Reasonable and Prudent Alternative Table

ADAPTIVE MANAGEMENT ACTIONS

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
The Action Agencies will continue collaboration with States and Tribes in the implementation of RPA actions, progress reporting, and adaptive management using regional fora such as the Regional Implementation Oversight Group, as described in their Biological Assessment, Section 2.1.		
1	**Implementation Plans** The Corps, BPA, and Reclamation will collectively submit to NOAA Fisheries Action Implementation Plans by the end of December 2009, December 2013, and December 2016 that detail commitments to implement actions during subsequent years. Specifically, that Action Implementation Plans will describe the tributary and estuary habitat actions that will be funded during the 2010-2013, 2014-2016, and 2017-2018 periods. The Implementation Plans will take into account pertinent new information on climate change and effects of that information on limiting factors and project prioritization. The Action Implementation Plans will also detail any changes in hydro, predation management, hatchery, or RM&E RPA actions from the actions described in this RPA for each time period. This information will assist NOAA Fisheries in determining if the RPA is being implemented as identified in this Biological Opinion or, conversely, if re-initiation triggers defined in 50 CFR 402.16 have been exceeded.	Implementation Plans will be submitted to NOAA Fisheries in December 2009, December 2013, and December 2016.
2	**Annual Progress Reports** The Corps, BPA, and Reclamation will submit to NOAA Fisheries Annual Progress Reports in September of all years except 2013 and 2016. The reports will cover operations for the previous calendar year. These Annual Progress Reports	Annual Progress Reports will be submitted to NOAA Fisheries in September 2009 through 2018, except in 2013 and 2016. In 2013 and 2016, progress reports will be part of the

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
	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.	Comprehensive Evaluation Reports.
3	**Comprehensive RPA Evaluations** The Corps, BPA, and Reclamation will submit to NOAA Fisheries Comprehensive RPA Evaluation of multi-year implementation activities by the end of June 2013 and June 2016. The Comprehensive Evaluations shall review all implementation activities through the end of the previous calendar year (as would be covered in the Annual Progress Report) and compares them to scheduled completion dates as identified in this RPA or modified in the Implementation Plans in 2009, 2013 and 2016. The Comprehensive Evaluations will also describe the status of the physical and biological factors identified in this RPA, and compare these with the expectations in the survival improvements identified in the Comprehensive Analysis or Supplemental Comprehensive Analysis. Physical and biological factors will include new information on climate change and its effects on listed salmon and steelhead. The Comprehensive Evaluation will include a discussion of the Action Agencies' plan to address any shortcomings of current estimated survival improvements as compared to the original survival estimates identified in the Comprehensive Analysis referenced in this Biological Opinion. This information will assist NOAA Fisheries in determining if the RPA is being implemented as anticipated in this Biological Opinion or, conversely, if re-	Comprehensive RPA Evaluation Reports will be submitted to NOAA Fisheries in June 2013 and June 2016.

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
	initiation triggers defined in 50 CFR 402.16 have been exceeded.	

HYDRO ACTIONS

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
	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.**	
	Hydropower Strategy 1—Operate the FCRPS to Provide Flows and Water Quality to Improve Juvenile and Adult Fish Survival	
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	**Implementation Plans** ▪ Plan for the operations of storage projects will be described in the Annual Water Management Plan.

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
	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.	**Annual Progress Report** Prepare an annual year end review **2013 and 2016 Comprehensive RPA Evaluation Report** ▪ Comprehensive Evaluation Report will summarize storage project operations for the fish season. There is no other physical or biological monitoring or reporting.

Table 1. Storage Project Operations to be Included in the Annual WMP

Storage Project	Operation
Dworshak	• Operate to standard flood control criteria; shift system flood control to Grand Coulee when possible, unless modified by Hydro Strategy 1, Action 14 (Dry Water Year Operations). • When not operating to minimum flows, operate to reaching the upper flood control rule curve on or about April 10 (the exact date to be determined during in-season management) to increase flows for spring flow management. • Provide minimum flows while not exceeding Idaho State Total Dissolved Gas (TDG) water quality standard of 110%. • Refill by about June 30. • Draft to elevation 1535 feet by the end of August and elevation 1520 feet (80 feet from full) by the end of September unless modified per the Agreement between the U.S. and the Nez Perce Tribe for water use in the Dworshak Reservoir. • Regulate outflow temperatures to attempt to maintain water temperatures at Lower Granite tailwater at or below the water quality standard of 68° F. • Maximum project discharge for salmon flow augmentation to be within state of Idaho TDG water quality standards of 110%.

Table 1. Storage Project Operations to be Included in the Annual WMP

Storage Project	Operation
Libby	• Follow VARQ[1] (variable outflow) flood control procedures. • Follow variable December 31 flood control draft based on early season water supply forecast. • Operate consistent with the Columbia River Treaty, and the International Joint Commission and the 1938 Order on Kootenay Lake. • When not operating to minimum flows, operate to achieve 75% chance of reaching the upper flood control rule curve on or about April 10 (the exact date to be determined during in-season management) to increase flows for spring flow management. • Operate to provide tiered white sturgeon augmentation volumes to achieve habitat attributes for sturgeon spawning/recruitment consistent with the 2006 U.S. Fish and Wildlife Service (USFWS) Biological Opinion (BiOp) in May, June and July; shaped in coordination with Regional Forum TMT. • To provide for summer flow augmentation, refill by early July (exact date to be determined in-season), determined by available water supply and shape and spring flow operations, while also avoiding involuntary spill and meeting flood control objectives. • Provide even or gradually declining flows following sturgeon flows during the summer months (minimize double peak) as determined through TMT in-season management. • Experimental draft to 10 feet from full by the end of September (except in lowest 20th percentile water years, as measured at The Dalles, when draft will increase to 20 feet from full by end of September). If project fails to refill 20 feet from full, release inflows or operate to meet minimum flows through the summer months. Rationale for the experimental draft was adopted by the Northwest Power and Conservation Council (Council) and further details of the evaluation can be found in the FCRPS Biological Assessment (Appendix B.2.1). Meet minimum flow requirements for bull trout from May 15 to September 30 as described in the USFWS 2006 Libby Biological Opinion and 4,000 cubic feet per second (cfs) in October through May 14 for resident fish. • Limit spill to avoid exceeding Montana State TDG standard of 110%, when possible, and in a manner consistent with the Action Agencies' responsibilities for ESA-listed resident fish. • Limit outflow fluctuations by operating to ramping rates set in the 2006 USFWS Biological Opinion to avoid stranding bull trout.

[1] In December 2002, the Corps prepared an Environmental Assessment (EA) and signed a Finding of No Significant Impact (FONSI) to implement VARQ on an interim basis at Libby starting in January 2003. Reclamation has been following VARQ flood control procedures at Hungry Horse Dam on an interim basis since 2002 based on an EA and a FONSI signed in March 2002. The Corps, in cooperation with Reclamation, completed preparation of the Upper Columbia Alternative Flood Control and Fish Operations Final Environmental Impact Statement in 2006 to evaluate the long-term impacts of implementation of alternative flood control operations, including VARQ, and fish flow operations at Libby and Hungry Horse dams. Both agencies are working toward completing NEPA for a decision on long-term flood control operations and fish flow operations at Libby and Hungry Horse dams.

Table 1. Storage Project Operations to be Included in the Annual WMP

Storage Project	Operation
Grand Coulee	• Use standard flood control criteria including adjustments for flood control shifts from Dworshak and Brownlee unless modified by Hydro Strategy 1, Action 14 (Dry Water Year Operations). • Operate to achieve 85% probability of reaching upper rule curve (URC) elevation by about April 10. • Refill by about June 30 each year (exact date to be determined during in-season management). • Take advantage of reservoir draft for flood control during high water years to perform drum gate maintenance. Drum gate maintenance may be deferred in some dry water years; however, drum gate maintenance must occur at a minimum one time in a 3-year period, two times in a 5-year period, and three times in a 7-year period. • Draft to support salmon flow objectives during July-August with variable draft limit of 1278 to 1280 feet by August 31 based on the water supply forecast. Future evaluation of this element may be accomplished as discussed in the FCRPS Biological Assessment (Appendix B.2.1). • Reduce pumping into Banks Lake and allow Banks Lake to operate up to 5 feet from full pool (elevation 1565) during August to help meet salmon flow objectives when needed. • If the Lake Roosevelt drawdown component of Washington's Columbia River Water Management Program (CRWMP) is implemented, it will not reduce flows during the salmon flow objective period (April to August). The metric for this is that Lake Roosevelt will be drafted by an additional 1.0 foot in non-drought years and by about 1.8 feet in drought[2] years by the end of August. A third of this water will go to in-stream flows. A more detailed description of this element is provided in this section of the FCRPS BA (Appendix B.2.1).[3] • May be used to help meet tailwater elevations below Bonneville Dam to support chum spawning and incubation. • Operate to help meet Priest Rapids flow objective to support fall Chinook salmon spawning and incubation. • Operate to minimize TDG production.
Hungry Horse	• Follow VARQ flood control procedures.[4] • Maintain minimum flows all year for bull trout with a sliding scale based on the forecast. Operate to meet minimum flows of 3200-3500 cfs at Columbia Falls on the mainstem Flathead River and 400-900 cfs in the South Fork Flathead River. • When not operating to minimum flows, operate to achieve 75% probability of reaching URC elevation by about April 10. • Refill by about June 30 each year (exact date to be determined during in-season management). • Experimental draft during July-September to a draft limit of 3550 feet (10 feet from full) by September 30, except in the driest 20 percentile of water conditions limit draft to 3540 feet (20 feet from full) when needed to meet lower Columbia flow augmentation objectives, If project fails to refill 20 feet from full, release inflows or operate to meet minimum flows through the summer months.

[2] The definition of drought year in this case is when the March 1 water supply forecast for the April through September period at The Dalles is less than 60 million acre-feet (MAF).

[3] Reclamation will not implement this action unless the state of Washington has secured the concurrence of the Tribes and Reclamation has separately consulted with them on a Government-to-Government basis. In addition, the State and Reclamation would need to comply with their respective Environmental Policy Acts and Reclamation would need to submit a water permit application for approval by the State.

[4] Reclamation has been following VARQ flood control procedures at Hungry Horse Dam on an interim basis since 2002 and will complete NEPA for long-term implementation.

Table 1. Storage Project Operations to be Included in the Annual WMP

Storage Project	Operation
	Rationale for the experimental draft was adopted by the Council and further details of the evaluation are provided in the BA (Appendix B.2.1). • Provide even or gradually-declining flows during summer months (minimize double peak). • Limit spill to maximum of 15% of outflow to avoid exceeding Montana State TDG standards of 110% to the extent possible. • Limit outflow fluctuations by operating to ramping rates set in 2000 USFWS Biological Opinion to avoid stranding bull trout.
Albeni Falls	• Operate to standard flood control criteria. • Operate to provide Lake Pend Oreille shoreline spawning conditions for kokanee (winter pool levels of 2055 feet or 2051 feet elevation) determined through interagency coordination per USFWS Biological Opinion of 2000. • Interagency coordination of winter pool levels for kokanee in consideration of spawning and incubation needs for lower Columbia River chum salmon.

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
Hydropower Strategy 1—Operate the FCRPS to Provide Flows and Water Quality to Improve Juvenile and Adult Fish Survival		
5	**Lower Columbia and Snake River Operations** 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. ▪ Lower Snake River projects (Ice Harbor, Lower Monumental, Little Goose	**Implementation Plans** ▪ Plan for the operations of run-of-river mainstem projects will be described in the Annual Water Management Plan. **Annual Progress Report** ▪ Prepare an annual year end review. **2013 and 2016 Comprehensive RPA Evaluation Report** ▪ Comprehensive Evaluation Report will

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
Hydropower Strategy 1—Operate the FCRPS to Provide Flows and Water Quality to Improve Juvenile and Adult Fish Survival		
	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. ▪ 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. These run-of-river operations will be included in the annual WMP.	summarize MOP operations at the Lower Snake River projects and John Day elevations for the fish passage season. There is no other physical or biological monitoring or reporting.
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 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	**Implementation Plans** ▪ Annual Water Management Plan and seasonal updates. **Annual Progress Report** ▪ Annual progress reports will describe FCRPS operations for the fish passage season. There is no other physical or biological monitoring or reporting.

