

*Endangered Species Act
Federal Columbia River Power System
2008 Annual ESA Progress Report*

Reasonable and Prudent Alternative (RPA) Summary Table: Actions and Accomplishments

Adaptive Management Actions

RPA No.	Action Description	2008 Actions and Accomplishments
<p><i>The Action Agencies will continue collaborating with states and tribes in the implementation of RPA actions, progress reporting, and adaptive management using regional forums such as the Regional Implementation Oversight Group, as described in their Biological Assessment, Section 2.1.</i></p>		
1	<p><i>Implementation Plans</i> <i>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.</i></p>	<p>The Action Agencies took numerous steps aimed at developing the full set of actions for the 2010-2012 implementation plan, including establishing work groups to identify RME gaps. The agencies also reviewed and updated configuration and operation plans and made plans to convene expert panel workshops to identify and evaluate tributary and estuary habitat actions.</p>
2	<p><i>Annual Progress Reports</i> <i>The Corps, BPA, and Reclamation will submit to NOAA Fisheries Annual Progress Reports in September of all years except 2013 and 2016. The reports will cover operations for the previous calendar year. These Annual Progress Reports will describe the status of implementing all actions as of the end of the previous calendar year. For example, the 2009 RPA Progress report will describe the status of actions through December 2008. In</i></p>	<p>Progress Report for 2008 completed.</p>

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	<p><i>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.</i></p>	
3	<p><i>Comprehensive RPA Evaluations</i> <i>The Corps, BPA, and Reclamation will submit to NOAA Fisheries Comprehensive RPA Evaluation of multi-year implementation activities by the end of June 2013 and June 2016. The Comprehensive Evaluations shall review all implementation activities through the end of the previous calendar year (as would be covered in the Annual Progress Report) and compares them to scheduled completion dates as identified in this RPA or modified in the Implementation Plans in 2009, 2013 and 2016. The Comprehensive Evaluations will also describe the status of the physical and biological factors identified in this RPA, and compare these with the expectations in the survival improvements identified in the Comprehensive Analysis or Supplemental Comprehensive Analysis. Physical and biological factors will include new information on climate change and its effects on listed salmon and steelhead. The Comprehensive Evaluation will include a discussion of the Action Agencies' plan to address any shortcomings of current estimated survival improvements as compared to the original survival estimates identified in the Comprehensive Analysis referenced in this Biological Opinion. This information will assist NOAA Fisheries in determining if the RPA is being implemented as anticipated in this Biological Opinion or, conversely, if re-initiation triggers defined in 50 CFR 402.16 have been exceeded.</i></p>	<p>Agencies began preliminary planning in 2008.</p>

Hydro Actions

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<p><i>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:</i></p>		
<ul style="list-style-type: none"> ▪ 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 		
<p>Each strategy consists of one or more specific actions. These are summarized in the following sections.</p>		
<p>Hydropower Strategy 1—Operate the FCRPS to Provide Flows and Water Quality to Improve Juvenile and Adult Fish Survival</p>		
4	<p><i>Storage Project Operations</i> <i>The Action Agencies will operate the FCRPS storage projects (Libby, Hungry Horse, Albeni Falls, Grand Coulee and Dworshak projects) for flow management (see FCRPS Biological Assessment, Appendix B.2-1, for pertinent discussion and Table B.2.1-2 for a summary of seasonal flow objectives and planning dates for the mainstem Columbia and Snake rivers) to aid anadromous fish. Specific operations for each storage project are identified in Table 1 below. These storage project operations will be included in the Water Management Plan. These projects are operated for multiple purposes including fish and wildlife, flood control, irrigation, navigation, power, and recreation. Table 1 primarily identifies operations that are designed to benefit flow management specifically for listed species. For more detail on the operation of storage projects for other purposes see Appendix B.1.</i></p>	<p>The FCRPS storage projects were operated in compliance with the 2008 Water Management Plan (WMP), which was developed in the fall of 2007 with full regional coordination. The NOAA BiOp was released in May 2008. However, the court ordered a continuation of 2007 operations in 2008 (except for changes needed to accommodate critical research and new structures). For this reason there were differences between the 2008 operations and those required by the 2008 BiOp. Details regarding the operation of storage projects are included in Section 3.</p>

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<p>Hydropower Strategy 1—Operate the FCRPS to Provide Flows and Water Quality to Improve Juvenile and Adult Fish Survival</p>		
5	<p>Lower Columbia and Snake River Operations <i>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.</i></p> <ul style="list-style-type: none"> ▪ <i>Lower Snake River projects (Ice Harbor, Lower Monumental, Little Goose and Lower Granite projects) will be operated at minimum operating pool (MOP) with a 1-foot operating range from April 3 until small numbers of juvenile migrants are present (approximately September 1) unless adjusted to meet authorized project purposes, primarily navigation. Lower Granite reservoir may be raised as needed after September 1, in order to operate the adult fish holding facilities to support brood stock collection.</i> ▪ <i>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.</i> ▪ <i>These run-of-river operations will be included in the annual WMP.</i> 	<p>These projects were operated consistent with the 2008 Water Management Plan, Fish Passage Plan, and Fish Operations Plan, all of which were developed collaboratively with the region prior to issuance of the 2008 Biological Opinion. Specific operations to benefit listed anadromous species are described below.</p> <p>Lower Monumental and Ice Harbor projects operated MOP to MOP + 1 ft from April 3 through September 10, 2008. Lower Granite project operated MOP to MOP + 1 ft from April 3 through September 10, 2008, and after that, operated 734.5–738 ft to support broodstock collection. Little Goose project operated MOP to MOP + 1 ft from April 3 through September 10, 2008.</p> <p>John Day Dam was operated 262.5–264 ft from April 10 through September 30, 2008.</p> <p>The operations were included in the annual Water Management Plan.</p>

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Hydropower Strategy 1—Operate the FCRPS to Provide Flows and Water Quality to Improve Juvenile and Adult Fish Survival		
6	<p><i>In-Season Water Management</i> <i>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 conditions for that year.</i></p> <p><i>A draft update of the WMP will be prepared by October 1 each year, with a final plan completed by January 1.</i></p> <p><i>The fall/winter update to the WMP will be drafted by November 1 and finalized by January 1</i></p> <p><i>A draft of the spring/summer update to the WMP will be prepared by March 1 and finalized by May 15.</i></p>	<p>The annual Water Management Plan for 2008 operations was prepared as noted above.</p> <p>The 2008 Water Management Plan can be accessed at http://www.nwd-wc.usace.army.mil/tmt/documents/wmp/2008/final/</p> <p>A draft of the 2009 plan was released on October 1, 2008, and the final plan was released on December 31, 2008.</p> <p>A fall/winter update to the draft 2009 plan was released on November 20, 2008.</p> <p>Not applicable for 2008 (BiOp issued May 2008).</p>
7	<p><i>Forecasting and Climate Change/Variability</i> <i>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.</i></p> <p><i>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</i></p>	<p>Columbia River Forecast Group (CRFG) was formed late in 2008. In 2009 and following, annual reviews will be held each year. Additional data sets (e.g. climate change water supply forecasts and flood control elevations) are being developed that will be used in conjunction with streamflow scenarios developed by the University of Washington (discussed below) to adequately model climate change impacts to the hydrosystem.</p> <p>Provided funding and collaborative support to the Washington Department of Ecology to contract with the University of Washington Climate Impact Group to develop climate change streamflow scenarios.</p>

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<p>Hydropower Strategy 1—Operate the FCRPS to Provide Flows and Water Quality to Improve Juvenile and Adult Fish Survival</p>		
	<p><i>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.</i></p>	
<p>8</p>	<p>Operational Emergencies <i>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.</i></p>	<p>There were no operational emergencies in 2008.</p>
<p>9</p>	<p>Fish Emergencies <i>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.</i></p>	<p>Two "fish emergency" situations occurred during 2008. At Bonneville Dam, the fish guidance screens were removed for a portion of the spring juvenile migration season to eliminate the fish exposure to plugged screens, which had been linked to high fish descaling observed at the smolt monitoring facility. At Little Goose Dam, in late August when river flows were very low, spill was changed from 30 percent to 11 kcfs. In both instances, these actions were coordinated with the region through the Technical Management Team (TMT) process.</p>
<p>10</p>	<p>Columbia River Treaty Storage <i>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:</i></p> <ul style="list-style-type: none"> ▪ <i>Providing the greatest flexibility possible for releasing water to benefit U.S. fisheries May through July.</i> ▪ <i>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.</i> 	<p>The Columbia River Treaty Operating Committee Agreement on Operation of Treaty Storage for Non-Power Uses for December 15, 2007, through July 31, 2008 (Non-Power Uses Agreement) was executed on December 12, 2007. Under this agreement, 1 million acre-feet (MAF) of flow augmentation water was stored in Mica Reservoir during January and February 2008. All flow augmentation storage was released by June 30, 2008, under the Non-Power Uses Agreement. The</p>

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	<ul style="list-style-type: none"> ▪ <i>Releasing flow augmentation storage to avoid causing damaging flow or excessive TDG in the United States or Canada.</i> 	Non-Power Uses Agreement for December 15, 2008, through July 31, 2009, was executed November 20, 2008.
	<i>BPA and the Corps will coordinate with Federal agencies, States and Tribes on Treaty operating plans</i>	Treaty operations were coordinated during fall 2008 stakeholder briefings.
11	<p>Non-Treaty Storage (NTS) <i>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.</i></p>	Conditions were such that no Non-Treaty Storage was returned during the 2008 operating year (September 2007 - August 2008). In September through November 2008, BPA stored an additional 78 thousand second feet day (ksfd) of water in the U.S. account (75.5 percent full).
12	<p>Non-Treaty Long-Term Agreement <i>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.</i></p>	<p>Before approaching BC Hydro to negotiate a new long-term non-treaty storage agreement, BPA has committed to the following:</p> <ul style="list-style-type: none"> ▪ Substantially refilling the U.S. account ▪ The dry year strategy work group defining potential use of non-treaty storage in dry years ▪ Coordinating with federal agencies, states, and tribes under the BiOp ▪ Coordination with tribes under the Fish Accords ▪ Establishing the collective U.S. interests in terms of such a new NTS agreement
	<i>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.</i>	No annual NTS agreement was negotiated in 2008.

