project storage and refilled from the Columbia River between August 31 and April 10.

Columbia Basin Project Maintenance

Maintenance of project facilities is a routine part of continued operation of Grand Coulee Dam, the Grand Coulee Pump/Generating Plant and Banks Lake, and other features of the Columbia Basin Project. The following describe maintenance actions at the project that affect project operations as described in the BA, but are not expected to adversely impact anadromous fish.

Maintenance on Facilities On and Around Banks Lake

As described on page B.1-4-7 to B.1-4-8 of the 2007 BA, since the 1980s, Banks Lake has been required to draft up to 35 feet every 12- to 15 years in order to perform routine maintenance. The last major drawdown of Banks Lake for maintenance occurred in 2011 through 2012. During this latest drawdown period, foundations were constructed to allow for bulkheads to be used to isolate the canal headworks. In the future, the use of bulkheads should diminish the need for these deep drawdowns to perform maintenance on the canal headworks. Of course other maintenance issues or requirements may still require that Banks Lake be significantly drafted below the normal operating range on occasion.

Grand Coulee 3rd Powerplant Overhaul

Grand Coulee Dam was modified in the late 1960's with the addition of the Third Power Plant (TPP) which included six turbine units that were put into service by the mid-1970's. These large units have reached their design life. Increased maintenance issues with the TPP generating units are occurring due to age-related wear on the principle components resulting in an increase in outages and a reduction in reliability. Reclamation has started overhauling the units, a process that is expected to take about 11-12 years to complete (between 2013 and 2024). Reclamation completed an Environmental Assessment that can be found at:
<http://www.usbr.gov/pn/programs/ea/wash/tpp/index.html>.

This activity does not affect streamflow but if flows are high and fewer units are in service it could the result in more spill which can elevate TDG levels, particularly if the project is spilling through the outlet tubes. There are no ESA-listed salmon or steelhead that reach Grand Coulee Dam or facilities so the only possible impact of increased spill at Grand Coulee to ESA-listed fish is the potential for higher TDG levels below Chief Joseph Dam. This is mitigated in part by flow deflectors installed at Chief Joseph Dam consistent with RPA 26. As described in RPA 26, the flow deflectors were installed as the most cost-effective alternative for gas abatement at these two dams. These flow deflectors have been shown to reduce gas levels from water spilled at Chief Joseph when TDG levels from Grand Coulee are *high*. In addition, as described above under Review of 2008 BiOp Modeling a review of HYDSIM modeling confirmed that changes in generating characteristics that have occurred within the FCRPS, including maintenance of the 3rd powerplant, are within the range of variability analyzed for the BiOp.

If the overhaul were not done, the incidence of TDG could increase over time due to forced outages depending upon a number of real-time conditions, such as water year type, time of year in which the

Appendix F: Hydrosystem Action Updates and Clarifications

outage occurs, and various other factors. As the overhaul proceeds, forced outages are expected to decline.

Washington State's Columbia River Water Management Program (CRWMP) Early Actions – Lake Roosevelt Drawdown

The Columbia River Water Management Plan (CRWMP) which includes the Lake Roosevelt Incremental Storage Release Program was considered in the 2007 Biological Assessment and the 2008 BiOp. This program is part of Washington Department of Ecology's (Ecology) Columbia River Initiative (CRI) Language describing this program and its expected effect on project operations can be found in several places in the 2007 BA including attachment B.1-4 to Appendix B (see page B.1-4-5 through B.1-4-7) and in the 2008 BiOp in the RPA table Action 4. Since the BA was published, NEPA and SEPA were completed in 2008 and partial implementation of the CRWMP started in 2009. The NEPA/SEPA process established a fish flow releases advisory group (FFRAG) that is made up of representatives from federal, state and tribal agencies. FFRAG meets once a year in March, after the March final forecast has been completed. The FFRAG develops a recommendation for how the fish flow and Municipal and Industrial (M&I) water should be release during the following fish juvenile migration season. These recommendations are then posted in the annual WMP and the Seasonal Update to the WMP. Deliveries can differ slightly to what was presented in the 2007 BA; water volumes are very small.

Attachment B.1-4, 4.1.2 – Grand Coulee Dam Multiple-Purpose Operations

Area Capacity Table for Lake Roosevelt

Reclamation recently completed a bathymetric study of Lake Roosevelt for use in developing a water quality model to model water temperature in Lake Roosevelt and in the tailwater of Grand Coulee Dam. A new area-capacity table was developed for Lake Roosevelt from this bathymetry. The active capacity of Lake Roosevelt increased 164,105 acre-feet at full pool elevation of 1290 ft. The active capacity based on the new tables is 5,349,560 acre-feet. This change in capacity will not change operations of the reservoir. For example, the end of August draft will remain at elevation 1280 and 1278 feet and the draft for the Lake Roosevelt Incremental Storage Releases Program will remain at 82,500 acre-feet.

Attachment B.1- 4, 4.1.3 Related ESA Consultations

Odessa Special Study

On April 2, 2013, Reclamation issued a Record of Decision for the Odessa Subarea Special Study Final Environmental Impact Statement (FEIS), selecting alternative 4A for implementation. Alternative 4A would provide surface water supplies to about 70,000 acres of land presently irrigated with water pumped from the Odessa aquifer. At full development, Alternative 4A will demand approximately 164,000 acre feet from the Columbia River from between October and March. Development of the Odessa Subarea will occur in phases over approximately 10 years. Actual additional diversions are not expected to occur until 2016 or later.

On January 11, 2013, Reclamation received a BiOp from the National Marine Fisheries Service (NMFS) concluding Alternative 4A was not likely to jeopardize Columbia River salmon or steelhead or adversely modify designated critical habitat. The BiOp noted that Alternative 4A would not divert water during the juvenile migration season, and minimizes flow reductions during the spawning and incubation season for chum salmon and Hanford reach Chinook. For more information the ROD, Final FEIS, Biological Assessment (BA), and BiOp, can be found at http://www.usbr.gov/pn/programs/ucao_misc/odessa/.

2007 BA, Appendix B.1 Operations for Flood Control, Irrigation, Navigation, and Power Generation and Transmission

Attachment B.1-6 Bonneville Power Administration Transmission Operations

Transmission Outage Coordination

The 2007 Biological Assessment, Appendix B, Attachment B.1-6 – Bonneville Power Administration Transmission Operations, states that generally “planned transmission outages can be scheduled to avoid affecting fish operations during the fish migration period”. Conducting timely maintenance and making needed upgrades or additions to the transmission system are important to maintain system reliability and reduce the risk of unplanned outages that could potentially have a more adverse effect on fish. As a result, it may be better to maintain the system or install upgrades or additions even during the fish migration season than to risk outages. There may also be times when it is not possible to schedule outages outside of the fish migration season. In these circumstances, BPA will analyze the potential impacts to fish and consult with NOAA Fisheries if there are likely to be adverse effects.

Appendix F: Hydrosystem Action Updates and Clarifications

Literature Cited

U.S. Army Corps of Engineers, Bonneville Power Administration, Bureau of Reclamation. 2007. Biological Assessment. Effects of the Federal Columbia River Power System and Mainstem Effects of Other Tributary Actions on Anadromous Salmon and steelhead Species Listed Under the Endangered Species Act.

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