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
Hydropower Strategy 1—Operate the FCRPS to Provide Flows and Water Quality to Improve Juvenile and Adult Fish Survival		
	conditions for that year. A draft update of the WMP will be prepared by October 1 each year, with a final Plan completed by January 1. The fall/winter update to the WMP will be drafted by November 1 and finalized by January 1. A draft of the spring/summer update to the WMP will be prepared by March 1 and finalized by May 15.	**2013 and 2016 Comprehensive RPA Evaluation Report** ▪ Comprehensive Evaluation Report will summarize FCRPS operations for the fish passage season. There is no other physical or biological monitoring or reporting.
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 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.	**Implementation Plans** ▪ If new water supply forecast procedures become available, this will be reported in the 2010, 2013, or 2016 Implementation Plans. Implementation Plans will also consider any new, pertinent information on climate change and its potential impacts on limiting factors and project prioritization. **Annual Progress Report** ▪ Annual progress reports will include a summary of the annual forecast review and also summarize any new, pertinent climate change information or research. **2013 and 2016 Comprehensive RPA Evaluation Report** ▪ Comprehensive Evaluation Report will

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
Hydropower Strategy 1—Operate the FCRPS to Provide Flows and Water Quality to Improve Juvenile and Adult Fish Survival		
		summarize annual forecast reviews and identify any new procedures that become available. The report will also summarize any new, pertinent climate change research and the potential impacts to listed salmon and steelhead.
8	**Operational Emergencies** 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.	**Implementation Plans** ▪ TMT emergency protocols identified in the Annual Water Management Plan and other appropriate Action Agencies emergency procedure documents. **Annual Progress Report** ▪ Annual progress reports will describe any emergency situations and actions taken per the emergency protocols. There is no other physical or biological monitoring or reporting. **2013 and 2016 Comprehensive RPA Evaluation Report** ▪ Comprehensive Evaluation Report will summarize any emergency situations and actions taken. There is no other physical

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
Hydropower Strategy 1—Operate the FCRPS to Provide Flows and Water Quality to Improve Juvenile and Adult Fish Survival		
		or biological monitoring or reporting.
9	**Fish Emergencies** 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 Action Agencies will develop (in coordination with the inseason 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.	**Implementation Plans** ▪ Fish emergencies will be included in the TMT emergency protocols and other appropriate Action Agency emergency procedure documents. **Annual Progress Report** ▪ Annual progress reports will describe any fish emergency situations and actions taken. There is no other physical or biological monitoring or reporting. **2013and 2016 Comprehensive RPA Evaluation Report** ▪ Comprehensive Evaluation Report will summarize any emergency situations and actions taken. There is no other physical or biological monitoring or reporting.
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: ▪ Providing the greatest flexibility possible for releasing water to benefit U.S.	**Implementation Plans** ▪ BPA and the Corps will pursue negotiations annually with Canada prior to the fish passage season.

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
Hydropower Strategy 1—Operate the FCRPS to Provide Flows and Water Quality to Improve Juvenile and Adult Fish Survival		
	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 coordinate with Federal agencies, States and Tribes on Treaty operating plans.	**Annual Progress Report** ▪ Annual progress reports will describe actions taken to provide 1 MAF of storage in Treaty space. There is no other physical or biological monitoring or reporting. **2013 and 2016 Comprehensive RPA Evaluation Report** ▪ Comprehensive Evaluation Report will summarize actions taken to provide 1 MAF of storage in Treaty space. There is no other physical or biological monitoring or reporting.
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.	**Implementation Plans** ▪ BPA will manage refill obligations consistent with the 1990 non-Treaty storage agreement. **Annual Progress Report** ▪ Annual progress reports will describe actions taken to refill non-Treaty storage space. There is no other physical or biological monitoring or reporting.

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
Hydropower Strategy 1—Operate the FCRPS to Provide Flows and Water Quality to Improve Juvenile and Adult Fish Survival		
		2013 Comprehensive RPA Evaluation Report ▪ Comprehensive Evaluation Report will summarize actions taken to refill the remaining non-Treaty storage space by June 30, 2011. There is no other physical or biological monitoring or reporting. **2016 Comprehensive RPA Evaluation Report** ▪ Action completed. No reporting.
12	**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. 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.	**Implementation Plans** ▪ Following refill of the non-Treaty space under the 1990 agreement, and in coordination with U.S. agencies, states, and Tribes, BPA will pursue negotiations of a long-term agreement contingent on BC Hydro's interest. **Annual Progress Report** ▪ Annual progress reports will describe actions taken to develop long-term and/or annual agreements that affect lower

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
Hydropower Strategy 1—Operate the FCRPS to Provide Flows and Water Quality to Improve Juvenile and Adult Fish Survival		
		Columbia River flows during the April through August period. There is no other physical or biological monitoring or reporting. **2013 Comprehensive RPA Evaluation Report** ▪ Comprehensive Evaluation Report will summarize actions taken to refill the remaining non-Treaty storage space by June 30, 2011. There is no other physical or biological monitoring or reporting. **2016 Comprehensive RPA Evaluation Report** ▪ Action completed. No reporting.
13	**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.	**Implementation Plans** ▪ Prior to negotiation of a long-term agreement, BPA will meet with U.S. agencies, states, and Tribes to solicit input. **Annual Progress Report** ▪ Annual progress reports will describe

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
Hydropower Strategy 1—Operate the FCRPS to Provide Flows and Water Quality to Improve Juvenile and Adult Fish Survival		
		actions to coordinate non-Treaty storage agreements. There is no other physical or biological monitoring or reporting. **2013 and 2016 Comprehensive RPA Evaluation Report** ▪ Comprehensive Evaluation Report will summarize actions to coordinate non-Treaty storage agreements. There is no other physical or biological monitoring or reporting.
14	**Dry Water Year Operations** 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: ▪ 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	**Implementation Plans** ▪ Dry water year operations will be described in the Annual Water Management Plan and seasonal updates. **Annual Progress Report** ▪ Annual progress reports will describe actions taken during dry water years. There is no other physical or biological monitoring or reporting.

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
Hydropower Strategy 1—Operate the FCRPS to Provide Flows and Water Quality to Improve Juvenile and Adult Fish Survival		
	coordinate use of this flexibility in the Regional Forum TMT. ▪ 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 allow flexibility for the release of any stored water to provide U.S. fisheries benefits in dry water years, to the extent possible. ▪ 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. ▪ 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. ▪ 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 30). ▪ 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	**2013 and 2016 Comprehensive RPA Evaluation Report** ▪ Comprehensive Evaluation Report will summarize actions taken during dry water years. There is no other physical or biological monitoring or reporting.

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
Hydropower Strategy 1—Operate the FCRPS to Provide Flows and Water Quality to Improve Juvenile and Adult Fish Survival		
	operations and other project purposes.	
15	**Water Quality Plan for Total Dissolved Gas and Water Temperature in the Mainstem Columbia and Snake Rivers** 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: ▪ Real-time monitoring and reporting of TDG and temperatures measured at fixed monitoring sites, ▪ 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, ▪ 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, ▪ 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	**Implementation Plans** ▪ The Water Quality Plan for Total Dissolved Gas and Water Temperature in the Mainstem Columbia and Snake Rivers (WQP) will be updated periodically and described in the 2009, 2013 and 2016 Implementation Plans. **Annual Progress Report** ▪ Annual progress reports will describe actions taken to implement actions for ESA commitments. There is no other physical or biological monitoring or reporting. **2013 and 2016 Comprehensive RPA Evaluation Reports** ▪ Comprehensive Evaluation Report will summarize actions taken to implement actions for ESA commitments. There is no other physical or biological monitoring or reporting.

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
Hydropower Strategy 1—Operate the FCRPS to Provide Flows and Water Quality to Improve Juvenile and Adult Fish Survival		
	real-time decision making for Dworshak Dam operations, and ▪ Expand water temperature modeling capabilities to include the Columbia River from Grande Coulee to Bonneville dams to better assess the effect of operations or flow depletions on summer temperatures ▪ Investigate alternatives to reduce total mass loading of TDG at Bonneville Dam while maintaining juvenile survival performance, and ▪ Continued operation of lower Snake River projects at MOP.	
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. Reclamation submitted a BA on the Yakima Project and is currently preparing updates to this document. Reclamation completed a draft BA for the Tualatin Project in December 2007, and expects to submit a final BA to NOAA Fisheries in 2008. Reclamation has drafted a BA on the Okanogan Project and expects to transmit a final BA to NOAA Fisheries in 2008.	**Annual Progress Report** ▪ Status of the consultations will be provided in the annual progress reports.

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
Hydropower Strategy 1—Operate the FCRPS to Provide Flows and Water Quality to Improve Juvenile and Adult Fish Survival		
17	**Chum Spawning Flows** Provide adequate conditions for chum spawning in the mainstem Columbia River in the area of the Ives Island complex and/or access to the Hamilton and Hardy Creeks for this spawning population. ▪ 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 needed. ▪ 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.	**Annual Progress Report** ▪ Annual progress reports will describe status of the actions taken in the previous year.

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
Hydropower Strategy 2—Modify Columbia and Snake River Dams to Maximize Juvenile and Adult Fish Survival[5] ***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.***		
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: Bonneville Powerhouse I ▪ Sluiceway modifications to optimize surface flow outlet to improve fish passage efficiency (FPE) and reduce forebay delay (2009). ▪ Minimum-gap turbine runner installation to improve survival of fish passing through turbines (2009) Bonneville Powerhouse II ▪ Screened bypass system modification to improve fish guidance efficiency (FGE) and reduce gatewell residence time (2008) ▪ Shallow BGS installation to increase Corner Collector efficiency and reduce forebay delay (prototype 2008)	**Implementation Plans** ▪ The initial COP for Bonneville Dam has been completed. The COP will be updated in 2008 and periodically thereafter, and the current version will be referenced in the 2009, 2013 and 2016 implementation plans. Specific Phase 1 actions will be addressed in these plans. **Annual Progress Report** ▪ Annual progress reports will describe status of the actions taken in the COP and the results of the associated RM&E. **2013 and 2016 Comprehensive RPA Evaluation Reports** ▪ Comprehensive Evaluation Report will summarize actions taken and the results of the associated RM&E. The Report will also include an analysis of the biological effectiveness of the actions taken to meet

[5] Dates shown are scheduled planning dates for completion.

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
Hydropower Strategy 2—Modify Columbia and Snake River Dams to Maximize Juvenile and Adult Fish Survival[5] ***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.***		
	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). 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 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.	the dam passage survival performance standard.
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:	**Implementation Plans** ▪ The initial COP for The Dalles Dam has been completed. The COP will be updated in 2008 and periodically thereafter, and the current version will be referenced in the 2009, 2013 and 2016 implementation plans. Specific Phase 1 actions will be addressed in these plans. **Annual Progress Report**

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
Hydropower Strategy 2—Modify Columbia and Snake River Dams to Maximize Juvenile and Adult Fish Survival[5] ***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.***		
	▪ Turbine operation optimization to improve overall dam survival (2011) ▪ Extended tailrace spill wall to increase direct and indirect survival of spillway passed fish (2010) 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.	▪ Annual progress reports will describe status of the actions taken in the COP and the results of the associated RM&E. **2013 and 2016 Comprehensive RPA Evaluation Reports** ▪ Comprehensive Evaluation Report will summarize actions taken and the results of the associated RM&E. The Report will also include an analysis of the biological effectiveness of the actions taken to meet the dam passage survival performance standard.
20	**Configuration and Operational Plan for John Day 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 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: ▪ Full-flow bypass and PIT-tag detection installation to reduce handing stress of	**Implementation Plans** ▪ The initial COP for John Day Dam has been completed. The COP will be updated in 2008 and periodically thereafter, and the current version will be referenced in the 2009, 2013 and 2016 implementation plans. Specific Phase 1 actions will be addressed in these plans.

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
Hydropower Strategy 2—Modify Columbia and Snake River Dams to Maximize Juvenile and Adult Fish Survival[5] ***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.***		
	bypassed fish (2007) ▪ Turbine operation optimization to improve overall dam survival (2011) ▪ 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. 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.	**Annual Progress Report** ▪ Annual progress reports will describe status of the actions taken in the COP and the results of the associated RM&E. **2013 and 2016 Comprehensive RPA Evaluation Reports** ▪ Comprehensive Evaluation Report will summarize actions taken and the results of the associated RM&E. The Report will also include an analysis of the biological effectiveness of the actions taken to meet the dam passage survival performance standard.
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 delay and increase survival of fish passing through the forebay, dam, and tailrace as warranted. Initial modifications will likely include: ▪ Turbine operation optimization to improve survival of fish passing through	**Implementation Plans** ▪ The initial COP for McNary Dam will be completed in 2009. The COP will be updated periodically, and the current version will be referenced in the 2009, 2013 and 2016 implementation plans. Specific Phase 1 actions will be addressed in these plans.