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<p>Hydropower Strategy 1—Operate the FCRPS to Provide Flows and Water Quality to Improve Juvenile and Adult Fish Survival</p>		
13	<p><i>Non-Treaty Coordination with Federal Agencies, States, and Tribes</i> Prior to negotiations of new long-term or annual non-Treaty storage agreements, BPA will coordinate with Federal agencies, States, and Tribes to obtain ideas and information on possible points of negotiation, and will report on major developments during negotiations.</p>	No long-term or annual non-treaty storage agreements were negotiated.
14	<p>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:</p>	(See below.)
	<ul style="list-style-type: none"> ▪ Within the defined “buckets” of available water (reservoir draft limits identified in RPA Action 4), flexibility will be exercised in a dry water year to distribute available water across the expected migration season to optimize biological benefits and anadromous fish survival. The Action Agencies will coordinate use of this flexibility in the Regional Forum TMT. ▪ 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. 	<p>No action; water year 2008 did not meet the definition of a dry year.</p> <p>No action; water year 2008 did not meet the definition of a dry year.</p> <p>No specific provisions for dry water year operations were needed or included in the agreement for 2008.</p>

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Hydropower Strategy 1—Operate the FCRPS to Provide Flows and Water Quality to Improve Juvenile and Adult Fish Survival		
	<ul style="list-style-type: none"> ▪ <i>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.</i> ▪ <i>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.</i> 	<p>See RPA 12 above. These commitments also apply to potential dry water year provisions in the potential new long-term non-treaty storage agreement.</p> <p>Dry year strategy work group met on July 17 and August 11, 2008.</p>
	<ul style="list-style-type: none"> ▪ <i>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).</i> 	<p>No action; water year 2008 did not meet the definition of a dry year.</p>
	<ul style="list-style-type: none"> ▪ <i>BPA will implement, as appropriate, its Guide to Tools and Principles for a Dry Year Strategy to reduce the effect energy requirements may pose to fish operations and other project purposes.</i> 	<p>No action; water year 2008 did not meet the definition of a dry year.</p>
15	<p>Water Quality Plan for Total Dissolved Gas and Water Temperature in the Mainstem Columbia and Snake Rivers</p> <p><i>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:</i></p> <p><i>Real-time monitoring and reporting of TDG and temperatures measured at fixed monitoring sites,</i></p> <p><i>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,</i></p>	<p>The Action Agencies prepared an update of the Water Quality Plan (released in January 2009).</p> <p>In 2008 the Action Agencies implemented the water quality measures required by the previous Water Quality Plan (from November 2006).</p> <p>Monitored and reported total dissolved gas (TDG) and temperature as per the Corps of Engineers Plan of Action for Dissolved Gas Monitoring in 2008.</p> <p>Studies were conducted to evaluate possible changes at Ice Harbor, John Day, and The Dalles dams. For further detail see Section 3.</p>

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Hydropower Strategy 1—Operate the FCRPS to Provide Flows and Water Quality to Improve Juvenile and Adult Fish Survival		
	<p><i>Continued development and use of SYSTDG model for estimating TDG production to assist in real-time decision making, including improved wind forecasting capabilities as appropriate,</i></p>	<p>SYSTDG model was again modified, and a statistical analysis of predictive errors was performed. See discussion in Section 3. Wind forecasting capabilities must await the acquisition of more comprehensive, representative, and reliable wind data, which are now being developed.</p>
	<ul style="list-style-type: none"> ▪ <i>Continued development of the CE-QUAL-W2 model for estimating river temperatures from Dworshak Dam on the Clearwater and Upper Snake River near confluence with the Grand Ronde River (USGS Anatone gage) through the lower Snake River (all four Corps lower Snake River projects) to assist in real-time decision making for Dworshak Dam operations, and</i> 	<p>Used the model for real-time decision making for Dworshak storage releases. No developmental changes in 2008.</p>
	<p><i>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</i></p>	<p>In 2008 this issue was addressed in the context of TMDL discussions with EPA. Supporting studies are scheduled to begin in January 2010.</p>
	<p><i>Investigate alternatives to reduce total mass loading of TDG at Bonneville Dam while maintaining juvenile survival performance, and</i></p>	<p>Initiated Bonneville spillway alternatives study. Detail presented in Section 3.</p>
	<p><i>Continued operation of lower Snake River projects at MOP.</i></p>	<p>Snake River Projects were operated at MOP. Detail presented under RPA 5.</p>
<p>16</p>	<p><i>Tributary Projects</i> <i>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.</i></p>	<p>Worked on the Yakima Biological Assessment (BA) in 2008. Reclamation convened stakeholders, including NOAA, in 2008 to work out the details of the proposed action. That process was completed in 2009. Reclamation is now completing the supplement to the BA.</p> <p>A BA for the Okanogan was submitted to NOAA in November 2008. In May NOAA requested a time extension to complete work on the BiOp, which was granted. During this period, Reclamation and NOAA have been investigating the potential for refining the proposed action.</p>

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Hydropower Strategy 1—Operate the FCRPS to Provide Flows and Water Quality to Improve Juvenile and Adult Fish Survival		
		Reclamation worked on a Tualatin BA in 2008 for submission to NOAA in 2009.
17	<p><i>Chum Spawning Flows</i> <i>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:</i></p> <ul style="list-style-type: none"> ▪ <i>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.</i> ▪ <i>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.</i> ▪ <i>Make adjustments to the tailwater elevation through the TMT process consistent with the size of the spawning population and water supply forecasts.</i> ▪ <i>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</i> 	<p>There are two phases of chum operations: spawning, which generally runs from late October through late December, and incubation and egress, which generally run from late December to early April. This update covers October 2007 through April 2008. These chum spawning operations were consistent with the 2008 Water Management Plan discussed above. More details are included in Section 3, including a discussion of chum operations in the fourth quarter of 2008 for the next brood year.</p> <p>Spawning protection levels were established in coordination with TMT in 2007. Minutes for 2007 TMT meetings can be referenced at http://www.nwd-wc.usace.army.mil/tmt/agendas/2007/. Details on the operation are included in Section 3.</p> <p>Water supply was sufficient for this operation.</p> <p>Adjustments were coordinated through the TMT process. Minutes for TMT meetings can be referenced under Meeting Calendar at http://www.nwd-wc.usace.army.mil/tmt/</p> <p>Chum incubation and emergence protection levels were established in coordination with the TMT in December 2007. Minutes for December TMT meetings can be referenced under Meeting Calendar at http://www.nwd-wc.usace.army.mil/tmt/agendas/2007/</p>

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	<ul style="list-style-type: none"> ▪ <i>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.</i> 	<p>In an April 9, 2008, TMT meeting, it was agreed that chum fry emergence had ended, and that there was no need to delay the start of spill. Meeting minutes are at http://www.nwd-wc.usace.army.mil/tmt/agendas/2008/0409min.pdf</p>
	<ul style="list-style-type: none"> ▪ <i>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.</i> 	<p>The chum protection level was periodically reviewed during the chum operations (which ran from October 2007 through April 2008) in the TMT process. Minutes for TMT meetings can be referenced under Meeting Calendar at http://www.nwd-wc.usace.army.mil/tmt/</p>

Hydro Actions

RPA No.	Action Description	2008 Actions/Accomplishments
<p>Hydropower Strategy 2—Modify Columbia and Snake River Dams to Maximize Juvenile and Adult Fish Survival¹</p> <p><i>Once the Action Agencies meet hydrosystem performance standards, they will ensure overall system performance through appropriate monitoring and maintenance activities. The Action Agencies will decide on the tools needed to maintain performance after coordinating with NOAA Fisheries and the regional forum.</i></p>		
18	<p><i>Configuration and Operational Plan for Bonneville Project</i> <i>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:</i></p> <p><i>Bonneville Powerhouse I</i></p> <ul style="list-style-type: none"> ▪ <i>Sluiceway modifications to optimize surface flow outlet to improve fish passage efficiency (FPE) and reduce forebay delay (2009).</i> ▪ <i>Minimum-gap turbine runner installation to improve survival of fish passing through turbines (2009)</i> <p><i>Bonneville Powerhouse II</i></p> <ul style="list-style-type: none"> ▪ <i>Screened bypass system modification to improve fish guidance efficiency (FGE) and reduce gatewell residence time (2008)</i> ▪ <i>Shallow BGS installation to increase Corner Collector efficiency and reduce forebay delay (prototype 2008)</i> 	<p>The initial Configuration and Operational Plan (COP) had already been completed at the time of the BiOp. The key objective of the COP is achievement and maintenance of hydro performance standards.</p> <p>Contract for initial work awarded late 2008. Automated sluice gates to be installed 2009. Sluiceway divider wall to be removed by 2010.</p> <p>Turbine rehab continued in 2008, with completion of Unit 8. Final two units to be completed in 2009.</p> <p>Work complete in 2008. Investigating potential problems with injuries in gatewells.</p> <p>Behavioral guidance screen (BGS) installed and tested. Second year of testing planned for 2009.</p>

¹ Dates shown are scheduled planning dates for completion.

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RPA No.	Action Description	2008 Actions/Accomplishments
<p>Hydropower Strategy 2—Modify Columbia and Snake River Dams to Maximize Juvenile and Adult Fish Survival¹</p> <p><i>Once the Action Agencies meet hydrosystem performance standards, they will ensure overall system performance through appropriate monitoring and maintenance activities. The Action Agencies will decide on the tools needed to maintain performance after coordinating with NOAA Fisheries and the regional forum.</i></p>		
	<p><i>Bonneville Dam Spillway</i> <i>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).</i></p>	<p>Initiated study of potential spillway improvements in conjunction with planned rehab. Evaluated new spill patterns and discharges to determine whether operational changes would improve juvenile fish survival.</p>
	<p><i>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.</i></p>	<p>Initial COP had already been completed and was updated in 2008.</p>
19	<p>Configuration and Operational Plan for The Dalles Project <i>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:</i></p> <ul style="list-style-type: none"> ▪ <i>Turbine operation optimization to improve overall dam survival (2011)</i> ▪ <i>Extended tailrace spill wall to increase direct and indirect survival of spillway passed fish (2010)</i> <p><i>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</i></p>	<p>The initial COP had already been completed at the time of the BiOp. The key objective of the COP is achievement and maintenance of hydro performance standards.</p> <p>Started procurement for model turbine runner.</p> <p>Awarded 2-year contract for construction of a 700-foot-long wall spill wall between Bays 8 and 9. Scheduled completion is during the 2009-2010 winter work period.</p> <p>An update of the COP was initiated in 2008 and is expected to be completed in 2009.</p>

Hydro Actions

RPA No.	Action Description	2008 Actions/Accomplishments
<p>Hydropower Strategy 2—Modify Columbia and Snake River Dams to Maximize Juvenile and Adult Fish Survival¹</p> <p><i>Once the Action Agencies meet hydrosystem performance standards, they will ensure overall system performance through appropriate monitoring and maintenance activities. The Action Agencies will decide on the tools needed to maintain performance after coordinating with NOAA Fisheries and the regional forum.</i></p>		
	<p><i>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.</i></p>	
20	<p>Configuration and Operational Plan for John Day Project <i>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:</i></p> <ul style="list-style-type: none"> ▪ <i>Full-flow bypass and PIT-tag detection installation to reduce handling stress of bypassed fish (2007)</i> ▪ <i>Turbine operation optimization to improve overall dam survival (2011)</i> ▪ <i>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.</i> <p><i>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.</i></p>	<p>COP was completed in 2007. An addendum is being prepared in 2009. The key objective of the COP is achievement and maintenance of hydro performance standards.</p> <p>A full-flow bypass and PIT-detector were installed in 2007.</p> <p>Initiated physical and numerical model studies. Analyzed risk of exposure to rapid decompression.</p> <p>Top-spill weirs were installed in Spill Bays 15 and 16 and tested. Details are discussed in Section 3.</p> <p>An addendum to the COP is being prepared in 2009.</p>

Hydro Actions

RPA No.	Action Description	2008 Actions/Accomplishments
<p>Hydropower Strategy 2—Modify Columbia and Snake River Dams to Maximize Juvenile and Adult Fish Survival¹</p> <p><i>Once the Action Agencies meet hydrosystem performance standards, they will ensure overall system performance through appropriate monitoring and maintenance activities. The Action Agencies will decide on the tools needed to maintain performance after coordinating with NOAA Fisheries and the regional forum.</i></p>		
21	<p><i>Configuration and Operational Plan for McNary Project</i> <i>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:</i></p> <ul style="list-style-type: none"> <li data-bbox="344 743 1123 954">■ <i>Turbine operation optimization to improve survival of fish passing through turbines (2013)</i> <li data-bbox="344 971 1123 1052">■ <i>Improve debris management to reduce injury of bypass and turbine passed fish (2011)</i> <li data-bbox="344 1068 1123 1166">■ <i>Relocate juvenile bypass outfall to improve egress, direct, and indirect survival on bypassed fish (2011)</i> <p><i>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.</i></p>	<p>Completed the draft surface passage alternatives study. COP completion is expected in 2009. The key objective of the COP is achievement and maintenance of hydro performance standards.</p> <p>Completed data collection for study of turbine pressure regimes on untagged fish survival. Developed a risk assessment model to predict fish mortality rates during turbine passage. Began developing a method to capture fish passing through turbines.</p> <p>Carried out initial problem identification and scoping.</p> <p>Carried out initial problem identification and scoping. Drogues were released and tracked from the outfall to determine tailrace flow patterns.</p>