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
Hydropower Strategy 2—Modify Columbia and Snake River Dams to Maximize Juvenile and Adult Fish Survival[5] ***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.***		
	turbines (2013) ▪ Improve debris management to reduce injury of bypass and turbine passed fish (2011) ▪ Relocate juvenile bypass outfall to improve egress, direct, and indirect survival on bypassed fish (2011) ▪ 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) 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.	**Annual Progress Report** ▪ Annual progress reports will describe status of the actions taken in the COP and the results of the associated RM&E. **2013 and 2016 Comprehensive RPA Evaluation Reports** ▪ Comprehensive Evaluation Report will summarize actions taken and the results of the associated RM&E. The Report will also include an analysis of the biological effectiveness of the actions taken to meet the dam passage survival performance standard.
22	**Configuration and Operational Plan for Ice Harbor 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 Ice Harbor Project (2008). As part of the first phase of modifications, the Corps will investigate, and implement the following reasonable	**Implementation Plans** ▪ The initial COP for Ice Harbor Dam will be completed in 2008. The COP will be updated periodically, and the current version will be referenced in the 2009,

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
Hydropower Strategy 2—Modify Columbia and Snake River Dams to Maximize Juvenile and Adult Fish Survival[5] ***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.***		
	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: ▪ Guidance screen modification to improve FGE (2010) ▪ Turbine operation optimization to improve survival of turbine passed fish (2011) ▪ Spillway chute and/or deflector modification to reduce injury and improve survival of spillway passed fish through the RSW (2009) ▪ Turbine unit 2 replacement to improve the survival of fish passing through turbines and reduce oil spill potential (2012) 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.	2013 and 2016 implementation plans. Specific Phase 1 actions will be addressed in these plans. **Annual Progress Report** ▪ Annual progress reports will describe status of the actions taken in the COP and the results of the associated RM&E. **2013 and 2016 Comprehensive RPA Evaluation Reports** ▪ Comprehensive Evaluation Report will summarize actions taken and the results of the associated RM&E. The Report will also include an analysis of the biological effectiveness of the actions taken to meet the dam passage survival performance standard.
23	**Configuration and Operational Plan for Lower Monumental 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 Lower Monumental Project (2010). As part of the first	**Implementation Plans** ▪ The initial COP for Lower Monumental Dam will be completed in 2010. The COP will be updated periodically, and the

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
Hydropower Strategy 2—Modify Columbia and Snake River Dams to Maximize Juvenile and Adult Fish Survival[5] ***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.***		
	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: ▪ Primary bypass operations with PIT-tag detection installation to reduce handling stress of bypassed fish (2007) ▪ Juvenile bypass system outfall relocation to improve egress, direct and indirect survival on bypassed fish (2011) ▪ Turbine operation optimization to improve the survival of fish passing through turbines (2013) ▪ RSW installation to improve FPE, reduce forebay delay, and improve direct and indirect survival (2008) 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.	current version will be referenced in the 2009, 2013 and 2016 implementation plans. Specific Phase 1 actions will be addressed in these plans. **Annual Progress Report** ▪ Annual progress reports will describe status of the actions taken in the COP and the results of the associated RM&E. **2013 and 2016 Comprehensive RPA Evaluation Reports** ▪ Comprehensive Evaluation Report will summarize actions taken and the results of the associated RM&E. The Report will also include an analysis of the biological effectiveness of the actions taken to meet the dam passage survival performance standard.

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
Hydropower Strategy 2—Modify Columbia and Snake River Dams to Maximize Juvenile and Adult Fish Survival[5] ***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.***		
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 warranted. Initial modifications will likely include: ▪ Turbine operation optimization to improve the survival of fish passing through turbines (2014) ▪ Primary bypass operations with PIT-tag detection installation to reduce handling stress of bypassed fish (2008) ▪ Primary bypass outfall relocation to improve egress, direct and indirect survival on bypassed fish (2009) ▪ Surface spillway weir and deflector installation to improve FPE, reduce forebay delay and improve direct and indirect survival (2009) 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	**Implementation Plans** ▪ The initial COP for Little Goose Dam will be completed in 2009. The COP will be updated periodically, and the current version will be referenced in the 2009, 2013 and 2016 implementation plans. Specific Phase 1 actions will be addressed in these plans. **Annual Progress Report** ▪ Annual progress reports will describe status of the actions taken in the COP and the results of the associated RM&E. **2013 and 2016 Comprehensive RPA Evaluation Reports** ▪ Comprehensive Evaluation Report will summarize actions taken and the results of the associated RM&E. The Report will also include an analysis of the biological effectiveness of the actions taken to meet the dam passage survival performance standard.

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
Hydropower Strategy 2—Modify Columbia and Snake River Dams to Maximize Juvenile and Adult Fish Survival[5] ***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.***		
	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: ▪ New juvenile fish facility including orifice configuration changes, primary dewatering, holding for transport, and primary bypass to improve direct and indirect survival for all collected fish (2012) ▪ Turbine operation optimization to improve survival of turbine passed fish (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	**Implementation Plans** ▪ The initial COP for Lower Granite Dam will be completed in 2009. The COP will be updated periodically, and the current version will be referenced in the 2009, 2013 and 2016 implementation plans. Specific Phase 1 actions will be addressed in these plans. **Annual Progress Report** ▪ Annual progress reports will describe status of the actions taken in the COP and the results of the associated RM&E. **2013 and 2016 Comprehensive RPA Evaluation Reports** ▪ Comprehensive Evaluation Report will summarize actions taken and the results of the associated RM&E. The Report will also include an analysis of the biological

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
Hydropower Strategy 2—Modify Columbia and Snake River Dams to Maximize Juvenile and Adult Fish Survival[5] ***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.***		
	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.	effectiveness of the actions taken to meet the dam passage survival performance standard.
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 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.	**Implementation Plans** ▪ Not applicable. **Annual Progress Report** ▪ Annual progress reports will describe status of the flow deflector construction. **2013 and 2016 Comprehensive RPA Evaluation Reports** ▪ Not applicable.
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	**Implementation Plans** ▪ The turbine unit operations are identified in the annual FPP. **Annual Progress Report** ▪ Annual progress reports are developed by

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
Hydropower Strategy 2—Modify Columbia and Snake River Dams to Maximize Juvenile and Adult Fish Survival[5] ***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.***		
	optimum configuration for safe fish passage.	BPA. **2013 and 2016 Comprehensive RPA Evaluation Reports** ▪ Not applicable.
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 ▪ Improve the Bradford Island ladder system to reduce stress and improve reliability of upstream adult passage (2013). The Dalles Dam ▪ 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). John Day Dam ▪ Adult ladder systems modifications to improve upstream adult passage conditions (2011). Ice Harbor Dam ▪ 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.	**Implementation Plans** ▪ The initial adult passage improvements are identified in the proposed RPA. Implementation plans in 2009, 2013, and 2016 will reflect current implementation plans. **Annual Progress Report** ▪ Annual progress reports will describe status of the actions taken. **2013 and 2016 Comprehensive RPA Evaluation Reports** ▪ Comprehensive Evaluation Report will summarize actions taken and the results of the associated RM&E.

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
Hydropower Strategy 2—Modify Columbia and Snake River Dams to Maximize Juvenile and Adult Fish Survival[5] ***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.***		
	Little Goose Dam ▪ 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). Lower Granite Dam ▪ 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). ▪ Adult fishway modification to improve upstream adult passage conditions impaired by temperature differentials (need will be determined by results of further research) (prototype 2011).	

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
Hydropower Strategy 3—Implement Spill and Juvenile Transportation Improvements at Columbia River and Snake River Dams		
29	**Spill Operations to Improve Juvenile Passage** 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 the hydrosystem performance standards and the requirements of the Clean Water Act (CWA).	**Implementation Plans** ▪ The initial spill operation for juveniles is described in the proposed RPA. The spill operation will be updated annually and reported in the FPP. **Annual Progress Report** ▪ Spill operations are reported annually. **2013 and 2016 Comprehensive RPA Evaluation Reports** ▪ This information is the same as will be reported for each mainstem dam in hydro actions 14-21.

Table 2. Initial Voluntary Spill Operations at Columbia and Snake River Dams[1/]

Project	Spring Operation (Day/Night)	Spring Planning Dates	Summer Operation (Day/Night)	Summer Planning Dates
Bonneville	100 kcfs/100 kcfs	4/10-6/15	85 kcfs/Gas Cap[8/]	6/16-8/31[4/]
The Dalles	40%/40%	4/10-6/15	40%/40%	6/16-8/31[4/]
John Day	30/30% or 40/40%[2/]	4/10-6/15	30%/30%	6/16-8/31[4/]
McNary	40%/40%	4/10-6/15[7/]	40%/40% vs. 60%/60%	6/16-8/31[4/]
Ice Harbor	30%/30% vs. 45 kcfs/Gas Cap	4/7-5/30	30%/30% vs. 45 kcfs/Gas Cap	6/16-8/31[5/]
Lower Monumental	27 kcfs/27 kcfs (Bulk Spill Gas Cap)	4/7-5/6; 5/21-5/30[3/]	17 kcfs/17 kcfs	6/1[6/]-8/31[5/]
Little Goose	30%/30%	4/5-5/6; 5/21-5/30[3/]	30%/30%	6/1[6/]-8/31[5/]
Lower Granite	20 kcfs/20 kcfs	4/3-5/6; 5/21-5/30[3/]	18 kcfs/18 kcfs	6/1[6/]-8/31[5/]

Notes:

[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/] 24-hour spill operations are being tested at John Day following construction of surface flow outlets.

[3/] Maximized transport operations (i.e., elimination of voluntary spill at collector projects) will occur from May 7 to May 20 in years when flows are greater than 65 kcfs on the Snake River.

[4/] 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.

[5/] Termination of summer spill will occur at the four lower Snake projects when subyearling counts fall below 300 fish per day for 3 consecutive days on a per project basis, but no later than August 31 each year. Termination of spill at Ice Harbor Dam will be two days after Lower Monumental Dam spill ends. If after discontinuing spill at any of the Snake River projects after August 1, the subyearling Chinook collection again exceeds 500 fish per day for two consecutive days, spill will resume at that project. Thereafter, fish collection numbers will be reevaluated to determine if spill should continue, using the criteria above until August 31.

[6/] 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.

[7/] When seasonally average flows are projected to be less than 125 kcfs, voluntary spill may not be initiated at McNary Dam for spring run fish.

[8/] 85 kcfs daytime spill will be provided from June 16 - July 31 of each year to protect the great majority of the migrating ESA-listed SR fall Chinook salmon, then 75 kcfs during the day from August 1 – August 31 as proposed by the Action Agencies.

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
Hydropower Strategy 3—Implement Spill and Juvenile Transportation Improvements at Columbia River and Snake River Dams		
30	**Juvenile Fish Transportation in the Columbia and Snake Rivers** 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.	**Implementation Plans** ▪ The initial juvenile fish transportation program is described in the proposed RPA. The program will be updated annually and reported in the FPP. **Annual Progress Report** ▪ Annual progress reports will provide the number of fish collected and transported in an annual report each February. **2013 and 2016 Comprehensive RPA Evaluation Reports** ▪ Please see Hydro Action 27.

Table 3. Initial Transportation Strategy for Snake River Collector Projects[1/]

Lower Granite Dam	**Spring Migrants**				**Summer Migrants**			
	Spill and Bypass	Spill and Transport	Transport and No Voluntary Spill	Adaptive[2/,3/]	Spill and Transport	Adaptive	Transport and No Spill	Adaptive
Seasonal Average Flows < 65 kcfs	None	None	April 3 to May 31	June	July	Aug	Sept	Oct +
Seasonal Average Flows > 65 kcfs	April 3 to April 20	April 21 to May 6 and May 21 to May 31	May 7 to May 20	June	July	Aug	Sept	Oct +
Little Goose Dam								
	Spill and Bypass	Spill and Transport	Transport and No Voluntary Spill	Adaptive	Spill and Transport	Adaptive	Transport and No Spill	Adaptive
Seasonal Average Flows < 65 kcfs	None	None	April 3 to May 31	June	July	Aug	Sept	Oct +
Seasonal Average Flows > 65 kcfs	April 5 to April 20	April 21 to May 6 and May 21 to May 31	May 7 to May 20	June	July	Aug	Sept	Oct +
Lower Monumental Dam								
	Spill and Bypass	Spill and Transport	Transport and No Voluntary Spill	Adaptive	Spill and Transport	Adaptive	Transport and No Spill	Adaptive
Seasonal Average Flows < 65 kcfs	None	None	April 3 to May 31	June	July	Aug	Sept	Oct +
Seasonal Average Flows > 65 kcfs	April 7 to April 20	April 21 to May 6 and May 21 to May 31	May 7 to May 20	June	July	Aug	Sept	Oct +

Note: All flows are in average kcfs for the April through June time period.

[1/] Transport operations may be adjusted for research purposes, due to conditions at the collection facilities, or through the adaptive management process (to better match juvenile outmigration timing, and/or to achieve or maintain performance standards). In addition, through the adaptive management provisions of the BiOp, the Action

Agencies, in consultation with NOAA Fisheries and the Regional Forum TMT, will annually review the transportation protocols taking into account new information concerning adult returns, in-river and transportation SARs, and model results. If new information indicates a modified transportation protocol is warranted, adaptive management will be used to make the appropriate adjustments in timing and triggers for transportation

[2/] The term "adaptive" in this table refers to a transition between two adjacent management strategies in the table. For example, where "Adaptive" is between "Transportation and Non Voluntary Spill" and "Spill and Transportation," the decision for each option would be made based on RM&E and in-season data (with the goal of increasing survival of migrating juvenile salmon and the expected adult returns).

[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.

Table 4. Initial Transportation Strategy for McNary Dam[1/]

McNary Dam	**Spring Migrants**		**Summer Migrants**	
	Spill and Bypass	Adaptive[2/]	Spill and Transport	Transport and No Voluntary Spill
Seasonal Average Flows > 125 kcfs[3/]	Apr 10 to July 14	July 15 to July 30	August	September

Notes:

Average flows reported in average kcfs for April through June.

[1/] Transport operations may be adjusted for research purposes, due to conditions at the collection facilities, or as a result of the adaptive management process (to better match juvenile outmigration timing and/or to achieve or maintain performance standards). If new information indicates that modifying (or eliminating) transport operations is warranted, adaptive management will be used to make appropriate adjustments.

[2/] The term "adaptive" in this table refers to a transition between two adjacent management strategies in the table. For example, where "Adaptive" is between "Spill and Bypass" and "Spill and Transport," the decision for each option would be made based on RM&E and in-season data.

[3/] When seasonal average flows at MCN are expected to be < 125 kcfs (which is likely to occur in about 1 out of 70 years), the Regional Forum TMT may consider, to the extent that regional power emergency operations allow flexibility at McNary Dam, the use of transport and the elimination of voluntary spill or other available means to to limit impacts to juvenile survival and adult returns.

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
Hydropower Strategy 3—Implement Spill and Juvenile Transportation Improvements at Columbia River and Snake River Dams		
31	**Configuration and Operational Plan Transportation Strategy** 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.	**Implementation Plans** ▪ The COP for Transportation Strategy will be initiated in 2009. The COP will be updated periodically, and the current version will be included in the 2009, 2013 and 2016 implementation plans. **Annual Progress Report** ▪ Annual progress reports will describe status of the construction and operational actions and associated RM&E to support the transportation strategy. **2013 and 2016 Comprehensive RPA Evaluation Reports** ▪ Comprehensive Evaluation Report will summarize the construction and operational action taken and associated RM&E to support the transportation strategy. The Report will also include an analysis of the biological effectiveness of the actions taken to meet a system survival performance target.

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
Hydropower Strategy 4—Operate and Maintain Facilities at Corps' Mainstem Projects to Maintain Biological Performance		
32	**Fish Passage Plan** 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: ▪ 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 maintenance that affects fish operations or structures to eliminate and/or minimize fish operation impacts; ▪ Schedule routine maintenance during non-fish passage periods; ▪ Conduct non-routine maintenance activities as needed; and ▪ Coordinate criteria changes and emergency operations with FPOM. **Operations and Maintenance** ▪ Provide redundancy or contingency plans, developed in coordination with	**Implementation Plans** ▪ The FPP is prepared annually. **Annual Progress Report** ▪ Not applicable. **2013 and 2016 Comprehensive RPA Evaluation Reports** ▪ Not applicable.

	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. ▪ 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.	
RPA No.	**Action Description**	**Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations**
Hydropower Strategy 5—Develop and Implement a Kelt Management Plan		
33	**Snake River Steelhead Kelt Management Plan** 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: ▪ 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.	**Implementation Plans** ▪ The Kelt Management Plan is prepared annually. **Annual Progress Report** ▪ Status of project implementation (including project milestones) through December of the previous year for all actions identified in implementation plans. **2013 and 2016 Comprehensive RPA Evaluation Reports** ▪ Progress toward achieving the goals of the Snake River Steelhead Kelt Management Plan will be provided in the 2013 and 2016 comprehensive RPA evaluation reports.

HABITAT ACTIONS

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
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.		
Habitat Strategy 1—Protect and Improve Tributary Habitat Based on Biological Needs and Prioritized Actions		
34	**Tributary Habitat Implementation 2007 to 2009 – Progress Toward 2018 Habitat Quality Improvement Targets.** 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. 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 below.	**Implementation Plan** ▪ Specific projects for implementation in the 2007-2009 period are identified in the FCRPS BA, Attachment B.2.2-2, Tables 1-5a. **Annual Progress Reports** ▪ Status of project implementation (including project milestones) through December of previous year for all 2007-2009 actions. ▪ Report physical metrics for implementation achieved (e.g., miles of access, cfs streamflow acquired, #s of screens, and miles or acres of habitat protected or enhanced, and miles of complexity enhanced) relative to the project objectives.

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
Habitat Strategy 1—Protect and Improve Tributary Habitat Based on Biological Needs and Prioritized Actions		
35	**Tributary Habitat Implementation 2010-2018 – Achieving Habitat Quality and Survival Improvement Targets.** 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. a) 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. ▪ The Action Agencies shall convene an 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. ▪ 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	**Implementation Plans** ▪ Specific projects will be identified in implementation plans in December 2009, 2013, and 2016. Plans will include location, limiting factor treated, targeted population(s), reporting metrics and expected biological benefits for each project. ▪ Progress Guidelines: To maintain progress toward the 2018 survival improvements, each implementation plan cycle will identify projects the Action Agencies will fund to achieve approximately 33% of the remaining habitat improvements needed to be met in each cycle will be determined based on the tributary survival benefits achieved from projects, as implemented, in the previous cycle. The 2016 Plan will identify steps the Action Agencies will take to ensure that projects needed to cover any remaining tributary survival deficits will be fully funded by 2018. **Annual Progress Reports** ▪ Status of project implementation

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
Habitat Strategy 1—Protect and Improve Tributary Habitat Based on Biological Needs and Prioritized Actions		
	quantitative habitat metrics which can be used to quantitatively evaluate progress and completion of individual projects. ▪ 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 salmonid survival. 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. The Action Agencies will continue to work cooperatively with the Council to identify priorities and obtain ISRP review of projects proposed for BPA funding. ▪ 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. ▪ 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	(including project milestones) through December of previous year for all actions identified in implementation plans. ▪ Report physical metrics for implementation achieved (e.g., miles of access, cfs streamflow acquired, #s of screens installed, miles of acres of habitat protected or enhanced, and miles of complexity enhanced by benefited population(s)) relative to the total needed to complete project and achieve the estimated survival benefits, by project. **2013 and 2016 Comprehensive RPA Evaluation Reports** ▪ Comprehensive report on status of project implementation, by project, (including project milestones) for all actions identified in implementation plans. ▪ Comprehensive report of physical metrics for implementation achieved (e.g. miles of access, cfs streamflow acquired #s of screens installed, miles or acres of habitat protected or enhanced, and miles of complexity enhanced by benefited population(s)) and still remaining, by

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
Habitat Strategy 1—Protect and Improve Tributary Habitat Based on Biological Needs and Prioritized Actions		
	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. b) 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. c) For those lower Columbia populations above Bonneville Dam that have been significantly 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.	project. ▪ By population, report progress toward overall habitat quality improvement targets and population-specific survival benefit. ▪ Where population-specific survival benefits are not achieving Progress Guidelines above, identify processes or projects to place to ensure achievements by the next comprehensive report. ▪ Report results of all biological effectiveness monitoring/studies, including new scientific information, and identify how results will be applied to future implementation, if appropriate. ▪ Where new scientific or other information suggests that habitat quality improvement estimates for projects from the previous cycle were significantly in error, the Action Agencies will describe the analytical approach used to re-evaluate the estimated habitat and survival benefits for each project affected.

Table 5. Estimated Habitat Quality Improvements

ESU	Major Population Group	Population	Estimated Percentage Habitat Quality Improvement of 2007-2009 Actions	Total Estimated Percentage Habitat Quality Improvement of 2007-2018 Actions
Snake River Spring/Summer Chinook	Grand Ronde/Imnaha	**Catherine Creek**	**4**	**23**
		Lostine/Wallowa River	2	2 *
		Grand Ronde River upper mainstem	**2**	**23**
		Imnaha River mainstem	1	1 *
	Middle Fork Salmon River	Big Creek	1	1 *
	South Fork Salmon River	Secesh River	1	1 *
		South Fork Salmon River Mainstem	<1	<1 *
	Lower Snake	**Tucannon River**	**7**	**17**
	Upper Salmon River	East Fork Salmon River	1	1 *
		Lemhi River	7	7 *
		Pahsimeroi River	41	41 *
		Salmon River lower mainstem below Redfish Lake	1	1 *
		Salmon River upper mainstem above Redfish Lake	14	14 *
		Valley Creek	1	1 *
		Yankee Fork	**10**	**30**
Upper Columbia Spring Chinook	Upper Columbia – Below Chief Joseph	**Entiat River**	**10**	**22**
		Methow River	**2**	**6**
		Wenatchee River	**1**	**3**

Table 5. Estimated Habitat Quality Improvements (continued)

ESU	Major Population Group	Population	Estimated Percentage Habitat Quality Improvement of 2007-2009 Actions	Total Estimated Percentage Habitat Quality Improvement of 2007-2018 Actions
Middle Columbia Steelhead	Cascades Eastern Slope Tributaries	Deschutes River – eastside	1	1 *
		Deschutes River – Westside	<1	<1 *
		Fifteen mile Creek (winter run)	<1	<1 *
		Klickitat River	4	4 *
	John Day River	John Day River lower mainstem tributaries	<1	<1 *
		John Day River upper mainstem	<1	<1 *
		Middle Fork John Day River	<1	<1 *
		North Fork John Day River	<1	<1 *
		South Fork John Day River	1	1 *
	Umatilla and Walla Walla River	Touchet River	4	4 *
		Umatilla River	4	4 *
		Walla Walla River	4	4 *
	Yakima River Group	Naches River	4	4 *
		Satus Creek	4	4 *
		Toppenish	4	4 *
		Yakima River upper mainstem	4	4 *
Snake River Steelhead	Clearwater River	**Lochsa River**	**6**	**16**
		Lolo Creek	**8**	**12**
		Selway River	**<1**	**<1**
		South Fork Clearwater River	**5**	**14**

Table 5. Estimated Habitat Quality Improvements (continued)

ESU	Major Population Group	Population	Estimated Percentage Habitat Quality Improvement of 2007-2009 Actions	Total Estimated Percentage Habitat Quality Improvement of 2007-2018 Actions
Snake River Steelhead	Grand Ronde River	Grand Ronde River lower mainstem tributaries	<1	<1 *
		Grand Ronde River upper mainstem	4	4 *
		Joseph Creek (OR)	<1	<1 *
		Joseph Creek (WA)	4	4 *
		Wallowa River	<1	<1 *
	Hells Canyon	Hells Canyon		
	Imnaha River	Imnaha River		*
	Lower Snake	Asotin Creek	4	4 *
		Tucannon River	5	5 *
	Salmon River	**Lower Middle Fork mainstem and tribs (Big, Camas, and Loon Creeks)**	**1**	**2**
		East Fork Salmon River	2	2 *
		Lemhi River	3	3 *
		Pahsimeroi River	9	9 *
		Salmon River upper mainstem	6	6 *
		Secesh River	**1**	**6**
		South Fork Salmon River	**<1**	**1**
Upper Columbia Steelhead	Upper Columbia River – below Chief Joseph	**Entiat River**	**6**	**8**
		Methow River	**2**	**4**
		Okanogan River	**12**	**14**
		Wenatchee River	**1**	**4**

* 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.

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
Habitat Strategy 2—Improve Juvenile and Adult Fish Survival in Estuary Habitat		
36	**Estuary Habitat Implementation 2007 to 2009** The Action Agencies will provide funding to implement specific actions identified for implementation in 2007-2009 (FCRPS BA, Attachment B.2.2) as part of a 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 state of development such that quantitative physical metrics have not been related to estimated survival benefits will be selected per Action 37. If projects identified for implementation in 2007-2009 prove infeasible, in whole or in part, the Action Agencies will implement comparable replacement projects in 2010-2013 to provide equivalent habitat benefits needed to achieve equivalent survival benefits. Replacement projects will be selected per Action 37.	**Implementation Plan** ▪ Specific projects for implementation in the 2007-2009 period are identified in the FCPRS BA, Attachment B.2.2. **Annual Progress Reports** ▪ Status of project implementation (including project milestones) through December of previous year for all 2007-2009 actions. ▪ Report physical metrics for implementation achieved (e.g., # of acres protected/restored/enhanced; riparian miles protected) relative to the total needed to complete project and achieve the estimated survival benefits.
37	**Estuary Habitat Implementation 2010-2018—Achieving Habitat Quality and Survival Improvement Targets** The Action Agencies will provide funding to implement additional specific projects as needed to achieve the total estuary survival benefits identified in the FCRPS BA Attachment B.2.2). Projects will identify location, treatment of limiting factor, targeted ESU/DPS or ESUs/DPSs, appropriate reporting metrics, and estimated biological benefits based on the achieving of those metrics. Pertinent new information on climate change and potential effects of that	**Implementation Plans** ▪ Specific projects will be identified in implementation plans in December, 2009, 2013 and 2016. Plans will include location, area extent of action, type of action, expected biological benefits, and other relevant information and authorities necessary for implementation. If the

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
Habitat Strategy 2—Improve Juvenile and Adult Fish Survival in Estuary Habitat		
	information on limiting factors will be considered. ▪ Action Agencies will actively engage the LCREP Science workgroup to identify project benefits in coordination with other regional experts, using recovery planning products and the modified LCREP project selection criteria (FCRPS BA Attachment B.2.2-3) to identify projects that will benefit salmon considered in this RPA. ▪ To support project selection the Action Agencies will convene an expert regional technical group. This group will use the habitat metrics to determine the estimated change in survival which would result from full implementation. ▪ Project proposals will clearly describe the completed project in terms of quantitative habitat metrics which can be used to quantitatively evaluate progress and completion of individual projects. ▪ The expert regional technical group will use the approach originally applied in the FCRPS BA (Attachment B.2.2) (*Estimated Benefits of Federal Agency Habitat Projects in the Lower Columbia River Estuary*) and all subsequent information on the relationship between actions, habitat and salmon productivity models developed through the FCRPS RM&E to estimate the change in overall estuary habitat and resultant change in population survival. ▪ If actions from the previous cycle prove infeasible, in whole or in part, the Action Agencies will ensure implementation of comparable replacement estuary projects in the next implementation plan cycle to maintain estimated habitat quality improvements at the ESU/DPS level and achieve equivalent survival benefits. Selection of replacement projects, to ensure comparable survival benefits, will be made based on input from expert panels, regional recovery planning groups, the Northwest Power and Conservation Council, and NOAA Fisheries.	Action Agencies do not have the appropriations necessary to implement specific projects the Implementation Plans will detail the steps in place to secure those appropriations and identify contingency projects which will be implemented should those appropriations not be secured by the next check-in. ▪ Progress Guidelines: To maintain progress toward the 2018 survival benefits, each implementation cycle will identify projects the Action Agencies will fund to achieve approximately 33% of the remaining post 2007-2009 total estuary survival improvements, for each ESU/DPS, needed to achieve the total 2018 survival benefits assumed for the estuary. The remaining survival improvements needed to be met in each cycle will be determined based on the estuary survival benefits achieved from projects, as implemented, in the previous cycle. The 2016 Plan will identify steps the Action Agencies will take to ensure that projects needed to cover any remaining estuary survival deficits will be funded by 2017.