Hydro Actions

RPA No.	Action Description	2008 Actions/Accomplishments
<p>Hydropower Strategy 2—Modify Columbia and Snake River Dams to Maximize Juvenile and Adult Fish Survival¹</p> <p><i>Once the Action Agencies meet hydrosystem performance standards, they will ensure overall system performance through appropriate monitoring and maintenance activities. The Action Agencies will decide on the tools needed to maintain performance after coordinating with NOAA Fisheries and the regional forum.</i></p>		
22	<p><i>Configuration and Operational Plan for Ice Harbor Project</i> <i>The Corps will consider all relevant biological criteria and prepare, in cooperation with NOAA Fisheries and the co-managing agencies, a Configuration and Operational Plan for the Ice Harbor Project (2008). As part of the first phase of modifications, the Corps will investigate, and implement the following reasonable and effective measures to reduce passage delay and increase survival of fish passing through the forebay, dam, and tailrace as warranted. Initial modifications will likely include:</i></p> <ul style="list-style-type: none"> <li data-bbox="344 732 1136 1040">▪ <i>Guidance screen modification to improve FGE (2010)</i> <li data-bbox="344 1040 1136 1227">▪ <i>Turbine operation optimization to improve survival of turbine passed fish (2011)</i> <li data-bbox="344 1227 1136 1344">▪ <i>Spillway chute and/or deflector modification to reduce injury and improve survival of spillway passed fish through the RSW (2009)</i> 	<p>Development of the COP was initiated in 2007 and a draft was issued in December 2008. The key objective of the COP is achievement and maintenance of hydro performance standards.</p> <p>A regional team evaluated the biological effects of improvements to the existing Standard Length Traveling Screens (i.e., raising the STS or adding flow vanes to reduce the potential of juvenile fish traveling through an 18-inch gap to the turbines) and concluded that no significant survival benefit was gained from eliminating this gap. Therefore, this action was not recommended in the draft COP, as there were other potential actions that were both cost-effective and could provide significant survival benefits.</p> <p>Completed data collection for a study of turbine pressure regimes on untagged fish survival. Developed a risk assessment model to predict fish mortality rates during turbine passage. Began developing a method to capture fish passing through turbines.</p> <p>Initiated hydraulic modeling. The removable spillway weir (RSW) chute modification will likely not be completed because of a lack of regional support.</p>

Hydro Actions

RPA No.	Action Description	2008 Actions/Accomplishments
<p>Hydropower Strategy 2—Modify Columbia and Snake River Dams to Maximize Juvenile and Adult Fish Survival¹</p> <p><i>Once the Action Agencies meet hydrosystem performance standards, they will ensure overall system performance through appropriate monitoring and maintenance activities. The Action Agencies will decide on the tools needed to maintain performance after coordinating with NOAA Fisheries and the regional forum.</i></p>		
	<ul style="list-style-type: none"> ▪ <i>Turbine unit 2 replacement to improve the survival of fish passing through turbines and reduce oil spill potential (2012)</i> <p><i>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.</i></p>	<p>Completed development of water pathway modification alternative testing and selection. Developed draft plans and specifications for design and supply for turbine runner.</p> <p>A draft was released for regional review in December 2008.</p>
23	<p><i>Configuration and Operational Plan for Lower Monumental Project</i> <i>The Corps will consider all relevant biological criteria and prepare, in cooperation with NOAA Fisheries and the co-managing agencies, a Configuration and Operational Plan for the Lower Monumental Project (2010). As part of the first phase of modifications, the Corps will investigate, and implement the following reasonable and effective measures to reduce passage delay and increase survival of fish passing through the forebay, dam, and tailrace as warranted. Initial modifications will likely include:</i></p> <ul style="list-style-type: none"> ▪ <i>Primary bypass operations with PIT-tag detection installation to reduce handling stress of bypassed fish (2007)</i> ▪ <i>Juvenile bypass system outfall relocation to improve egress, direct and indirect survival on bypassed fish (2011)</i> 	<p>COP not planned until 2010. The key objective of the COP is achievement and maintenance of hydro performance standards.</p> <p>Completed in 2007.</p> <p>Initiated and scoped project. Collected velocity data at transect in tailrace.</p>

Hydro Actions

RPA No.	Action Description	2008 Actions/Accomplishments
<p>Hydropower Strategy 2—Modify Columbia and Snake River Dams to Maximize Juvenile and Adult Fish Survival¹</p> <p><i>Once the Action Agencies meet hydrosystem performance standards, they will ensure overall system performance through appropriate monitoring and maintenance activities. The Action Agencies will decide on the tools needed to maintain performance after coordinating with NOAA Fisheries and the regional forum.</i></p>		
	<ul style="list-style-type: none"> ▪ Turbine operation optimization to improve the survival of fish passing through turbines (2013) 	<p>Completed data collection for study of turbine pressure regimes on untagged fish survival. Developed a risk assessment model to predict fish mortality rates during turbine passage. Began developing a method to capture fish passing through turbines.</p>
	<ul style="list-style-type: none"> ▪ RSW installation to improve FPE, reduce forebay delay, and improve direct and indirect survival (2008) 	<p>Construction was completed on the RSW before the 2008 juvenile fish migration season began. Conducted first year of post-construction testing. Biological performance evaluation results are discussed in Chapter 4.</p>
	<p><i>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.</i></p>	<p>COP not planned until 2010.</p>
24	<p>Configuration and Operational Plan for Little Goose Project <i>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:</i></p>	<p>Completion of COP expected by end of 2009. The key objective of the COP is achievement and maintenance of hydro performance standards.</p>
	<ul style="list-style-type: none"> ▪ Turbine operation optimization to improve the survival of fish passing through turbines (2014) 	<p>Completed data collection for study of turbine pressure regimes on untagged fish survival. Developed a risk assessment model to predict fish mortality rates during</p>

Hydro Actions

RPA No.	Action Description	2008 Actions/Accomplishments
	<p>Hydropower Strategy 2—Modify Columbia and Snake River Dams to Maximize Juvenile and Adult Fish Survival¹</p> <p><i>Once the Action Agencies meet hydrosystem performance standards, they will ensure overall system performance through appropriate monitoring and maintenance activities. The Action Agencies will decide on the tools needed to maintain performance after coordinating with NOAA Fisheries and the regional forum.</i></p>	
		turbine passage. Began developing a method to capture fish passing through turbines.
	<ul style="list-style-type: none"> ▪ <i>Primary bypass operations with PIT-tag detection installation to reduce handling stress of bypassed fish (2008)</i> 	Completed design, awarded contract, and initiated installation of a juvenile PIT monitoring system in the full flow section of the primary bypass. (The project was completed in 2009, before the juvenile fish migration season began.)
	<ul style="list-style-type: none"> ▪ <i>Primary bypass outfall relocation to improve egress, direct and indirect survival on bypassed fish (2009)</i> 	Initiated construction on the relocation of the bypass outfall in late 2008. The relocation will be completed during the 2009–2010 juvenile bypass system winter maintenance period. The relocated outfall will release fish in an area with higher river velocities and consistent downstream flow during all operations.
	<ul style="list-style-type: none"> ▪ <i>Surface spillway weir and deflector installation to improve FPE, reduce forebay delay and improve direct and indirect survival (2009)</i> 	Completed design of an adjustable spillway weir and awarded contract. (The weir was installed in 2009 before the juvenile fish migration season began.)
	<p><i>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.</i></p>	Completion of COP expected by end of 2009.

Hydro Actions

RPA No.	Action Description	2008 Actions/Accomplishments
<p>Hydropower Strategy 2—Modify Columbia and Snake River Dams to Maximize Juvenile and Adult Fish Survival¹</p> <p><i>Once the Action Agencies meet hydrosystem performance standards, they will ensure overall system performance through appropriate monitoring and maintenance activities. The Action Agencies will decide on the tools needed to maintain performance after coordinating with NOAA Fisheries and the regional forum.</i></p>		
25	<p><i>Configuration and Operational Plan for Lower Granite Project</i> <i>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:</i></p>	<p>Work was initiated on the COP for Lower Granite in 2008. A regional brainstorming session in May led to formulation and description of alternatives. Evaluation criteria also were developed and will be used to evaluate the alternatives in 2009. A key objective of the COP is achievement and maintenance of hydro performance standards.</p>
	<ul style="list-style-type: none"> ▪ <i>New juvenile fish facility including orifice configuration changes, primary dewatering, holding for transport, and primary bypass to improve direct and indirect survival of all collected fish (2012)</i> 	<p>Continued development of the Engineering Design Report and conducted a Value Engineering Study.</p>
	<ul style="list-style-type: none"> ▪ <i>Turbine operation optimization to improve survival of turbine passed fish (2014).</i> 	<p>Completed data collection for the study of turbine pressure regimes on untagged fish survival. Developed a risk assessment model to predict fish mortality rates during turbine passage. Began developing a method to capture fish passing through turbines.</p>
	<p><i>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.</i></p>	<p>Completion of COP expected by end of 2009.</p>

Hydro Actions

RPA No.	Action Description	2008 Actions/Accomplishments
<p>Hydropower Strategy 2—Modify Columbia and Snake River Dams to Maximize Juvenile and Adult Fish Survival¹</p> <p><i>Once the Action Agencies meet hydrosystem performance standards, they will ensure overall system performance through appropriate monitoring and maintenance activities. The Action Agencies will decide on the tools needed to maintain performance after coordinating with NOAA Fisheries and the regional forum.</i></p>		
26	<p><i>Chief Joseph Dam Flow Deflector</i> <i>The Corps will complete the flow deflector construction at Chief Joseph Dam by 2009.</i></p> <p><i>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.</i></p>	<p>Construction of flow deflectors on all 19 spillway bays at Chief Joseph was completed in September 2008.</p>
27	<p><i>Turbine Unit Operations</i> <i>The Action Agencies will operate turbine units to achieve best fish passage survival (currently within 1% of best efficiency at mainstem dams on the Lower Columbia and Lower Snake rivers from April 1 – October 31 (hard constraint) and from November 1 – March 31 (soft constraint) each year. Continue turbine operations evaluations and apply adaptive management to operate units in their optimum configuration for safe fish passage.</i></p>	<p>Turbine units on mainstem dams were operated within 1 percent of best efficiency, with a few exceptions.</p> <p>Work continued toward developing new turbine designs for safer fish passage.</p> <ul style="list-style-type: none"> ▪ Studies were completed on the effects of rapid decompression (to be completed 2009). ▪ A physical model study was completed. ▪ An alternatives study of methods of capturing fish that have passed through turbine is under way at Lower Granite Dam (to be completed in 2009).
28	<p><i>Columbia and Snake River Project Adult Passage Improvements</i> <i>The Corps will implement the following structural improvements to adult passage at the mainstem Columbia and Snake river projects:</i></p>	<p>(See below.)</p>

Hydro Actions

RPA No.	Action Description	2008 Actions/Accomplishments
<p>Hydropower Strategy 2—Modify Columbia and Snake River Dams to Maximize Juvenile and Adult Fish Survival¹</p> <p><i>Once the Action Agencies meet hydrosystem performance standards, they will ensure overall system performance through appropriate monitoring and maintenance activities. The Action Agencies will decide on the tools needed to maintain performance after coordinating with NOAA Fisheries and the regional forum.</i></p>		
	<p><i>Bonneville Dam</i></p> <ul style="list-style-type: none"> ▪ <i>Improve the Bradford Island ladder system to reduce stress and improve reliability of upstream adult passage (2013).</i> 	<p>Planned for 2013.</p>
	<p><i>The Dalles Dam</i></p> <ul style="list-style-type: none"> ▪ <i>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).</i> 	<p>Evaluation of alternatives for the east ladder continued. Further efforts on the north ladder were deferred pending spillwall completion and testing, to allow for evaluation of the effects of the new configuration on adult use of the north ladder.</p>
	<p><i>John Day Dam</i></p> <ul style="list-style-type: none"> ▪ <i>Adult ladder systems modifications to improve upstream adult passage conditions (2011).</i> 	<p>Completed an entrance/AWS (auxiliary water system) alternatives study. Initiated design documentation report (DDR). Completed DDR for exist section and count station modification alternatives. Initiated plans and specs for FY2010 construction start.</p>
	<p><i>Ice Harbor Dam</i></p> <ul style="list-style-type: none"> ▪ <i>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.</i> 	<p>Completed warranty replacement of two of the three gear shafts on the north shore auxiliary water supply pumps in fall 2008. (Replacement of the third gear shaft was completed early in 2009.)</p>
	<p><i>Little Goose Dam</i></p> <ul style="list-style-type: none"> ▪ <i>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).</i> 	<p>Conducted a radio telemetry study of adult passage under three spill patterns to determine whether spillway weir operations would impair adult passage.</p>

Hydro Actions

RPA No.	Action Description	2008 Actions/Accomplishments
<p>Hydropower Strategy 2—Modify Columbia and Snake River Dams to Maximize Juvenile and Adult Fish Survival¹</p> <p><i>Once the Action Agencies meet hydrosystem performance standards, they will ensure overall system performance through appropriate monitoring and maintenance activities. The Action Agencies will decide on the tools needed to maintain performance after coordinating with NOAA Fisheries and the regional forum.</i></p>		
	<p><i>Lower Granite Dam</i></p> <ul style="list-style-type: none"> ▪ <i>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).</i> 	<p>Began an investigation of why the water supply is insufficient. Supplying additional water to the trap is also being included in design of the new juvenile facility.</p>
	<p><i>Adult fishway modification to improve upstream adult passage conditions impaired by temperature differentials (need will be determined by results of further research) (prototype 2011).</i></p>	<p>Conducted a radio telemetry study of adult passage and delay in relation to temperature throughout the fishway, tailrace, and forebay.</p>

Hydro Actions

RPA No.	Action Description	2008 Actions/Accomplishments
Hydropower Strategy 3—Implement Spill and Juvenile Transportation Improvements at Columbia River and Snake River Dams		
29	<p><i>Spill Operations to Improve Juvenile Passage</i></p> <p><i>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).</i></p>	<p>Spill operations in 2008 were consistent with the Fish Operations plan that was court ordered on February 25, 2008. Spill operations are discussed in detail in Section 3 and are fully reported in the <i>2008 Dissolved Gas and Water Temperature Monitoring Report</i>, available at http://www.nwd-wc.usace.army.mil/tmt/wq/tdg_and_temp/2008/.</p>

Hydro Actions

RPA No.	Action Description	2008 Actions/Accomplishments
Hydropower Strategy 3—Implement Spill and Juvenile Transportation Improvements at Columbia River and Snake River Dams		
30	<p><i>Juvenile Fish Transportation in the Columbia and Snake Rivers</i></p> <p><i>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</i></p>	<p>Transport operations in 2008 were consistent with the Fish Operations plan that was court ordered on February 25, 2008. The 2008 transportation program was accomplished in accordance with NOAA ESA Permit Number 1237. Details are discussed in Section 3.</p>

Hydro Actions

RPA No.	Action Description	2008 Actions/Accomplishments
Hydropower Strategy 3—Implement Spill and Juvenile Transportation Improvements at Columbia River and Snake River Dams		
	<p><i>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 <u>and</u> 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.</i></p>	

Hydro Actions

RPA No.	Action Description	2008 Actions/Accomplishments
Hydropower Strategy 3—Implement Spill and Juvenile Transportation Improvements at Columbia River and Snake River Dams		
31	<p><i>Configuration and Operational Plan Transportation Strategy</i> <i>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.</i></p>	<p>A transportation COP is planned for 2010. The goal of this plan is to use transportation in a way that optimizes life cycle survival of ESA-listed fish, based on the latest empirical information.</p>

Hydro Actions

RPA No.	Action Description	2008 Actions/Accomplishments
<p>Hydropower Strategy 4—Operate and Maintain Facilities at Corps’ Mainstem Projects to Maintain Biological Performance</p>		
32	<p><i>Fish Passage Plan</i> <i>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:</i></p>	<p>The Fish Passage Plan was completed and all modifications to the plan were carried out in full coordination with the region.</p>
	<ul style="list-style-type: none"> ▪ Operate according to project-specific criteria and dates to operate and maintain fish facilities, turbine operating priorities, and spill patterns; ▪ Operate according to fish transportation criteria; ▪ Maintain turbine operations within the 1% of best efficiency range; ▪ Maintain spillway discharge levels and dates to provide project spill for fish passage; ▪ Implement TDG monitoring plan; ▪ Operate according to protocols for fish trapping and handling; ▪ Take advantage of low river conditions, low reservoir elevations or periods outside the juvenile migration season to accomplish repairs, maintenance, or inspections so there is little or no effect on juvenile fish; ▪ Coordinate routine and non-routine 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. 	
	<p><i>Operations and Maintenance</i></p> <ul style="list-style-type: none"> ▪ Provide redundancy or contingency plans, developed in coordination with NOAA Fisheries and the Regional Forum, which will assure that key adult fish passage facility equipment operates as necessary to minimize long-term adult passage delays. ▪ Evaluate the condition of items necessary (e.g., spillway hoist systems, cranes, 	

Hydro Actions

RPA No.	Action Description	2008 Actions/Accomplishments
	<p>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.</p>	

Hydro Actions

RPA No.	Action Description	2008 Actions/Accomplishments
Hydropower Strategy 5—Develop and Implement a Kelt Management Plan		
33	<p><i>Snake River Steelhead Kelt Management Plan</i></p> <p>The BPA and Corps will prepare a Snake River Kelt Management Plan in coordination with NOAA Fisheries and the Regional Forum. The BPA and Corps will implement the plan to improve the productivity of interior basin B-run steelhead populations as identified in Sections 8.5. Key considerations in the development and implementation of the plan should include:</p> <ul style="list-style-type: none"> ▪ Measures to increase the in-river survival of migrating kelts, ▪ Potential for the collection and transport (either with or without short-term reconditioning) of kelts to areas below Bonneville Dam, ▪ Potential for long-term reconditioning as a tool to increase the number of viable females on the spawning grounds, ▪ Research as necessary to accomplish the elements of this plan. 	<p>Began initial investigations for kelt collection and reconditioning sites. BPA funded CRITFC to prepare a Kelt Master Plan that will cover much of the reconditioning topic to be included in the broader Kelt Management Plan.</p>

Habitat Actions

RPA No.	Action Description	2008 Actions/Accomplishments
<p><i>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:</i></p> <ul style="list-style-type: none"> ▪ 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 <p>Each strategy consists of one or more specific actions. These are summarized in the following sections.</p>		
<p>Habitat Strategy 1—Protect and Improve Tributary Habitat Based on Biological Needs and Prioritized Actions</p>		
34	<p><i>Tributary Habitat Implementation 2007 to 2009 – Progress Toward 2018 Habitat Quality Improvement Targets.</i></p> <p><i>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.</i></p> <p><i>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.</i></p>	<p>Actions implemented in 2007 and 2008 with funding and technical assistance from the Action Agencies are listed in Section 4, Attachments 1 through 4.</p> <p>Any needed replacement actions will be identified at expert panel workshops scheduled to occur in 2009.</p>

Habitat Actions

RPA No.	Action Description	2008 Actions/Accomplishments
Habitat Strategy 1—Protect and Improve Tributary Habitat Based on Biological Needs and Prioritized Actions		
35	<p><i>Tributary Habitat Implementation 2010-2018 – Achieving Habitat Quality and Survival Improvement Targets.</i></p> <p><i>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.</i></p> <p><i>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.</i></p> <p><i>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.</i></p> <p><i>The expert panel will use methods consistent with the NWR v. NMFS Remand Collaboration Habitat Workgroup process.</i></p> <p><i>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.</i></p>	<ul style="list-style-type: none"> ▪ In November 2008, the Action Agencies began holding meetings to inform local experts about the upcoming workshops that would be convened in 2009. In the orientation meetings, the Action Agencies provided an overview of tributary habitat FCRPS BiOp requirements, described the methods planned to gather input on 2007-2009 implementation of habitat actions, and described what would be needed for the 2010-12 habitat implementation planning. The orientation meetings were held in LaGrande, Oregon; Lewiston, Idaho; Salmon, Idaho; and Wenatchee, Washington. ▪ No further action for this RPA was needed in 2008.

Habitat Actions

RPA No.	Action Description	2008 Actions/Accomplishments
Habitat Strategy 1—Protect and Improve Tributary Habitat Based on Biological Needs and Prioritized Actions		
	<ul style="list-style-type: none"> ▪ <i>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.</i> ▪ <i>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.</i> ▪ <i>The Action Agencies will continue to work cooperatively with the Council to identify priorities and obtain ISRP review of projects proposed for BPA funding.</i> ▪ <i>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.</i> 	

Habitat Actions

RPA No.	Action Description	2008 Actions/Accomplishments
Habitat Strategy 1—Protect and Improve Tributary Habitat Based on Biological Needs and Prioritized Actions		
	<p><i>If new scientific or other information (except incomplete implementation or project modifications) suggests that habitat quality improvement estimates for projects from the previous cycle were significantly in error, the Action Agencies will examine the information and review the project or projects in question and their estimated benefits. This review will occur as part of the 2009 Annual Report and the Comprehensive RPA Evaluations in 2013 and 2016 and will be performed in conjunction with NOAA Fisheries. In the event such review finds that habitat quality improvement benefits were significantly overstated, the Action Agencies will implement replacement projects (selected as per Action 35 above) to provide benefits sufficient to achieve the habitat quality improvement and population-or MPG-specific survival benefit estimated for the original project or projects.</i></p> <p><i>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.</i></p> <p><i>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.</i></p>	

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

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
Upper Columbia Spring Chinook	Upper Columbia – Below Chief Joseph	Entiat River	10	22
		Methow River	2	6
		Wenatchee River	1	3
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 *

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
	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
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

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
		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.

Habitat Actions

RPA No.	Action Description	2008 Actions/Accomplishments
Habitat Strategy 2—Improve Juvenile and Adult Fish Survival in Estuary Habitat		
36	<p><i>Estuary Habitat Implementation 2007 to 2009</i> <i>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.</i></p>	<p>During 2008, the Action Agencies implemented eight habitat actions. On-the-ground actions included two land acquisitions: Willow Grove and Wolf Bay. Management plans, including future restoration activities on the acquired parcels, have been or are in the process of being put in place. Additional habitat actions included removing riparian/wetland invasive plant species and planting native species, installing fencing in riparian areas to exclude cattle, removing riprap, improving fish passage structures, and placing large wood. Further project-level detail is listed in Section 4, Attachment 5.</p>
37	<p><i>Estuary Habitat Implementation 2010-2018—Achieving Habitat Quality and Survival Improvement Targets</i> <i>The Action Agencies will provide funding to implement additional specific projects as needed to achieve the total estuary survival benefits identified in the FCRPS BA Attachment B.2.2). Projects will identify location, treatment of limiting factor, targeted ESU/DPS or ESUs/DPSs, appropriate reporting metrics, and estimated biological benefits based on the achieving of those metrics. Pertinent new information on climate change and potential effects of that information on limiting factors will be considered.</i></p> <ul style="list-style-type: none"> ▪ <i>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.</i> ▪ <i>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.</i> 	<ul style="list-style-type: none"> ▪ The Action Agencies will use the <i>Columbia River Estuary ESA Recovery Plan Module for Salmon and Steelhead</i> (by NOAA Fisheries) to guide restoration and protection efforts through a collaborative process. Beginning in 2008, the Action Agencies have initiated the development of a strategic approach to identifying restoration and protection projects in the estuary using a new Ecosystem Classification System being developed by the University of Washington and the U.S. Geological Survey. The strategic approach will use guiding principles based on salmonid ecology to identify potential sites with the highest value to salmon and steelhead. This is a collaborative effort between the Action Agencies and other regional interests, including the Lower Columbia River Estuary Partnership (LCREP), the states of Oregon and Washington, the Cowlitz Tribe, and local restoration practitioners, including the Columbia River Estuary Study Taskforce (CREST), the Columbia Land Trust, watershed councils, and conservation districts.