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
Habitat Strategy 2—Improve Juvenile and Adult Fish Survival in Estuary Habitat		
	▪ FCRPS RM&E results will actively inform the relationship between actions, estuary habitat change and salmon productivity and new scientific information will be applied to estimate benefits for future implementation. ▪ If new scientific or other information (except incomplete implementation of project modification) suggests that habitat quality improvement estimates for projects from the previous cycle were significantly in error, the Action Agencies will examine the information and review the project or projects in question and their estimated benefits. This review will occur as part of the 2009 Annual Report and the Comprehensive RPA Evaluations in 2013 and 2016 and will be performed in conjunction with NOAA Fisheries. In the event such review find that habitat based survival improvement were significantly overstated, the Action Agencies will implement replacement projects (selected as per new projects above) to provide benefits sufficient to achieve the ESU/DPS-specific survival benefit estimated for each affected project.	**Annual Progress Reports** ▪ Status of project implementation (including project milestones) through December of previous year for all actions identified in implementation plans. ▪ Report physical metrics for implementation achieved (e.g. # of acres protected, restored, enhanced; riparian miles protected) relative to the total needed to complete project and achieve the estimated survival benefits, by project. ▪ By ESU, report progress toward ESU/DPS-specific survival benefit. ▪ Where ESU/DPS specific survival benefits are not achieving Progress Guidelines above, identify processes or projects in place to ensure achievements by the next comprehensive report. **2013 and 2016 Comprehensive RPA Evaluation Reports** ▪ Comprehensive report on status of project implementation, by project, (including project milestones) for all actions identified in implementation plans. ▪ Comprehensive report of physical metrics for implementation achieved (e.g. # of

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
Habitat Strategy 2—Improve Juvenile and Adult Fish Survival in Estuary Habitat		
		acres protected/restored/enhanced; riparian miles protected; # of pile dikes removed) and still remaining, by project. ▪ Where ESU-specific survival benefits are not achieving Progress Guidelines above, identify processes or projects in place to ensure achievement by the next comprehensive report. ▪ Report results of all RM&E studies, including information from expert regional technical group, and identify how results will be applied to future implementation, if appropriate. ▪ Where new scientific or other information suggests that survival improvement estimates for projects from the previous cycle were significantly in error, the Action Agencies will describe the analytical approach used to re-evaluate the estimated survival benefits for each project affected.
38	**Piling and Piling Dike Removal Program** To increase access to productive habitat and to reduce avian predation, the Action Agencies will develop and implement a piling and pile dike removal program. ▪ In 2008, the Action Agencies will work with Lower Columbia River Estuary	**Implementation Plans** ▪ Specific projects for implementation in the 2008-2009 period will be identified following development of a plan for

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
Habitat Strategy 2—Improve Juvenile and Adult Fish Survival in Estuary Habitat		
	Program to develop a plan for strategic removal of structures that have lower value to navigation channel maintenance, present low-risk to adjacent land use, support increased ecosystem function, and are cost-effective. ▪ Beginning in 2008 and 2009, the Action Agencies will begin implementation. Implementation will continue through 2018.	strategic removal of structures in 2008. Specific projects will be identified in implementation plans in December, 2009, 2013 and 2016. If all projects cannot be identified at the start of each 3 year period, projects will be identified prospectively in the Annual Report. Plans and reports will include location, limiting factor treated, targeted ESU/s, reporting metric and expected biological benefit for each project. **Annual Progress Reports** ▪ Status of project implementation (including project milestones) through December of previous year for all actions identified in implementation plans. ▪ Report physical metrics for implementation achieved (e.g. # of pilings/pile dikes removed, habitat area restored) by project. **2013 and 2016 Comprehensive RPA Evaluation Reports** ▪ Comprehensive report on status of project implementation (including project

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
Habitat Strategy 2—Improve Juvenile and Adult Fish Survival in Estuary Habitat		
		milestones) for all actions identified in implementation plans. ▪ Comprehensive report of physical metrics for implementation achieved (e.g. # of pilings/pile dikes removed). ▪ Report describing the effect of piling and pile dike removal projects implemented on survival of salmonids by ESU/DPS.

HATCHERY ACTIONS

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
	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.	
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		
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.	**Implementation Plans** ▪ Consultation under the ESA on the operation of hatchery programs funded by the FCRPS Action Agencies, including the submittal of updated and complete HGMPs. Updated and complete HGMPs are to be submitted to NOAA Fisheries and ESA consultation should be initiated by January 2009 for hatchery programs in the Upper Columbia, by July 2009 for hatchery programs in the Middle Columbia and by February 2010 for hatchery programs in the Snake River basin. ESA consultations should be

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
		completed by July 2009 for hatchery programs in the Upper Columbia, January 2010 for hatchery programs in the Middle Columbia and August 2010 for hatchery programs in the Snake River basin. **Annual Progress Reports** ▪ Status of submittal/approval of HGMPs including site specific application of BMPs. **2013 and 2016 Comprehensive RPA Evaluation Reports** ▪ Report level of compliance with NOAA approved HGMPs at all FCRPS mitigation hatchery programs.

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
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		
40	**Reform FCRPS Hatchery Operations to Reduce Genetic and Ecological Effects on ESA-Listed Salmon and Steelhead** The Action Agencies will undertake/fund 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.	**Implementation Plans** ▪ Actions and implementation schedules for reforms identified in Table 6 and future reforms identified by the Action Agencies following the HSRG process will be provided in implementation plans in December 2009, December 2013, and December 2016. **Annual Progress Reports** ▪ Status of implementation through December of previous year for all reforms identified in Table 6. ▪ Status of implementation of future reforms identified by the Action Agencies following the HSRG process. **2013 and 2016 Comprehensive RPA Evaluation Reports** ▪ Comprehensive report on status of project implementation for all actions identified in implementation plans. ▪ Report on any reform-specific monitoring and evaluation.

Table 6. Specific Projects to Implement Hatchery RPA Actions

Hatchery Strategy 1, Action 40 **Reform FCRPS Hatchery Operations to Reduce Genetic and Ecological Effects on ESA-Listed Salmon & Steelhead**	
	For **Lower Columbia Chinook:** The COE will review the John Day Hatchery Mitigation Program.
	For **Snake River Steelhead:** Fund the Tucannon River steelhead supplementation program to transition to local broodstock using BMPs.[6]
	For **Middle Columbia Steelhead:** Fund the Touchet River steelhead supplementation program to transition to local broodstock using BMPs. [7]
	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.

[6] Current operation of these programs is undergoing site specific ESA consultation; a Section 7 determination has not yet been made.
[7] Current operation of these programs is undergoing site specific ESA consultation; a Section 7 determination has not yet been made.

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
Hatchery Strategy 2—Preserve and Rebuild Genetic Resources Through Safety-net and Conservation Actions to Reduce Short-term Extinction Risk and Promote Recovery		
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 6.	**Implementation Plans** ▪ Identification of ongoing safety net programs and planning or implementation of new or modified safety-net programs will be provided in implementation plans in December, 2009, 2013 and 2016. **Annual Progress Reports** ▪ Status of implementation through December of previous year for all safety net programs identified in Table 7. **2013 and 2016 Comprehensive RPA Evaluation** ▪ Comprehensive report on status of implementation of all actions identified in implementation plans. ▪ Report on any associated monitoring and evaluation results that may inform future operations.

Table 7. Specific Projects to Implement Hatchery RPA Actions

Hatchery Strategy 2, Action 41 **Implement Safety-Net Programs to Preserve Genetic Resources and Reduce Short-term Extinction Risk**	
	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).
	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 spawners comprised of hatchery-origin fish.
	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.
	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.
	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).
	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.

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
Hatchery Strategy 2—Preserve and Rebuild Genetic Resources Through Safety-net and Conservation Actions to Reduce Short-term Extinction Risk and Promote Recovery		
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 6.	**Implementation Plans** ▪ Implementation schedules for new conservation programs identified in Table 8 and ongoing conservation programs, planning or implementation of new or modified conservation programs will be provided in implementation plans in December 2009, December 2013, and December 2016. Any necessary regulatory approvals will be included in the implementation schedules. **Annual Progress Reports** ▪ Status of implementation through December of previous year for all conservation programs identified in Table 6. **2013 and 2016 Comprehensive RPA Evaluation Reports** ▪ Comprehensive report on status of implementation of all actions identified in implementation plans. ▪ Report on any associated monitoring and

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
Hatchery Strategy 2—Preserve and Rebuild Genetic Resources Through Safety-net and Conservation Actions to Reduce Short-term Extinction Risk and Promote Recovery		
		evaluation results that may inform future operations.

Table 8. Specific Projects to Implement Hatchery RPA Actions

Hatchery Strategy 2, Action 42 **Implement Conservation Programs to Build Genetic Resources & Assist in Promoting Recovery**	
	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.
	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.
	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 monitoring and evaluation costs.
	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

	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.
	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 using local broodstock and following a sliding scale for managing the composition of natural spawners comprised of hatchery origin fish.
	For **Snake River Sockeye:** Fund further expansion of the sockeye program to increase total smolt releases to between 500,000 and 1 million fish.
	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.
	For **Columbia River Chum:** Fund a hatchery program to re-introduce chum salmon in Duncan Creek including capital construction, implementation and monitoring and evaluation costs as long as NOAA Fisheries considers it beneficial to recovery and necessary to reduce extinction risk of the target population.
	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.

PREDATION MANAGEMENT ACTIONS

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
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 salmonids in the lower Snake and Columbia rivers ▪ Predation Management Strategy 2—Implement avian predation control measures to increase survival of juvenile salmonids in the lower Snake and Columbia rivers ▪ Predation Management Strategy 3—Implement marine mammal control measures to increase survival of adult salmonids at Bonneville Dam ▪ Each strategy consists of two specific actions. These are summarized in the following sections.		
Predation Management Strategy 1—Implement Piscivorous Predation Control Measures to Increase Survival of Juvenile Salmonids in the lower Snake and Columbia Rivers		
43	**Northern Pikeminnow Management Program (NPMP)** 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. 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.	**Implementation Plans** ▪ The NPMP will be described in the 2009, 2013 and 2016 Implementation Plan. **Annual Progress Report** ▪ Annual progress reports will describe actions taken, including: — Number of pikeminnow removals — Estimated reduction of juvenile salmon Consumed — Average exploitation rate — Results of periodic program evaluations (including updates on age restructuring and compensatory responses)

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
		2013 and 2016 Comprehensive RPA Evaluation Reports ▪ Comprehensive Evaluation Report will summarize actions taken.

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
Predation Management Strategy 1—Implement Piscivorous Predation Control Measures to Increase Survival of Juvenile Salmonids in the lower Snake and Columbia Rivers		
44	**Develop strategies to reduce non-indigenous fish** 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.	**Implementation Plans** ▪ Results of the workshop will be described in the 2009 Implementation Plan. **Annual Progress Report** ▪ Beginning in 2010, annual progress reports will describe actions taken as a result of the workshop. **2013 and 2016 Comprehensive RPA Evaluation Reports** ▪ Comprehensive Evaluation Report will summarize actions taken as a result of the

		workshop.