Habitat Actions

RPA No.	Action Description	2008 Actions/Accomplishments
Habitat Strategy 2—Improve Juvenile and Adult Fish Survival in Estuary Habitat		
	<ul style="list-style-type: none"> ▪ <i>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.</i> ▪ <i>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.</i> ▪ <i>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.</i> ▪ <i>FCRPS RM&E results will actively inform the relationship between actions, estuary habitat change and salmon productivity and new scientific information will be applied to estimate benefits for future implementation.</i> ▪ <i>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.</i> 	<ul style="list-style-type: none"> ▪ The Action Agencies will also use LCREP’s Science Work Group, using its ecosystem criteria, to help select restoration and protection projects in the Lower Columbia River and Estuary. ▪ The Action Agencies convened the RPA 37 Expert Regional Technical Group (ERTG) Steering Group in 2008. The ERTG will use the approach originally applied in the FCRPS BA and all subsequent information on the relationship between actions, habitat, and salmon productivity models to estimate the change in overall estuary habitat and resultant change in survival. The ERTG will be convened in 2009 and begin evaluating federal projects for their survival benefit potential. When available, new scientific information resulting from FCRPS RME will be applied to estimate benefits for projects implemented between 2010 and 2018. ▪ If habitat projects from 2007-2009 are not implemented in whole or in part, the Action Agencies will implement comparable replacement projects to provide the same or greater benefits. Project selection will be based on input from expert panels, regional recovery planning groups, the Northwest Power and Conservation Council, and NOAA Fisheries.
38	<p><i>Piling and Piling Dike Removal Program</i></p> <p><i>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.</i></p> <ul style="list-style-type: none"> ▪ <i>In 2008, the Action Agencies will work with Lower Columbia River Estuary Program to</i> 	<ul style="list-style-type: none"> ▪ In 2008, the Action Agencies collaborated with LCREP and others to set up a Pile Structure Program subcommittee

Habitat Actions

RPA No.	Action Description	2008 Actions/Accomplishments
Habitat Strategy 2—Improve Juvenile and Adult Fish Survival in Estuary Habitat		
	<p><i>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.</i></p> <ul style="list-style-type: none"> ▪ <i>Beginning in 2008 and 2009, the Action Agencies will begin implementation. Implementation will continue through 2018.</i> 	<p>under LCREP’s Science Work Group. The Action Agencies made considerable progress toward a final draft program plan for the new Pile Structure Program. This document is under review by NOAA Fisheries’ Northwest Region and Northwest Science Center. It will also be reviewed by the Independent Scientific Review Panel after NOAA Fisheries’ review.</p> <ul style="list-style-type: none"> ▪ In 2008, the Action Agencies, in collaboration with others, initiated implementation of the Pile Structure Program by gathering data on conditions at pile structure sites, designing a scientific approach, and creating a review draft of the Pile Structure Program Plan. Site-specific data collection and monitoring will begin in 2009 with on-the-ground implementation, including pile structure removal in 2010.

Hatchery Actions

RPA No.	Action Description	2008 Actions/Accomplishments
<p><i>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:</i></p>		
<ul style="list-style-type: none"> ▪ 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 <p>Each strategy consists of two specific actions. These are summarized in the following sections.</p>		
<p>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</p>		
39	<p><i>FCRPS Funding of Mitigation Hatcheries – Programmatic</i> <i>The FCRPS Action Agencies will continue funding hatcheries in accordance with existing</i></p>	

Hatchery Actions

RPA No.	Action Description	2008 Actions/Accomplishments
	<p><i>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 PWWG 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.</i></p>	<ul style="list-style-type: none"> ▪ Upper Columbia Programs: In 2008, development of a Hatchery and Genetic Management Plan (HGMP) for the Leavenworth National Fish Hatchery (NFH) spring Chinook salmon program was begun, and an updated and complete HGMP is expected by January 2009. After review, it will be submitted to NOAA Fisheries to initiate consultation. HGMPs for the Entiat and Winthrop NFH programs are expected to be developed in 2009. NOAA Fisheries will consult on all hatchery programs affecting Upper Columbia River spring Chinook and steelhead simultaneously in 2010 to ensure that their interrelated and interdependent effects avoid jeopardy. ▪ Middle Columbia: No action in 2008. the status of this RPA will be reported in the 2010 Annual Progress Report. ▪ Lower Columbia: No action in 2008. The status of this RPA will be reported in the 2011 Annual Progress Report.

Hatchery Actions

RPA No.	Action Description	2008 Actions/Accomplishments
40	<p><i>Reform FCRPS Hatchery Operations to Reduce Genetic and Ecological Effects on ESA-Listed Salmon and Steelhead</i></p> <p><i>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.</i></p>	<ul style="list-style-type: none"> ▪ The Corps coordinated with U.S. v. Oregon parties regarding development of their position on, and justification for, changes they believe are necessary in the John Day Mitigation Program. Corps reprogrammed production between Spring Creek NFH and Bonneville hatchery. ▪ In 2008, BPA staff began preliminary implementation planning with U.S. Fish and Wildlife’s Lower Snake River Compensation Plan (LSRCP) staff. Implementation will require considerable coordination among USFWS and co-managers, and some feasibility issues have been identified that will need to be explored further in 2009. ▪ As above, in 2008 BPA staff began preliminary implementation planning with USFWS LSRCP staff. Implementation will require considerable coordination among USFWS and co-managers, and some feasibility issues have been identified that will need to be explored further in 2009. ▪ HGMPs for Winthrop NFH programs are expected to be developed in 2009. NOAA Fisheries will consult on all hatchery programs affecting Upper Columbia River spring Chinook and steelhead simultaneously in 2010 to ensure that their interrelated and interdependent effects avoid jeopardy.

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 and 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. ²
	For Middle Columbia Steelhead : Fund the Touchet River steelhead supplementation program to transition to local broodstock using BMPs. ³
	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.

² Current operation of these programs is undergoing site-specific ESA consultation; a Section 7 determination has not yet been made.

³ Current operation of these programs is undergoing site-specific ESA consultation; a Section 7 determination has not yet been made.

Hatchery Actions

RPA No.	Action Description	2008 Actions/Accomplishments
<p>Hatchery Strategy 2—Preserve and Rebuild Genetic Resources Through Safety-net and Conservation Actions to Reduce Short-term Extinction Risk and Promote Recovery</p>		
<p>41</p>	<p><i>Implement Safety Net Programs to Preserve Genetic Resources and Reduce Short-term Extinction Risk</i></p> <p><i>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.</i></p>	<ul style="list-style-type: none"> ▪ BPA again funded the Snake River Sockeye Salmon Captive Broodstock Program project. BPA also funded a new hatchery building at the Idaho Department of Fish and Game (IDFG) Eagle hatchery. ▪ BPA continued to fund this safety-net program through the Tucannon River Spring Chinook Captive Broodstock Program, a BPA project. ▪ In 2008, BPA continued to fund this safety-net program through the Oregon Spring Chinook Captive Propagation Program, a BPA project. ▪ In 2008, BPA continued to fund this safety-net program through the Johnson Creek Artificial Propagation Enhancement Project, a BPA project. ▪ In 2008, BPA continued to fund an experimental captive rearing program through the Idaho Snake River Spring Chinook Captive Propagation Project, a BPA project. ▪ It is not feasible to implement this action at this time due to a lack of adequate B-run steelhead population viability data. Once sufficient data are available through enhanced Snake River steelhead monitoring, we will begin to work with NOAA to develop the type of "trigger" described above.

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	
	<p>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).</p>
	<p>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.</p>
	<p>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.</p>
	<p>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.</p>
	<p>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).</p>
	<p>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.</p>

Hatchery Actions

RPA No.	Action Description	2008 Actions/Accomplishments
Hatchery Strategy 2—Preserve and Rebuild Genetic Resources Through Safety-net and Conservation Actions to Reduce Short-term Extinction Risk and Promote Recovery		
42	<p><i>Implement Conservation Programs to Build Genetic Resources and Assist in Promoting Recovery</i></p> <p><i>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.</i></p>	<ul style="list-style-type: none"> ▪ As of December 2008, the Confederated Colville Tribes' proposal for the Chief Joseph Hatchery was proceeding through the Northwest Power and Conservation Council's (NPCC) Three-Step Review process for major artificial production projects. Chief Joseph Hatchery is expected to receive approval in 2009 to move into review Step 3 (final design), and construction is anticipated to begin in 2010. ▪ In 2008, the Yakama Tribe developed a proposal for Upper Columbia River steelhead kelt reconditioning that would implement this RPA action as well as a similar Columbia River Fish Accords action. The proposal will be funded under the BPA project Upper Columbia River Kelt Reconditioning. As of December 2008, the proposal was undergoing scientific review and revision. ▪ This action is being implemented by the Confederated Colville Tribes through a Fish and Wildlife Program/Columbia River Fish Accords project: Local Okanogan Steelhead Broodstock. ▪ In 2008, BPA continued to fund this action through the BPA project Kelt Reconditioning/Reproductive Success. ▪ In 2008, BPA continued to fund operation and maintenance for this action through the LSRCP Direct Funding Agreement. ▪ As of December 2008, NOAA had not approved an HGMP for this action. Because funding of the action is contingent on a NOAA-approved HGMP, BPA did not fund construction of the Northeast Oregon Hatchery Lostine and Imnaha spring/summer Chinook propagation facilities

Hatchery Actions

RPA No.	Action Description	2008 Actions/Accomplishments
Hatchery Strategy 2—Preserve and Rebuild Genetic Resources Through Safety-net and Conservation Actions to Reduce Short-term Extinction Risk and Promote Recovery		
		<p>in 2008.</p> <ul style="list-style-type: none"> ▪ On September 2, 2008, BPA signed a Fish Accord with the State of Idaho. Included in this accord to provide funding certainty over a 10-year period was the commitment to provide funding for a new sockeye salmon fish hatchery (property acquisition and construction). ▪ No action in 2008 for Subaction 8.
		<ul style="list-style-type: none"> ▪ In 2008, BPA continued to fund this action through the BPA project Reintroduction of Chum Salmon into Duncan Creek. ▪ As of December 2008, the Washington Department of Fish and Wildlife (WDFW) was developing a proposal for a BPA-funded project to implement this action.

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	
	<p>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.</p>
	<p>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.</p>
	<p>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.</p>

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 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 and Invasive Species Management Actions

RPA No.	Action Description	2008 Actions/Accomplishments
<p><i>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:</i></p> <ul style="list-style-type: none"> ▪ Predation and Invasive Species Management Strategy 1—Implement piscivorous predation control measures to increase survival of juvenile salmonids in the lower Snake and Columbia rivers ▪ Predation and Invasive Species Management Strategy 2—Implement avian predation control measures to increase survival of juvenile salmonids in the lower Snake and Columbia rivers ▪ Predation and Invasive Species Management Strategy 3—Implement marine mammal control measures to increase survival of adult salmonids at Bonneville Dam <p>Each strategy consists of two specific actions. These are summarized in the following sections.</p>		
<p>Predation and Invasive Species Management Strategy 1—Implement Piscivorous Predation Control Measures to Increase Survival of Juvenile Salmonids in the Lower Snake and Columbia Rivers</p>		
43	<p><i>Northern Pikeminnow Management Program (NPMP)</i> <i>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.</i> <i>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.</i></p>	<ul style="list-style-type: none"> ▪ The Northern Pikeminnow Management Program (NPMP) was again implemented in 2008. ▪ In 2004, BPA increased the reward for the catch of this predator and increased the number removed by 25 percent over prior years. The increased reward was made permanent in 2005 to sustain the higher catches. ▪ In 2008, researchers increased cumulative tagging efforts, increasing year-over-year application of tags by 75 percent. ▪ As part of the annual evaluation of the NPMP, and based on 2008 catches, managers determined that continued implementation of the Dam Angling program component is warranted.

Predation and Invasive Species Management Actions

RPA No.	Action Description	2008 Actions/Accomplishments
Predation and Invasive Species Management Strategy 1—Implement Piscivorous Predation Control Measures to Increase Survival of Juvenile Salmonids in the Lower Snake and Columbia Rivers		
44	<p><i>Develop strategies to reduce non-indigenous fish</i></p> <p><i>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.</i></p>	<ul style="list-style-type: none"> ▪ In September 2008, BPA sponsored a one-day workshop entitled “Review, Evaluate, and Develop Strategies to Reduce Non-Native Piscivorous Predation on Juvenile Salmonids.” ▪ Next steps in the development of strategies to reduce non-indigenous predation are to narrow the dozen or so grouped recommendations to two to three, through continued collaboration with the regional agencies and tribes. Once the topic areas have been narrowed, pursuit of basic or applied research will occur through implementation of actions intended to address the focal areas of concern.

Predation and Invasive Species Management Actions

RPA No.	Action Description	2008 Actions/Accomplishments																												
Predation and Invasive Species Management Strategy 2—Implement Avian Predation Control Measure to Increase Survival of Juvenile Salmonids in the Lower Snake and Columbia Rivers																														
45	<p><i>Reduce Caspian Terns on East Sand Island in the Columbia River Estuary</i> <i>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.</i></p> <table border="1" data-bbox="331 589 1129 1091"> <thead> <tr> <th data-bbox="331 589 636 703"><i>Site</i></th> <th data-bbox="636 589 720 703"><i>Acres</i></th> <th data-bbox="720 589 909 703"><i>Proposed Year of Creation</i></th> <th data-bbox="909 589 1129 703"><i>Proposed Year in which Target Acreage Is Achieved</i></th> </tr> </thead> <tbody> <tr> <td data-bbox="331 703 636 751"><i>Fern Ridge Lake</i></td> <td data-bbox="636 703 720 751">1</td> <td data-bbox="720 703 909 751">2007/2008</td> <td data-bbox="909 703 1129 751">2007/2008</td> </tr> <tr> <td data-bbox="331 751 636 800"><i>Summer Lake</i></td> <td data-bbox="636 751 720 800">1.5</td> <td data-bbox="720 751 909 800">2008</td> <td data-bbox="909 751 1129 800">2008</td> </tr> <tr> <td data-bbox="331 800 636 849"><i>Crump Lake</i></td> <td data-bbox="636 800 720 849">1</td> <td data-bbox="720 800 909 849">2009</td> <td data-bbox="909 800 1129 849">2009</td> </tr> <tr> <td data-bbox="331 849 636 930"><i>Brooks Island (San Francisco Bay)</i></td> <td data-bbox="636 849 720 930">2</td> <td data-bbox="720 849 909 930">2008/2009</td> <td data-bbox="909 849 1129 930">2008/2009</td> </tr> <tr> <td data-bbox="331 930 636 1011"><i>Hayward Regional Shoreline (San Francisco Bay)</i></td> <td data-bbox="636 930 720 1011">0.5</td> <td data-bbox="720 930 909 1011">2008/2009</td> <td data-bbox="909 930 1129 1011">2008/2009</td> </tr> <tr> <td data-bbox="331 1011 636 1091"><i>Don Edwards NWR (San Francisco Bay)</i></td> <td data-bbox="636 1011 720 1091">0.5-1</td> <td data-bbox="720 1011 909 1091">2009</td> <td data-bbox="909 1011 1129 1091">2009</td> </tr> </tbody> </table>	<i>Site</i>	<i>Acres</i>	<i>Proposed Year of Creation</i>	<i>Proposed Year in which Target Acreage Is Achieved</i>	<i>Fern Ridge Lake</i>	1	2007/2008	2007/2008	<i>Summer Lake</i>	1.5	2008	2008	<i>Crump Lake</i>	1	2009	2009	<i>Brooks Island (San Francisco Bay)</i>	2	2008/2009	2008/2009	<i>Hayward Regional Shoreline (San Francisco Bay)</i>	0.5	2008/2009	2008/2009	<i>Don Edwards NWR (San Francisco Bay)</i>	0.5-1	2009	2009	<ul style="list-style-type: none"> ▪ In 2008, the Corps constructed an island with alternative tern nesting habitat at Fern Ridge Reservoir. Tern decoys were deployed and tern colony sounds were used; however, no terns nested on the island in 2008. At the end of the breeding season, a small number of terns were using the island. ▪ The first of three islands was constructed in the Summer Lake State Wildlife Area. ▪ Construction of the Crump Lake island was completed in March of 2008. Caspian terns arrived on the island in early May; approx. 428 breeding pairs of terns nested. ▪ No construction was necessary in 2008 for Subactions 4, 5, or 6.
<i>Site</i>	<i>Acres</i>	<i>Proposed Year of Creation</i>	<i>Proposed Year in which Target Acreage Is Achieved</i>																											
<i>Fern Ridge Lake</i>	1	2007/2008	2007/2008																											
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Predation and Invasive Species Management Actions

RPA No.	Action Description	2008 Actions/Accomplishments
Predation and Invasive Species 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 <i>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.</i>	Conducted research necessary to develop management plan.
47	Inland Avian Predation <i>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.</i>	Initiated discussions with NOAA and USFWS on project approach and scope.
48	Other Avian Deterrent Actions <i>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.</i>	Avian deterrent actions, such as hazing and wire arrays, were carried out in accordance with the Fish Passage Plan (FPP) as called for in RPA 48.

Predation and Invasive Species Management Actions

RPA No.	Action Description	2008 Actions/Accomplishments
Predation and Invasive Species Management Strategy 3—Implement Marine Mammal Control Measures to Increase Survival of Adult Salmonids at Bonneville Dam		
49	Marine Mammal Control Measures <i>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.</i>	The Corps installed sea lion exclusion devices (SLEDs) at Bonneville Dam's 12 primary fishway entrances. In addition, the Corps and BPA supported land- and water-based harassment efforts by states and tribes.

Research, Monitoring, and Evaluation Actions

RPA No.	Action Description	2008 Actions/Accomplishments
<p>Research, Monitoring and Evaluation Actions</p>		
<p><i>The overall RME 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 RME through project implementation and compliance monitoring, status monitoring, action effectiveness research, and critical uncertainties research in the following nine areas:</i></p> <ul style="list-style-type: none"> ▪ <i>RME Strategy 1—Monitor Status of Selected Fish Populations Related to FCRPS Actions</i> ▪ <i>RME Strategy 2—Hydropower RME</i> ▪ <i>RME Strategy 3—Tributary Habitat RME</i> ▪ <i>RME Strategy 4—Estuary and Ocean RME</i> ▪ <i>RME Strategy 5—Harvest RME</i> ▪ <i>RME Strategy 6—Hatchery RME</i> ▪ <i>RME Strategy 7—Predation and Invasive Species Management RME</i> ▪ <i>RME Strategy 8—Coordination and Data Management</i> ▪ <i>RME Strategy 9—Project Implementation and Compliance Monitoring</i> <p><i>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.</i></p> <p><i>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:</i></p> <ul style="list-style-type: none"> ▪ <i>Programmatic performance. This will be tracked through project implementation and compliance monitoring.</i> ▪ <i>Biological and environmental performance. This 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 are applied through analytical models. Targets allow us to check for progress toward expected life stage 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.</i> 		

Research, Monitoring, and Evaluation Actions

RPA No.	Action Description	2008 Actions/Accomplishments
<p>RME Strategy 1—Monitor the Status of Selected Fish Populations Related to FCRPS Actions</p> <p><i>The Action Agencies’ strategy is to support performance monitoring and adaptive management related to the status of fish populations.</i></p>		
50	<p><i>Fish Population Status Monitoring</i> <i>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).</i></p>	
	<ul style="list-style-type: none"> ▪ <i>Implement and maintain the Columbia River Basin passive integrated transponder (PIT)-Tag Information System. (Annually)</i> 	<ul style="list-style-type: none"> ▪ The BPA-funded Columbia Basin PIT-Tag Information project (PTAGIS) was implemented to perform research at mainstem juvenile or adult fish facilities. PTAGIS provides coordination, setup, operations, and maintenance for about a dozen Northwest Power and Conservation Council Fish and Wildlife Program (FWP) or Anadromous Fish Evaluation Program (AFEP) projects throughout the fish migration season.
	<ul style="list-style-type: none"> ▪ <i>Monitor adult returns at mainstem hydroelectric dams using both visual counts and the PIT-tag detection system (see Hydrosystem section). (Annually)</i> 	<ul style="list-style-type: none"> ▪ The Corps' standard adult visual count program was implemented as required by RPA 52 below. The BPA-funded Lower Granite Dam Adult Trap Operations project was implemented to continue daily operation of the Lower Granite adult trap to sample steelhead, spring/summer Chinook, and PIT-tagged fall Chinook (scales and length measurement).
	<ul style="list-style-type: none"> ▪ <i>Monitor juvenile fish migrations at mainstem hydroelectric dams using smolt monitoring and the PIT-tag detection system (see Hydrosystem section). (Annually)</i> 	<ul style="list-style-type: none"> ▪ BPA implemented two projects to monitor smolts. For example, the Smolt Monitoring by Non-Federal Entities project (198712700) collected species, condition, and external mark detail from all sampled fish, along with condition and length data from a subsample of the smolts and all incidental species caught in the samples.
	<ul style="list-style-type: none"> ▪ <i>Fund status and trend monitoring as a component of the pilot studies in the</i> 	<ul style="list-style-type: none"> ▪ Thirty-eight projects were implemented to support ongoing

Research, Monitoring, and Evaluation Actions

RPA No.	Action Description	2008 Actions/Accomplishments
	<ul style="list-style-type: none"> – <i>Wenatchee, Methow, and Entiat river basins in the Upper Columbia River,</i> – <i>the Lemhi and South Fork Salmon river basins, and the John Day River Basin</i> – <i>to further advance the methods and information needed for assessing the status</i> – <i>of fish populations. (Initiate in FY 2007-2009 Project Funding, review and</i> – <i>modify annually to ensure that these projects continue to provide a means of</i> – <i>evaluating the effectiveness of tributary mitigation actions).</i> 	<p>pilot studies. For example, the BPA-funded Integrated Status and Effectiveness Program projects conducted monitoring to evaluate food web and life history responses to habitat change. The program also conducted juvenile snorkel surveys in winter (30) and summer (42) sampling sites to evaluate population dynamics at restoration sites compared to unrestored sites.</p>
	<ul style="list-style-type: none"> ▪ <i>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)</i> 	<ul style="list-style-type: none"> ▪ Seventeen projects were implemented to supplement B-run steelhead monitoring needs. For example, the BPA-funded Idaho Monitoring and Evaluation Studies project PIT-tagged juveniles in streams of the Middle Fork Salmon River, South Fork Salmon River, and Little Salmon River to estimate juvenile steelhead production and timing; the project also snorkeled streams to estimate juvenile densities in the Clearwater River and tributaries and collected DNA tissue samples in the Salmon River and Clearwater tributaries to genotype and analyze genetic tissues.
	<ul style="list-style-type: none"> ▪ <i>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)</i> 	<ul style="list-style-type: none"> ▪ Sixty-seven projects were implemented to improve fish population monitoring to evaluate priority populations and critical performance measures. For example, the BPA-funded Evaluate Umatilla Juvenile Salmonid Outmigration (smolt monitoring) project facilitated the calibration of trap collection efficiency, supported documentation of PIT-tagged fish detected at Three Mile Falls Dam and migration timing of natural-origin steelhead, and helped improve the collection of biological data.
	<ul style="list-style-type: none"> ▪ <i>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)</i> 	<ul style="list-style-type: none"> ▪ Twenty-seven BPA projects were continued and one was initiated in 2008 that supported monitoring and research on hatchery marking.
	<ul style="list-style-type: none"> ▪ <i>Report available information on population viability metrics in annual and comprehensive evaluation reports. (Initiate in FY 2008)</i> 	<ul style="list-style-type: none"> ▪ Regarding the synthesis of fish population data for annual comprehensive reports, the Action Agencies and NOAA

Research, Monitoring, and Evaluation Actions

RPA No.	Action Description	2008 Actions/Accomplishments
		Fisheries agreed to a process whereby NOAA Fisheries would provide population viability information for the future reports.