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
Predation Management Strategy 2—Implement Avian Predation Control Measure to Increase Survival of Juvenile Salmonids in the lower Snake and Columbia Rivers		
45	**Reduce Caspian Terns on East Sand Island in the Columbia River Estuary** 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.	**Implementation Plans** ▪ Initial plans are contained in Section B.2.5.3 of the FCRPS BA. **Annual Progress Report** ▪ Report the number of pairs on East Sand Island and the number of acres of tern habitat relative to objectives. ▪ Report number of acres developed at each site, monitoring of nesting pairs and consumption rates on salmonids at East Sand Island. **2013 and 2016 Comprehensive RPA Evaluation Reports** ▪ Comprehensive Evaluation Report will summarize the effects of redistribution of Caspian terns on salmonids in the Columbia River estuary.

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

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
Predation Management Strategy 2—Implement Avian Predation Control Measure to Increase Survival of Juvenile Salmonids in the lower Snake and Columbia Rivers		
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.	**Implementation Plans** ▪ Status of the management plan will be provided in the 2009 Implementation Plan. **Annual Progress Report** ▪ Annual progress reports will describe actions taken if warranted. **2013 and 2016 Comprehensive RPA Evaluation Reports** ▪ Comprehensive Evaluation Report will summarize actions taken.
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.	**Implementation Plans** ▪ Status of the management plan will be provided in the 2009 Implementation Plan. **Annual Progress Report** ▪ Annual progress reports will describe actions taken if warranted. **2013 and 2016 Comprehensive RPA Evaluation Reports**

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
Predation Management Strategy 2—Implement Avian Predation Control Measure to Increase Survival of Juvenile Salmonids in the lower Snake and Columbia Rivers		
		▪ Comprehensive Evaluation Report will summarize actions taken.
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.	**Implementation Plans** ▪ The FPP identifies avian deterrent actions at the lower Snake and Columbia River dams. The FPP is updated annually. **Annual Progress Report** ▪ Annual deterrent actions will not be reported. **2013 and 2016 Comprehensive RPA Evaluation Reports** ▪ Annual deterrent actions will not be reported.

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
Predation Management Strategy 3—Implement Marine Mammal Control Measures to Increase Survival of Adult Salmonids at Bonneville Dam		
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.	**Implementation Plans** ▪ The FPP identifies annual installation of sea lion excluder gates. **Annual Progress Report** ▪ Not applicable. **2013 and 2016 Comprehensive RPA Evaluation Reports** ▪ Not applicable.

RESEARCH, MONITORING, AND EVALUATION ACTIONS

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations

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***

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
	survival improvements and trends in evolutionary significant unit (ESU) or population performance. Performance targets inform longer-term adaptive management decisions and prioritization of options across populations with different relative needs.	
RM&E Strategy 1—Monitor the Status of Selected Fish Populations Related to FCRPS Actions ***The Action Agencies' strategy is to support performance monitoring and adaptive management related to the status of fish populations.***		
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). ▪ Implement and maintain the Columbia River Basin passive integrated transponder (PIT)-Tag Information System. (Annually) ▪ Monitor adult returns at mainstem hydroelectric dams using both visual counts and the PIT-tag detection system (see Hydrosystem section). (Annually) ▪ Monitor juvenile fish migrations at mainstem hydroelectric dams using smolt monitoring and the PIT-tag detection system (see Hydrosystem section). (Annually) ▪ Fund status and trend monitoring as a component of the pilot studies in the	**Implementation Plans** ▪ Specific projects for implementation in the 2007-2009 period are identified in the FCRPS BA Attachment B.2.6-1, Table 8. ▪ Specific projects will be identified in implementation plans in December 2009, 2013, and 2016. ▪ Review and modify existing Action Agencies' fish populations 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. **Annual Progress Report** ▪ Status of project implementation (including project milestones) through December of the

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
RM&E Strategy 1—Monitor the Status of Selected Fish Populations Related to FCRPS Actions ***The Action Agencies' strategy is to support performance monitoring and adaptive management related to the status of fish populations.***		
	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). ▪ 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) ▪ 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) ▪ 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) ▪ Report available information on population viability metrics in annual and comprehensive evaluation reports. (Initiate in FY 2008)	previous year for all actions identified in Attachment B.2.6-1 or subsequent implementation plans. **2013 and 2016 Comprehensive RPA Evaluation Reports** ▪ The evaluation of fish population status information will be included.
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: ▪ Support the coordination, data management, and annual synthesis of fish	**Implementation Plans** ▪ Specific Projects will be identified in implementation plans in December 2009, 2013, and 2016. **Annual Progress Report**

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
RM&E Strategy 1—Monitor the Status of Selected Fish Populations Related to FCRPS Actions ***The Action Agencies' strategy is to support performance monitoring and adaptive management related to the status of fish populations.***		
	population metrics through Regional Data Repositories and reports. (Annually) ▪ 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) ▪ 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)	▪ Status of project implementation (including project milestones) through December of the previous year for all actions identified in implementation plans. **2013 and 2016 Comprehensive RPA Evaluation Reports** ▪ Progress on collaboration will be reported.

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations

RM&E Strategy 2—Hydrosystem Research, Monitoring, and Evaluation

NOAA Fisheries concurs with the Action Agencies' strategy to support performance monitoring and adaptive management related to hydropower actions. Performance standards have been identified for average juvenile dam survival for run-of-river spring and summer migrants and adult hydro system survival. Hydrosystem Action programmatic standards have also been identified and will be annually monitored with project implementation monitoring. The expected increase in total juvenile system survival associated with the Hydrosystem Action has been identified as a long-term performance target. This performance target will be assessed in the future using the same modeling approach used to assess the benefit of actions within this Biological Opinion, but using actual operations and configurations in place in 2012 and 2015, at the time of the comprehensive evaluation. These estimates will be based on the Comprehensive Fish Passage Model (COMPASS), calibrated and validated by the most recent years' empirical survival data.

Juvenile Dam Passage Performance Standards

The Action Agencies juvenile performance standards are an average across Snake River and Lower Columbia River dams of 96% average dam passage survival for spring Chinook and steelhead and 93% average across all dams for Snake River subyearling Chinook. Dam passage survival is defined as survival from the upstream face of the dam to a standardized reference point in the tailrace. (See RM&E Hydro Performance Monitoring, Appendix B.2.6-2). NOAA Fisheries considers the "effect zone" of the dams to extend into the forebays. However, the available information does not support the establishment of a dam survival or delay performance standard that includes the forebay. NOAA Fisheries expects that surface passage improvements proposed in the RPA will decrease delay and increase survival through the forebays of dams that will be configured with new surface passage routes (see Chapter 8 for a more detailed discussion of this topic).

Juvenile In-river Survival Performance Metric

The FCRPS Action Agencies will annually measure the survival of in-river migrating fish and compare these numbers with COMPASS model estimates based on the conditions experienced and the expected benefits of completed hydro actions (SCA, In-river Juvenile Survival Appendix).

Juvenile System Survival Performance Targets

The Action Agencies' juvenile system survival performance targets estimate the expected increase in juvenile fish survival through the hydrosystem (system survival to below Bonneville Dam) that are associated with the proposed hydrosystem actions, relative to the 2004 base level (See Appendix B to the Action Agencies' Comprehensive Analysis). These relative survival improvements will be used as the biological performance target as the

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations

RM&E Strategy 2—Hydrosystem Research, Monitoring, and Evaluation

basis for performance tracking.

Adult Performance Standards

The Action Agencies' adult performance standards will track and confirm that the relatively high levels of adult survival currently observed are maintained or increased (see Table 7).

Table 7. Adult Performance Standard by ESU.*

ESU	Adult Standard	Reach	Rationale
SR Fall Chinook	81.2%	BON to LGR	
SR Spring -Summer Chinook	91.0%	BON to LGR	
SR Sockeye	Surrogate, develop in future if data is sufficient.	BON to LGR	Standards will be developed when sufficient numbers of PIT tagged SR sockeye return to Bonneville Dam to allow survival estimates to be made. Until then, assume that survival is adequate if SR spring/summer Chinook salmon and steelhead BON to LGR standards are met..
SR steelhead	90.1%	BON to LGR	Due to some data limitations/uncertainties, the performance standards will be reviewed as new information becomes available, and standards updated as appropriate.
UCR spring Chinook	90.1%	BON to MCN	
UCR steelhead	84.5%	BON to MCN	Due to data limitations/uncertainties, the performance standards will be reviewed as new information becomes available, and standards updated as appropriate.
MCR steelhead	Surrogate	Variable	Assume that survival is adequate if SR steelhead BON to LGR standard is met. Due to some data limitations/uncertainties, the performance standards will be reviewed as new information becomes available, and standards updated as appropriate.

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations

RM&E Strategy 2—Hydrosystem Research, Monitoring, and Evaluation

CR chum	None	None	Cannot be directly measured at present. Assume that survival is adequate if SR fall Chinook BON to LGR standard is met.
LCR Chinook	None	None	Cannot be directly measured at present. Assume that survival for spring and fall populations is adequate if SR spring/summer Chinook and SR fall Chinook standards are met.
LCR coho	None	None	Cannot be directly measured at present. Assume that survival is adequate if SR fall Chinook BON to LGR standard is met.
LCR steelhead	None	None	Cannot be directly measured at present. Assume that survival is adequate if SR steelhead BON to MCN standard is met.
UWR Chinook	None	None	Not expected to migrate upstream of Bonneville Dam
UWR steelhead	None	None	Not expected to migrate upstream of Bonneville Dam

*NMFS developed these survival standards (wild and hatchery origin fish combined) based on fish detected (via PIT tags) at Bonneville Dam and later at the uppermost (for the species detected) federal dam (2002 to 2006) that were known to migrate in-river as juveniles. These estimates have been adjusted to account for estimated harvest and straying rates of adults within the FCRPS migration corridor, but otherwise capture all other sources of mortality manifested within the identified reaches, including those resulting from the existence and operation of the FCRPS, unquantifiable levels of mortality from other potential sources (e.g., unreported or delayed mortality caused by fisheries, marine mammal predator attacks, etc.), and unquantifiable levels of "natural" mortality (i.e., levels of mortality in the migratory corridor that would have occurred "naturally" without human influence). Estimates are generally based on 2002 to 2007 data(see SCA - Adult Survival Rate Appendix). Shaded cells denote ESUs that required estimates be made using other ESUs as surrogates.

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: ▪ Monitor and evaluate salmonid dam survival rates for a subset of FCRPS projects. ▪ Monitor and evaluate juvenile salmonid in-river and system survival through	**Implementation Plans** ▪ Specific projects will be identified in implementation plans in December 2009, 2013, and 2016. **Annual Progress Report** ▪ Status of project implementation (including

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
RM&E Strategy 2—Hydrosystem Research, Monitoring, and Evaluation		
	the FCRPS, including estimates of differential post-Bonneville survival of transported fish relative to in-river fish (D-value) as needed. ▪ Monitor and evaluate adult salmonid system survival upstream through the FCRPS. ▪ 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. ▪ 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. ▪ Develop an action plan for conducting hydrosystem status monitoring (analytical approaches, tagging needs, methods, and protocols) in ongoing collaboration with the State and Federal fishery agencies and Tribes. This will be done in coordination with status monitoring needs and strategies being developed for estuary/ocean, habitat, hatcheries, and harvest. (Initiate in FY2009) ▪ Cooperate with NOAA Fisheries, US v Oregon parties, Confederated Tribes of the Colville Reservation, and other co-managers to 1) review relevant information and identify factors (migration timing, spatial distribution, etc.) that might explain the differential conversion rates (BON to MCN) observed for UCR steelhead and spring Chinook salmon compared to SR steelhead and spring/summer Chinook salmon (see RPA Table 7 and SCA - Adult Survival Estimates Appendix); 2) develop a monitoring plan to determine the most likely cause of these differential losses (considering the potential use of flat plate PIT tag detectors in tributaries or fishery areas, additional adult detectors at The	project milestones) through December of the previous year for all actions identified in implementation plans. **2013 and 2016 Comprehensive RPA Evaluation Reports** ▪ The evaluation will include information from these actions.

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
RM&E Strategy 2—Hydrosystem Research, Monitoring, and Evaluation		
	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. 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.	

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations

RM&E Strategy 2—Hydrosystem Research, Monitoring, and Evaluation

Table 8. Minimum Adult Fish Counting Schedule

Dam	Duration of Operation	Duration of Counting	Hours of Count
Bonneville	January 1 - December 31	January 1 - December 31	04:00 - 20:00
The Dalles	February 20 – December 7	February 20 – December 7	04:00 - 20:00
John Day	February 20 – December 7	February 20 – October 31	04:00 - 20:00
McNary	March 1 – December 31	March 1 – October 31	04:00 - 20:00
Ice Harbor	March 1 – December 31	March 1 - October 31	04:00 - 20:00
Lower Monumental	March 1 – December 31	April 1 - October 31	04:00 - 20:00
Little Goose	March 1 – December 31	April 1 - October 31	04:00 - 20:00
Lower Granite	March 1 – December 31	March 1 – March 31	06:00 - 16:00
		April 1 - June 14	04:00 - 20:00
		June 15 - August 31	24 hours
		August 31 - October 31	04:00 - 20:00
		November 1 - December 31	06:00 - 16:00

53	**Monitor and Evaluate Migration Characteristics and River Condition** The Action Agencies will monitor and evaluate the following biological and physical attributes of anadromous fish species migrating through the FCRPS on an annual basis:	**Implementation Plans** ▪ Specific projects will be identified in implementation plans in December 2009, 2013, and 2016.

[8] Planning dates and voluntary operation of the Bonneville Dam corner collector may be adjusted (increased or decreased) through the adaptive management process or for research purposes.

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
RM&E Strategy 2—Hydrosystem Research, Monitoring, and Evaluation		
	▪ Monitor and estimate the abundance of smolts passing index dams. ▪ Monitor and describe the migration timing of smolts at index dams, identify potential problems, and evaluate implemented solutions. ▪ Monitor and document the condition (e.g., descaling and injury) of smolts at all dams with JBS systems, identify potential problems, and evaluate implemented solutions. ▪ Monitor and enumerate adult salmonids passing through fishways in the FCRPS, identify potential problems, and evaluate implemented solutions. ▪ 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.[8]	**Annual Progress Report** ▪ Status of project implementation (including project milestones) through December of the previous year for all actions identified in implementation plans. **2013 and 2016 Comprehensive RPA Evaluation Reports** ▪ The evaluation will include information from these actions.
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. ▪ Monitor and evaluate the effects of existing spillways, modifications, and operations on smolt survival. ▪ Monitor and evaluate the effectiveness of traditional juvenile bypass systems and modifications to such, on smolt survival and condition. ▪ Monitor and evaluate the effectiveness of surface bypass structures and modifications on smolt survival and condition. ▪ Monitor and evaluate the effectiveness of turbine operations and modifications on smolt survival and condition.	**Implementation Plans** ▪ Specific projects will be identified in implementation plans in December 2009, 2013, and 2016. **Annual Progress Report** ▪ Status of project implementation (including project milestones) through December of the previous year for all actions identified in implementation plans.

[9] Planning dates and voluntary operation of The Dalles Dam sluiceway may be adjusted (increased or decreased) through the adaptive management process or for research purposes.

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
RM&E Strategy 2—Hydrosystem Research, Monitoring, and Evaluation		
	▪ Monitor and evaluate overall dam passage with respect to modifications at projects (including forebay delay and survival). ▪ Monitor and evaluate the effectiveness of the juvenile fish transportation program and modifications to operations. ▪ Monitor and evaluate the effects of environmental conditions affecting juvenile fish survival. ▪ Monitor and evaluate the effectiveness of reducing predation toward improving juvenile fish survival. ▪ Investigate, evaluate and deploy alternative technologies and methodologies for fish passage and the RM&E Action. ▪ Determine if actions directed at benefiting juveniles have an unintended effect on migrating adults (e.g., certain spill operations). ▪ Install and maintain adult PIT-tag detectors in fish ladders at key dams in the FCRPS and evaluate adult survival (conversion rates). ▪ Monitor and evaluate the effects of fish ladder operations and configurations on adult passage rates. ▪ In addition to the current sluiceway operation (generally April 1 – November 30), evaluate operation of The Dalles Dam sluiceway from March 1 – March 31 and from December 1 – December 15 as a potential means to provide a safer fallback passage rout for overwintering steelhead and kelts, implement if warranted.[9] ▪ Investigate surface-flow outlets during wintertime to provide safer fallback opportunity for over wintering steelhead (need will be determined by results of further research).	**2013 and 2016 Comprehensive RPA Evaluation Reports** ▪ The evaluation will include information from these actions

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
RM&E Strategy 2—Hydrosystem Research, Monitoring, and Evaluation		
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: ▪ 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) ▪ Investigate the post-Bonneville mortality effect of changes in fish arrival timing and transportation to below Bonneville. (Initiate in FY 2007-2009) ▪ 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) ▪ Investigate, describe and quantify key characteristics of the early life history of Snake River Fall Chinook Salmon in the mainstem Snake, Columbia, and Clearwater rivers. (Initiate in FY 2007-2009 Project) ▪ Complete analysis and reporting of a multi-year (2000-2007) investigation on the effects of adult passage experience in the FCRPS on pre-spawning mortality (2008). Following reporting, SRWG will review the results and provide a recommendation on the need and nature of future research. Future research will be coordinated through the Regional Forum. ▪ 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. ▪ Investigate feasibility of developing PIT-tag detectors for spillways and turbines.	**Implementation Plans** ▪ Specific projects will be identified in implementation plans in December 2009, 2013, and 2016. **Annual Progress Report** ▪ Status of project implementation (including project milestones) through December of the previous year for all actions identified in implementation plans. **2013 and 2016 Comprehensive RPA Evaluation Reports** ▪ The evaluation will include information from these actions.

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
RM&E Strategy 2—Hydrosystem Research, Monitoring, and Evaluation		
	▪ Evaluate new tagging technologies for use in improving the accuracy and assessing delayed or indirect hydro effects on juvenile or adult fish. ▪ 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.	

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
RM&E Strategy 3—Tributary Habitat Research, Monitoring, and Evaluation		
The Action Agencies' strategy is to support performance monitoring and adaptive management related to tributary habitat actions.		
56	**Monitor and Evaluate Tributary Habitat Conditions and Limiting Factors** The Action Agencies will: ▪ 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	**Implementation Plans** ▪ Specific projects for implementation in the 2007-2009 period are identified in the FCRPS BA Attachment B.2.6-1, Table 2.[10] ▪ Specific projects will be identified in implementation plans in December 2009, 2013, and 2016.

[10]Funding levels during Fiscal Years (FY) 2007-2009 for Columbia Basin Fish and Wildlife Program Projects are identified in the Bonneville Power Administration's (BPA) funding decision letter (with attachments and subsequent revisions)to the Northwest Power and Conservation Council (Council) dated February 9, 2007.

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
RM&E Strategy 3—Tributary Habitat Research, Monitoring, and Evaluation		
	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). ▪ Implement habitat status and trend monitoring as a component of the pilot studies in the Wenatchee, Methow and Entiat river basins in the Upper Columbia River, the Lemhi and South Fork Salmon river basins, and the John Day River Basin. (Initiate in FY 2007-2009 Projects, annually review and modify annually to ensure that these project continue to provide a means of evaluating the effectiveness of tributary mitigation actions. ▪ 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)	**Annual Progress Report** ▪ Status of project implementation (including project milestones) through December of the previous year for all actions identified in implementation plans. **2013 and 2016 Comprehensive RPA Evaluation Reports** ▪ The evaluation will include information from these actions.
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.	**Implementation Plans** ▪ Specific projects for implementation in the 2007-2009 period are identified in the FCRPS BA Attachment B.2.6-1, Table 2.[11] ▪ Specific projects will be identified in

[11] The scope of work and funding levels for these projects are subject to change through ongoing annual review, prioritization, and funding decision processes in FY08 and FY09. Funding levels during Fiscal Years (FY) 2007-2009 for Columbia Basin Fish and Wildlife Program Projects are identified in the Bonneville Power Administration's (BPA) funding decision letter (with attachments and subsequent revisions)to the Northwest Power and Conservation Council (Council) dated February 9, 2007. In the event funding is decreased for projects that monitor the status and trend of key ESA fish populations, these projects shall give continued monitoring of ESA populations the highest priority.

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
RM&E Strategy 3—Tributary Habitat Research, Monitoring, and Evaluation		
	▪ 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). ▪ 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 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). ▪ 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). ▪ Action Agencies will convene a regional technical group to develop an initial set of relationships in FY 2008, then annually convene the group to expand and refine models relating habitat actions to ecosystem function and salmon survival by incorporating research and monitoring results and other relevant information. (Initiate in FY 2008)	implementation plans in December 2009, 2013, and 2016. **Annual Progress Report** ▪ Status of project implementation (including project milestones) through December of the previous year for all actions identified in implementation plans. **2013 and 2016 Comprehensive RPA Evaluation Reports** ▪ The evaluation will include information from these actions.

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
RM&E Strategy 4—Estuary Habitat and Ocean Research, Monitoring, and Evaluation		
The Action Agencies' strategy is to support performance monitoring and adaptive management related to estuary habitat actions.		
58	**Monitor and Evaluate Fish Performance in the Estuary and Plume** The Action Agencies will monitor biological responses and/or environmental attributes, and report in the following areas: ▪ Monitor and evaluate smolt survival and/or fitness in select reaches from Bonneville Dam through the estuary. (Initiate in FY 2007-2009 Projects, annually review and modify until complete) ▪ Develop an index and monitor and evaluate life history diversity of salmonid populations at representative locations in the estuary. (Initiate in FY 2007-2009 Projects) ▪ Monitor and evaluate juvenile salmonid growth rates and prey resources at representative locations in the estuary and plume. (Initiate in FY 2007-2009 Projects, annually review and modify until complete) ▪ Monitor and evaluate temporal and spatial species composition, abundance, and foraging rates of juvenile salmonid predators at representative locations in the estuary and plume. (Initiate in FY 2007-2009 Projects, annually review and modify until complete)	**Implementation Plans** ▪ Specific projects for implementation in the 2007-2009 period are identified in the FCRPS BA Attachment B.2.6-1, Table 2.[12] ▪ Specific projects will be identified in implementation plans in December 2009, 2013, and 2016. **Annual Progress Report** ▪ Status of project implementation (including project milestones) through December of the previous year for all actions identified in implementation plans. **2013 and 2016 Comprehensive RPA Evaluation Reports** ▪ The evaluation will include information from these actions.

[12] Funding levels during Fiscal Years (FY) 2007-2009 for Columbia Basin Fish and Wildlife Program Projects are identified in the Bonneville Power Administration's (BPA) funding decision letter (with attachments and subsequent revisions)to the Northwest Power and Conservation Council (Council) dated February 9, 2007.

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
RM&E Strategy 4—Estuary Habitat and Ocean Research, Monitoring, and Evaluation		
59	**Monitor and Evaluate Migration Characteristics and Estuary/Ocean Conditions** The Action Agencies will monitor and evaluate selected ecological attributes of the estuary, which include the following or equivalent: ▪ Map bathymetry and topography of the estuary as needed for RM&E. (Initiate in FY 2007-2009 Projects) ▪ Establish a hierarchical habitat classification system based on hydro-geomorphology, ground-truth it with vegetation cover monitoring data, and map existing habitats. (Initiate in FY 2007-2009 Projects) ▪ Develop an index of habitat connectivity and apply it to each of the eight reaches of the study area. (Initiate in FY 2007-2009 Projects) ▪ Evaluate migration through and use of a subset of various shallow-water habitats from Bonneville Dam to the mouth toward understanding specific habitat use and relative importance to juvenile salmonids. (Initiate in FY 2007-2009 Projects, then annually) ▪ Monitor habitat conditions periodically, including water surface elevation, vegetation cover, plan community structure, primary and secondary productivity, substrate characteristics, dissolved oxygen, temperature, and conductivity, at representative locations in the estuary as established through RM&E. (FY 2007-2009 Projects, then annually)	**Implementation Plans** ▪ Specific projects for implementation in the 2007-2009 period are identified in the FCRPS BA Attachment B.2.6-1, Table 3. ▪ Specific projects will be identified in implementation plans in December 2009, 2013, and 2016. **Annual Progress Report** ▪ Status of project implementation (including project milestones) through December of the previous year for all actions identified in implementation plans. ▪ Tabulate the amount of absolute acreage by habitat type that is restored or protected every year. (Initiate in FY 2007-2009 Projects) ▪ Report annually on indices of productivity for the estuary and ocean (i.e., Pacific Decadal Oscillation, primary productivity indices). (Annually) **2013 and 2016 Comprehensive RPA Evaluation Reports** ▪ The evaluation will include information from these actions.

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
RM&E Strategy 4—Estuary Habitat and Ocean Research, Monitoring, and Evaluation		
60	**Monitor and Evaluate Habitat Actions in the Estuary** The Action Agencies will monitor and evaluate the effects of a representative set of habitat projects in the estuary, as follows: ▪ Develop a limited number of reference sites for typical habitats (e.g., tidal swamp, marsh, island, and tributary delta to use in action effectiveness evaluations). (Initiate in FY 2007-2009) ▪ Evaluate the effects of selected individual habitat restoration actions at project sites relative to reference sites and evaluate post-restoration trajectories based on project-specific goals and objectives. (Initiate in FY 2007-2009 Projects, annually review and modify as appropriate or until complete) ▪ Develop and implement a methodology to estimate the cumulative effects of habitat conservation and restoration projects in terms of cause-and-effect relationships between ecosystem and controlling factors, structures, and processes affecting salmon habitats and performance. (Initiate in FY 2007-2009 Projects, annually review and modify as appropriate or until complete)	**Implementation Plans** ▪ Specific projects for implementation in the 2007-2009 period are identified in the FCRPS BA Attachment B.2.6-1, Table 3. ▪ Specific projects will be identified in implementation plans in December 2009, 2013, and 2016. **Annual Progress Report** ▪ Status of project implementation (including project milestones) through December of the previous year for all actions identified in implementation plans. **2013 and 2016 Comprehensive RPA Evaluation Reports** ▪ The evaluation will include information from these actions.
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:	**Implementation Plans** ▪ Specific projects for implementation in the 2007-2009 period are identified in the FCRPS BA Attachment B.2.6-1, Table 3.[13]

[13] Funding levels during Fiscal Years (FY) 2007-2009 for Columbia Basin Fish and Wildlife Program Projects are identified in the Bonneville Power Administration's (BPA) funding decision letter (with attachments and subsequent revisions) to the Northwest Power and Conservation Council (Council) dated February 9, 2007.