Research, Monitoring, and Evaluation Actions

RPA No.	Action Description	2008 Actions/Accomplishments
RME Strategy 1—Monitor the Status of Selected Fish Populations Related to FCRPS Actions <i>The Action Agencies' strategy is to support performance monitoring and adaptive management related to the status of fish populations.</i>		
51	<p><i>Collaboration Regarding Fish Population Status Monitoring</i></p> <p><i>The Action Agencies will enhance existing fish populations status monitoring performed by fish management agencies through the following collaboration commitments:</i></p> <ul style="list-style-type: none"> ▪ <i>Support the coordination, data management, and annual synthesis of fish population metrics through Regional Data Repositories and reports. (Annually)</i> ▪ <i>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)</i> ▪ <i>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)</i> 	<ul style="list-style-type: none"> ▪ Eight BPA projects were implemented to support annual synthesis of fish population data for reports. Action Agency staff participated in RME Hydro and Hatchery RME work groups through which this was pursued. ▪ Action Agency staff participated in RME Hydro and Hatchery RME work groups through which this was pursued. ▪ Seven BPA projects were implemented to provide cost sharing for staff support in regional monitoring and evaluation coordination. The BPA-funded PNAMP Support project facilitated coordination work at the program, subbasin, and regional level.

Research, Monitoring, and Evaluation Actions

RPA No.	Action Description	2008 Actions/Accomplishments
RME Strategy 2—Hydrosystem Research, Monitoring, and Evaluation		
<p>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 the 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.</p> <p>Juvenile Dam Passage Performance Standards</p> <p>The Action Agencies’ juvenile performance standards are an average across Snake River and Lower Columbia River dams of 96 percent average dam passage survival for spring Chinook and steelhead and 93 percent 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 RME 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.</p> <p>Juvenile In-River Survival Performance Metric</p> <p>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).</p> <p>Juvenile System Survival Performance Targets</p> <p>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 basis for performance tracking.</p> <p>Adult Performance Standards</p> <p>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).</p>		

Research, Monitoring, and Evaluation Actions

RPA No.	Action Description		2008 Actions/Accomplishments
RME Strategy 2—Hydrosystem Research, Monitoring, and Evaluation			
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. (See below.)
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. (See below.)
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

Research, Monitoring, and Evaluation Actions

RPA No.	Action Description		2008 Actions/Accomplishments
RME Strategy 2—Hydrosystem Research, Monitoring, and Evaluation			
			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
<p>*NMFS developed these survival standards (wild- and hatchery-origin fish combined) based on detections of PIT-tagged that were known to migrate in-river as juveniles; detections were at Bonneville Dam and later at the uppermost federal dam for the species detected from 2002 to 2006. 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).</p>			
52	<p><i>Monitor and Evaluate Fish Performance within the FCRPS</i> <i>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:</i></p>		
	<ul style="list-style-type: none"> ▪ <i>Monitor and evaluate salmonid dam survival rates for a subset of FCRPS projects.</i> 		<ul style="list-style-type: none"> ▪ Estimated route-specific passage and survival rates at Lower Monumental, Ice Harbor, McNary, John Day, and Bonneville dams. These are discussed in more detail in the Hydro section.
	<ul style="list-style-type: none"> ▪ <i>Monitor and evaluate juvenile salmonid in-river and system survival through the FCRPS, including estimates of differential post-Bonneville survival of transported</i> 		<ul style="list-style-type: none"> ▪ PIT-tag-based survival estimates using tagged smolts entering and migrating through the FCRPS (Lower Granite

Research, Monitoring, and Evaluation Actions

RPA No.	Action Description	2008 Actions/Accomplishments
RME Strategy 2—Hydrosystem Research, Monitoring, and Evaluation		
	<i>fish relative to in-river fish (D-value) as needed.</i>	through Bonneville Dam) were calculated in 2008 and have been produced annually since 1994. NOAA Fisheries conducts the analysis under the BPA project Survival Estimate for Passage through Snake and Columbia River Dams and Reservoirs using fish PIT-tagged under the Smolt Monitoring Program and Comparative Survival Study (CSS).
	<ul style="list-style-type: none"> ▪ <i>Monitor and evaluate adult salmonid system survival upstream through the FCRPS.</i> 	<ul style="list-style-type: none"> ▪ The BPA-funded PTAGIS system project provides data on returning adults of known origin. NOAA biologists conduct analyses and report upstream passage survival.
	<ul style="list-style-type: none"> ▪ <i>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.</i> 	<ul style="list-style-type: none"> ▪ BPA funds have been allocated to initiate this effort as early as 2009. Planning is ongoing for the extent of tagging and stock coverage required, and will be specified in the tagging plan being developed under RPA 52.6.
	<ul style="list-style-type: none"> ▪ <i>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.</i> 	<ul style="list-style-type: none"> ▪ Feasibility study completed in 2008. A pilot study of sockeye performance through the hydrosystem will be carried out in 2009. Once additional production capacity is established, a hydrosystem performance study will be conducted.
	<ul style="list-style-type: none"> ▪ <i>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)</i> 	<ul style="list-style-type: none"> ▪ Projects were initiated to support action required in 2009.
	<ul style="list-style-type: none"> ▪ <i>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)</i> 	<ul style="list-style-type: none"> ▪ Complied with all provisions in 2008. This RPA action will be fully addressed in FY 2009 with expanded emplacement of stream-based detection systems.

Research, Monitoring, and Evaluation Actions

RPA No.	Action Description	2008 Actions/Accomplishments
RME Strategy 2—Hydrosystem Research, Monitoring, and Evaluation		
	<p><i>develop a monitoring plan to determine the most likely cause of these differential losses (considering the potential use of flat plate PIT tag detectors in tributaries or fishery areas, additional adult detectors at The Dalles and John Day fishways, etc. to provide improved estimates of harvest or stray rates for improved conversion rate estimates in the future); and 3) implement the monitoring plan.</i></p>	
	<p><i>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.</i></p>	
<p>Table 8. Minimum Adult Fish Counting Schedule</p>		

Research, Monitoring, and Evaluation Actions

RPA No.	Action Description	2008 Actions/Accomplishments	
RME Strategy 2—Hydrosystem Research, Monitoring, and Evaluation			
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	<p>Monitor and Evaluate Migration Characteristics and River Condition <i>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:</i></p> <ul style="list-style-type: none"> ▪ <i>Monitor and estimate the abundance of smolts passing index dams.</i> ▪ <i>Monitor and describe the migration timing of smolts at index dams, identify potential problems, and evaluate implemented solutions.</i> 	<ul style="list-style-type: none"> ▪ The BPA-funded Fish Passage Center project calculated passage indices at all collector dams, as well population estimates at Lower Granite Dam. ▪ In 2008, this RPA was addressed by the BPA-funded Smolt Monitoring Program. Data provided by the SMP were analyzed by the Fish Passage Center, NOAA Fisheries, and a host of other regional fish management agencies. 	

Research, Monitoring, and Evaluation Actions

RPA No.	Action Description	2008 Actions/Accomplishments
RME Strategy 2—Hydrosystem Research, Monitoring, and Evaluation		
	<ul style="list-style-type: none"> ▪ 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. 	<ul style="list-style-type: none"> ▪ Again, as in RPA 53.2, the SMP monitored and documented fish condition in 2008. The Fish Passage Center and other management agencies provided analysis and implementation recommendations.
	<ul style="list-style-type: none"> ▪ Monitor and enumerate adult salmonids passing through fishways in the FCRPS, identify potential problems, and evaluate implemented solutions. 	<ul style="list-style-type: none"> ▪ The Corps again implemented its adult fish count program. Fishways were monitored on a regular basis, as per FPP requirements. Results are discussed in annual Fishway Inspection Report prepared for each project.
	<ul style="list-style-type: none"> ▪ 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.⁴ 	<ul style="list-style-type: none"> ▪ Conducted March-April evaluation of kelt passage through the corner collector.
54	<p>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.</p>	
	<ul style="list-style-type: none"> ▪ Monitor and evaluate the effects of existing spillways, modifications, and operations on smolt survival. 	<ul style="list-style-type: none"> ▪ Estimated route-specific passage and survival rates at Lower Monumental, Ice Harbor, McNary, John Day, and Bonneville dams. Conducted HiZ tag studies of passage conditions at the McNary and Lower Monumental spillway weirs. Also, collected telemetry fish in McNary sort-by-code to compare with condition prior to release.
	<ul style="list-style-type: none"> ▪ Monitor and evaluate the effectiveness of traditional juvenile bypass systems and modifications to such, on smolt survival and condition. 	<ul style="list-style-type: none"> ▪ The passage and survival studies above also estimated the proportions collected by the bypass system and the resulting survival rates.
	<ul style="list-style-type: none"> ▪ Monitor and evaluate the effectiveness of surface bypass structures and 	<ul style="list-style-type: none"> ▪ Estimated route-specific passage and survival rates at Lower Monumental, Ice Harbor, McNary, John Day, and

⁴ 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.