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
RM&E Strategy 4—Estuary Habitat and Ocean Research, Monitoring, and Evaluation		
	▪ Continue work to define the ecological importance of the tidal freshwater, estuary, plume, and nearshore ocean environments to the viability and recovery of listed salmonid populations in the Columbia River Basin. ▪ Continue work to define the causal mechanisms and migration/behavior characteristics affecting survival of juvenile salmon during their first weeks in the ocean. ▪ Investigate the importance of early life history of salmon populations in tidal fresh water of the lower Columbia River. ▪ Continue development of a hydrodynamic numerical model for the estuary and plume to support critical uncertainties investigations.	▪ Specific projects will be identified in implementation plans in December 2009, 2013, and 2016. **Annual Progress Report** ▪ Status of project implementation (including project milestones) through December of the previous year for all actions identified in implementation plans. **2013 and 2016 Comprehensive RPA Evaluation Reports** ▪ The evaluation will include information from these actions.

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
RM&E Strategy 5—Harvest Research, Monitoring, and Evaluation		
The Action Agencies' strategy is to support performance monitoring and adaptive management related to harvest actions.		
62	**Fund Selected Harvest Investigations** The Action Agencies will fund selected harvest investigations linked to FCRPS interests: ▪ Evaluate the feasibility of obtaining PIT-tag recoveries between Bonneville and McNary dams (Zone 6) to determine whether recoveries can help refine estimates of in-river harvest rates and stray rates used to assess adult survival rates. For FY 2009, focus on a pilot to test the feasibility of PIT-tag recoveries of harvested fish in this reach (spring, summer, and fall Chinook salmon and summer steelhead). (Initiate in FY 2007-2009 Projects) ▪ Evaluate methods to develop or expand use of selective fishing methods and gear. (Initiate in FY 2007-2009 Projects) ▪ Evaluate post-release mortality rates for selected fisheries. (Initiate in FY 2007-2009 Projects) ▪ 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) ▪ Investigate the feasibility of genetic stock identification monitoring techniques. (Initiate in FY 2007-2009 Projects)	**Implementation Plans** ▪ Specific projects for implementation in the 2007-2009 period are identified in the FCRPS BA Attachment B.2.6-1, Table 4. ▪ Specific projects will be identified in implementation plans in December 2009, 2013, and 2016. **Annual Progress Report** ▪ Status of project implementation (including project milestones) through December of the previous year for all actions identified in implementation plans. **2013 and 2016 Comprehensive RPA Evaluation Reports** ▪ The evaluation will include information from these actions.

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
RM&E Strategy 6—Hatchery Research, Monitoring, and Evaluation		
The Action Agencies' strategy is to support performance monitoring and adaptive management related to hatchery actions.		
63	**Monitor Hatchery Effectiveness** The Action Agencies will continue to fund selected monitoring and evaluation of the effectiveness of Hatchery Actions. The evaluation of hatchery projects will be coordinated with the Tributary Habitat monitoring and evaluation program. These actions include: ▪ 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) ▪ Determine the effect that implemented hatchery reform actions have on the recovery of targeted salmon and steelhead populations. (Initiate in FY 2007-2009 Projects)	**Implementation Plans** ▪ Specific projects for implementation in the 2007-2009 period are identified in the FCRPS BA Attachment B.2.6-1, Table 5. ▪ Specific projects will be identified in implementation plans in December 2009, 2013, and 2016. **Annual Progress Report** ▪ Status of project implementation (including project milestones) through December of the previous year for all actions identified in implementation plans. **2013 and 2016 Comprehensive RPA Evaluation Reports** ▪ The evaluation will include information from these actions.
64	**Investigate Hatchery Critical Uncertainties** The Action Agencies will continue to fund selected research directed at resolving artificial propagation critical uncertainties: ▪ Continue to estimate the relative reproductive success (RSS) of hatchery – origin salmon and steelhead compared to reproductive success of their natural-origin counterparts for ESA-listed spring/summer Chinook population	**Implementation Plans** ▪ Specific projects for implementation in the 2007-2009 period are identified in the FCPRS BA Attachment B.2.6-1, Table 5. ▪ Specific projects will be identified in

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
RM&E Strategy 6—Hatchery Research, Monitoring, and Evaluation		
	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) ▪ Determine if properly designed intervention programs using artificial production make a net positive contribution to recovery of listed populations. (Initiate in FY 2007-2009) ▪ In collaboration with the other entities responsible for steelhead mitigation in the Methow River, BPA will fund a new RSS study for ESA-listed steelhead in the Methow River. BPA will also fund a new RSS study for listed fall Chinook in the Snake River. NOAA Fisheries will provide technical assistance to the Action Agencies in development of conceptual study designs suitable for use by the Action Agencies in obtaining a contractor to implement the new studies. (Initiate in FY 2007-2009 Projects)	implementation plans in December 2009, 2013, and 2016. **Annual Progress Report** ▪ Status of project implementation (including project milestones) through December of previous year for all actions identified in implementation plans. **2013 and 2016 Comprehensive RPA Evaluation Reports** ▪ The evaluation will include information from these actions.
65	**Investigate Hatchery Critical Uncertainties** The Action Agencies will fund research directed at resolving critical uncertainties: ▪ 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. ▪ Estimate fall Chinook hatchery program effects on the productivity of the fall Chinook salmon ESU. ▪ NOAA Fisheries will provide technical assistance to the Action Agencies in development of conceptual study designs suitable for use by the Action Agencies in obtaining a contractor to implement new studies.	**Implementation Plans** ▪ Provide a NOAA approved research plan/study design ▪ Implement in the 2007-2009 period **Annual Progress Report** ▪ Status of project implementation (including project milestones) and analysis of new information through December of the previous year.

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
RM&E Strategy 7—Predation Management Research, Monitoring, and Evaluation		
The Action Agencies' strategy is to support performance monitoring and adaptive management related to predation management actions.		
66	**Monitor and Evaluate the Caspian Tern Population in the Columbia River Estuary** The Action Agencies will monitor the tern population in the estuary and its impacts on outmigrating juvenile salmonids, as well as the effectiveness of the Caspian tern management plan.	**Implementation Plans** ▪ Specific projects for implementation in the 2007-2009 period are identified in the FCRPS BA Attachment B.2.6-1, Table 6. ▪ Specific projects will be identified in implementation plans in December 2009, 2013, and 2016. **Annual Progress Report** ▪ Status of project implementation (including project milestones) through December of the previous year for all actions (habitat actions are population response) identified in implementation plans. **2013 and 2016 Comprehensive RPA Evaluation Reports** ▪ The evaluation will include information from these actions.

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
RM&E Strategy 7—Predation Management Research, Monitoring, and Evaluation		
67	**Monitor and Evaluate the Double-Crested Cormorant Population in the Columbia River Estuary** The Action Agencies will monitor the cormorant population in the estuary and its impacts on outmigrating juvenile salmonids and develop and implement a management plan to decrease predation rates, if warranted.	**Implementation Plans** ▪ Specific projects for implementation in the 2007-2009 period are identified in the FCRPS BA Attachment B.2.6-1, Table 6. ▪ Specific projects will be identified in implementation plans in December 2009, 2013, and 2016. **Annual Progress Report** ▪ Status of project implementation (including project milestones) through December of the previous year for all actions (habitat actions are population response) identified in implementation plans. **2013 and 2016 Comprehensive RPA Evaluation Reports** ▪ The evaluation will include information from these actions.
68	**Monitor and Evaluate Inland Avian Predators** The Action Agencies will monitor avian predator populations in the Mid-Columbia River and evaluate their impacts on outmigrating juvenile salmonids and develop and implement a management plan to decrease predations rates, if warranted.	**Implementation Plans** ▪ Specific projects for implementation in the 2007-2009 period are identified in the FCRPS BA Attachment B.2.6-1, Table 6. ▪ Specific projects will be identified in implementation plans in December 2009,

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
RM&E Strategy 7—Predation Management Research, Monitoring, and Evaluation		
		2013, and 2016. **Annual Progress Report** ▪ Status of project implementation (including project milestones) through December of the previous year for all actions (habitat actions are population response) identified in implementation plans. **2013 and 2016 Comprehensive RPA Evaluation Reports** ▪ The evaluation will include information from these actions.
69	**Monitoring Related to Marine Mammal Predation** The Action Agencies will: ▪ Estimate overall sea lion abundance immediately below Bonneville Dam. (Initiate in FY 2007-2009 Projects) ▪ Monitor the spatial and temporal distribution of sea lion predation attempts and estimate predation rates. (Initiate in FY 2007-2009 Projects) ▪ 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)	**Implementation Plans** ▪ Specific projects for implementation in the 2007-2009 period are identified in the FCRPS BA Attachment B.2.6-1, Table 6. ▪ Specific projects will be identified in implementation plans in December 2009, 2013, and 2016. **Annual Progress Report** ▪ Status of project implementation (including project milestones) through

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
RM&E Strategy 7—Predation Management Research, Monitoring, and Evaluation		
		December of the previous year for all actions identified in implementation plans. **2013 and 2016 Comprehensive RPA Evaluation Reports** ▪ The evaluation will include information from these actions.
70	**Monitoring Related to Piscivorous (Fish) Predation** The Action Agencies will: ▪ Continue to update and estimate the cumulative benefits of sustained removals of northern pikeminnow since 1990. (Initiate in FY 2007-2009 Projects) ▪ Continue to evaluate if inter and intra compensation is occurring. (Initiate in FY 2007-2009 Projects) ▪ Evaluate the benefit of additional removals and resultant increase in exploitation rate's affect on reduction in predator mortality since the 2004 program incentive increase. (Initiate in FY 2007-2009 Projects) ▪ Develop a study plan to review, evaluate, and develop strategies to reduce non-indigenous piscivorous predation. (Initiate in FY 2007-2009 Projects)	**Implementation Plans** ▪ Specific projects for implementation in the 2007-2009 period are identified in the FCRPS BA Attachment B.2.6-1, Table 2. ▪ Specific projects will be identified in implementation plans in December 2009, 2013, and 2016. **Annual Progress Report** ▪ Status of project implementation (including project milestones) through December of the previous year for all actions identified in implementation plans. **2013 and 2016 Comprehensive RPA Evaluation Reports** ▪ The evaluation will include information from these actions.

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
RM&E Strategy 8—Coordination and Data Management Research, Monitoring, and Evaluation		
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		
71	**Coordination** The Action Agencies will coordinate RM&E activities with other Federal, State and Tribal agencies on an ongoing annual basis, including: ▪ Organizing and supporting the Corps AFEP. ▪ Supporting and participating in the Council's Columbia River Basin Fish and Wildlife Program project planning and review efforts. ▪ Supporting the standardization and coordination of tagging and monitoring efforts through participation and leadership in regional coordination forums such as PNAMP. ▪ 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. ▪ 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. ▪ 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-	**Implementation Plans** ▪ N/A **Annual Progress Report** ▪ Status of coordination of RM&E projects through December of the previous year will be provided **2013 and 2016 Comprehensive RPA Evaluation Reports** ▪ The evaluation will include a report on coordination efforts, projects and associated products and how the Action Agencies have incorporated those products into their RM&E and data management projects.

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
RM&E Strategy 8—Coordination and Data Management Research, Monitoring, and Evaluation		
	Network (NED)), and others.	
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: ▪ 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) ▪ 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) ▪ 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)	**Implementation Plans** ▪ N/A **Annual Progress Report** ▪ Status of data management projects through December of the previous year will be provided. **2013 and 2016 Comprehensive RPA Evaluation Reports** ▪ The evaluation will include a report on data management projects.

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
RM&E Strategy 9—Project Implementation and Compliance Monitoring Research, Monitoring, and Evaluation		
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.		
73	**Implementation and Compliance Monitoring** The Action Agencies will: ▪ 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. ▪ Maintain project and action level details for planning and reporting purposes. This approach will provide the most up-to-date information about the status of actions and projects being implemented. ▪ 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)	**Implementation Plans** ▪ N/A **Annual Progress Report** ▪ The Action Agencies will use the project-level detail contained in the Action Agencies' Biological Opinion databases to track results and assess our progress in meeting programmatic level performance targets. This performance tracking will be reported through annual progress reports and the 2013 and 2016 comprehensive reports. **2013 and 2016 Comprehensive RPA Evaluation Reports** ▪ The Action Agencies will use the project-level detail contained in the Action Agencies' Biological Opinion databases to track results and assess our progress in

RPA No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
RM&E Strategy 9—Project Implementation and Compliance Monitoring Research, Monitoring, and Evaluation		
		meeting programmatic level performance targets. This performance tracking will be reported through annual progress reports and the 2013 and 2016 comprehensive reports.