Research, Monitoring, and Evaluation Actions

RPA No.	Action Description	2008 Actions/Accomplishments
RME Strategy 2—Hydrosystem Research, Monitoring, and Evaluation		
	<i>modifications on smolt survival and condition.</i>	Bonneville dams.
	<ul style="list-style-type: none"> ▪ <i>Monitor and evaluate the effectiveness of turbine operations and modifications on smolt survival and condition.</i> 	<ul style="list-style-type: none"> ▪ Estimated route-specific passage and survival rates at Lower Monumental, Ice Harbor, and McNary dams.
	<ul style="list-style-type: none"> ▪ <i>Monitor and evaluate overall dam passage with respect to modifications at projects (including forebay delay and survival).</i> 	<ul style="list-style-type: none"> ▪ Passage and survival studies also estimated forebay and tailrace passage times and survival rates in the forebay.
	<ul style="list-style-type: none"> ▪ <i>Monitor and evaluate the effectiveness of the juvenile fish transportation program and modifications to operations.</i> 	<ul style="list-style-type: none"> ▪ Continued studies of the within-year transport/in-river yearling Chinook, fall Chinook transportation study, and alternate release location transport studies. Adult returns for the McNary transportation studies continued.
	<ul style="list-style-type: none"> ▪ <i>Monitor and evaluate the effects of environmental conditions affecting juvenile fish survival.</i> 	<ul style="list-style-type: none"> ▪ Passage and survival studies also considered river discharges, temperatures, etc. in their analyses.
	<ul style="list-style-type: none"> ▪ <i>Monitor and evaluate the effectiveness of reducing predation toward improving juvenile fish survival.</i> 	<ul style="list-style-type: none"> ▪ Ongoing research under Columbia River Fish Mitigation (CRFM) and BPA Fish and Wildlife Program funding continued monitoring of avian predators and their colonies (O&M), and dam angling and estimates of annual exploitation of pikeminnow (modeling), in conjunction with juvenile dam survival studies.
	<ul style="list-style-type: none"> ▪ <i>Investigate, evaluate and deploy alternative technologies and methodologies for fish passage and the RM&E Action.</i> 	<ul style="list-style-type: none"> ▪ Two prototype top spillway weirs (TSWs) were deployed at John Day Dam, and a new RSW was installed at Lower Monumental Dam.
	<ul style="list-style-type: none"> ▪ <i>Determine if actions directed at benefiting juveniles have an unintended effect on migrating adults (e.g., certain spill operations).</i> 	<ul style="list-style-type: none"> ▪ Conducted a radio telemetry study of adult passage under three spill patterns at Little Goose Dam to determine whether spillway weir operations would impair adult passage.

Research, Monitoring, and Evaluation Actions

RPA No.	Action Description	2008 Actions/Accomplishments
RME Strategy 2—Hydrosystem Research, Monitoring, and Evaluation		
	<ul style="list-style-type: none"> ▪ <i>Install and maintain adult PIT-tag detectors in fish ladders at key dams in the FCRPS and evaluate adult survival (conversion rates).</i> 	<ul style="list-style-type: none"> ▪ No new installations in 2008. PIT-tag detectors are now installed in all key FCRPS ladders. However, there are no detectors at ladders at The Dalles and John Day dams. Installation of detectors at those dams is on hold pending evaluation of effectiveness of tributary-based detectors.
	<ul style="list-style-type: none"> ▪ <i>Monitor and evaluate the effects of fish ladder operations and configurations on adult passage rates.</i> 	<ul style="list-style-type: none"> ▪ Studies were conducted at Lower Granite and Little Goose dams to assess passage timing and success. Also, ongoing ladder counts and PIT detections were examined to determine whether adult passage problems are occurring.
	<ul style="list-style-type: none"> ▪ <i>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.⁵</i> 	<ul style="list-style-type: none"> ▪ Evaluation initiated in December 2008 (and continued in spring 2009). Results are pending.
	<ul style="list-style-type: none"> ▪ <i>Investigate surface-flow outlets during wintertime to provide safer fallback opportunity for over wintering steelhead (need will be determined by results of further research).</i> 	<ul style="list-style-type: none"> ▪ See work at the Dalles Dam, immediately above.
55	<p><i>Investigate Hydro Critical Uncertainties and Investigate New Technologies</i> <i>The Action Agencies will fund selected research directed at resolving critical uncertainties that are pivotal in lifecycle model analyses. These specific actions include:</i></p>	
	<ul style="list-style-type: none"> ▪ <i>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)</i> 	<ul style="list-style-type: none"> ▪ Initiated a post-Bonneville JSAT survival study.
	<ul style="list-style-type: none"> ▪ <i>Investigate the post-Bonneville mortality effect of changes in fish arrival timing and transportation to below Bonneville. (Initiate in FY 2007-2009)</i> 	<ul style="list-style-type: none"> ▪ Ongoing study. See discussion for RPA 31.

⁵ 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.

Research, Monitoring, and Evaluation Actions

RPA No.	Action Description	2008 Actions/Accomplishments
RME Strategy 2—Hydrosystem Research, Monitoring, and Evaluation		
	<ul style="list-style-type: none"> ▪ <i>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)</i> 	<ul style="list-style-type: none"> ▪ No action required in 2008.
	<ul style="list-style-type: none"> ▪ <i>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)</i> 	<ul style="list-style-type: none"> ▪ Studies have been ongoing under the BPA Fish and Wildlife Program for more than a decade, and complementary projects have been funded under the U.S. Army Corps of Engineers' Anadromous Fish Evaluation Program (AFEP) (e.g., radio tag investigations in Snake reservoirs). Additionally, proposed transport studies have important life history implications. This combination of studies has been a complex, multi-faceted set of investigations that have taken place over years.
	<ul style="list-style-type: none"> ▪ <i>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.</i> 	<ul style="list-style-type: none"> ▪ Research was completed and a draft report presented in 2008. The report will be finalized in 2009.
	<ul style="list-style-type: none"> ▪ <i>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.</i> 	<ul style="list-style-type: none"> ▪ Completed data collection for study of turbine pressure regimes on untagged fish survival. Developed Risk assessment model to predict fish mortality rates during turbine passage. Began developing a method to capture fish passing through turbines. Completed development of water pathway modification alternative testing and selection. Developed draft plans and specifications for design and supply for turbine runner.
	<ul style="list-style-type: none"> ▪ <i>Investigate feasibility of developing PIT-tag detectors for spillways and turbines.</i> 	<ul style="list-style-type: none"> ▪ NOAA, the Corps, BPA and Destron Fearing began discussions regarding PIT detection at spillway weirs at McNary and Ice Harbor. The Corps and BPA supported efforts by NOAA Fisheries to develop a spillway PIT

Research, Monitoring, and Evaluation Actions

RPA No.	Action Description	2008 Actions/Accomplishments
RME Strategy 2—Hydrosystem Research, Monitoring, and Evaluation		
		antenna design for Bonneville Dam. Dry tests were run on an existing spillway gate housed in the spillway repair pit.
	<ul style="list-style-type: none"> Evaluate new tagging technologies for use in improving the accuracy and assessing delayed or indirect hydro effects on juvenile or adult fish. 	<ul style="list-style-type: none"> JSATs (COE's AFEP Program) and the BPA-funded POST project continued the development of both tags and methods in 2008 to determine delayed or indirect effects of hydro passage by detecting fish in the estuary below Bonneville Dam and the ocean environment off the Pacific Coast. Data from these efforts were presented at the 2008 Annual AFEP review in Portland, as well as in a variety of government reports and peer-reviewed journal articles.
	<ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> Installed and tested a flat-plate PIT detector in John Day River. The PIT antenna withstood spring freshet flows and has been detecting PIT-tagged adult fish. (A second year of testing and determining detection efficiency is being carried out in 2009.)

Research, Monitoring, and Evaluation Actions

RPA No.	Action Description	2008 Actions/Accomplishments
RME Strategy 3—Tributary Habitat Research, Monitoring, and Evaluation		
<i>The Action Agencies' strategy is to support performance monitoring and adaptive management related to tributary habitat actions.</i>		
56	<i>Monitor and Evaluate Tributary Habitat Conditions and Limiting Factors</i> The Action Agencies will:	
	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> Fifty-nine BPA projects were implemented that have elements that support research in selected areas of the pilot study basins (Wenatchee, Methow and Entiat river

Research, Monitoring, and Evaluation Actions

RPA No.	Action Description	2008 Actions/Accomplishments
RME Strategy 3—Tributary Habitat Research, Monitoring, and Evaluation		
	<p><i>habitat conditions and fish productivity (limiting factors) to improve the development and parameterization of models used in the planning and implementation of habitat projects. These studies will be coordinated with the influence of hatchery programs in these habitat areas. Review and modify annually to ensure that these projects continue to provide a means of evaluating the effectiveness of tributary mitigation actions).</i></p>	<p>basins in the Upper Columbia River, the Lemhi and South Fork Salmon river basins, and the John Day River Basin).</p>
	<ul style="list-style-type: none"> ▪ <i>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.</i> 	<ul style="list-style-type: none"> ▪ Seventeen projects were implemented that have elements that supported the implementation of habitat status and trend monitoring as a component of the pilot basin studies. Also, Reclamation funded Seth White's dissertation to understand the effects of carrying capacity on fish competition. Reclamation incorporated that information in a plan to examine trophic structure and food web effects on fish production in the Methow River.
	<ul style="list-style-type: none"> ▪ <i>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)</i> 	<ul style="list-style-type: none"> ▪ Four projects were implemented to facilitate and participate in an ongoing collaborative process to develop a regional strategy for limited habitat status and trend monitoring for key ESA fish populations.
57	<ul style="list-style-type: none"> ▪ <i>Evaluate the Effectiveness of Tributary Habitat Actions</i> ▪ <i>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.</i> 	
	<ul style="list-style-type: none"> ▪ <i>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).</i> 	<ul style="list-style-type: none"> ▪ Three BPA-funded projects were implemented to support action effectiveness pilot studies in the Entiat River Basin to study treatments to improve channel complexity and fish productivity.

Research, Monitoring, and Evaluation Actions

RPA No.	Action Description	2008 Actions/Accomplishments
RME Strategy 3—Tributary Habitat Research, Monitoring, and Evaluation		
	<ul style="list-style-type: none"> ▪ <i>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).</i> 	<ul style="list-style-type: none"> ▪ Six BPA projects were implemented in the pilot study in the Lemhi River basin to study treatments to reduce entrainment and provide better fish passage flow conditions.
	<ul style="list-style-type: none"> ▪ <i>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).</i> 	<ul style="list-style-type: none"> ▪ Six BPA projects were implemented to support 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—consequently—fish productivity.
	<ul style="list-style-type: none"> ▪ <i>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).</i> 	<ul style="list-style-type: none"> ▪ Thirteen projects were implemented to support project- and watershed-level assessments of habitat, habitat restoration, and fish productivity in the Wenatchee, Methow and John Day basins. A Reclamation project has shown that fixes to passage barriers in the Methow River result in recolonization of upstream habitat by spawners of ESA-listed fish. Reclamation completed a watershed assessment of the South Fork John Day River that compared landscape features and fish production, completed planning for a six-year assessment of a major channel restoration, and led the planning of a watershed-level assessment (Intensively Monitored Watershed) in the Methow.
	<ul style="list-style-type: none"> ▪ <i>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)</i> 	<ul style="list-style-type: none"> ▪ The Tributary Habitat and Fish Population Work Group met several times beginning in early 2008 to evaluate survival models. However, the technical group did not include other technical staff from the co-managers (federal and state agencies and the tribes).

RPA No.	Action Description	2008 Actions/Accomplishments
RME Strategy 4—Estuary Habitat and Ocean Research, Monitoring, and Evaluation		
<i>The Action Agencies' strategy is to support performance monitoring and adaptive management related to estuary habitat actions.</i>		
58	<p><i>Monitor and Evaluate Fish Performance in the Estuary and Plume</i> <i>The Action Agencies will monitor biological responses and/or environmental attributes, and report in the following areas:</i></p>	
	<ul style="list-style-type: none"> ▪ <i>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)</i> 	<ul style="list-style-type: none"> ▪ More than 15,000 juvenile salmonids were tagged with miniaturized acoustic transmitters, released at several sites upstream of Bonneville Dam, and detected at seven acoustic telemetry arrays deployed across the Lower Columbia River and estuary. Data from the study were used to estimate survival rates of yearling and subyearling Chinook salmon and steelhead in various reaches of the lower river and estuary.
	<ul style="list-style-type: none"> ▪ <i>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)</i> 	<ul style="list-style-type: none"> ▪ Planning within the AFEP process was initiated during 2008 for a project addressing this RPA subaction.
	<ul style="list-style-type: none"> ▪ <i>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)</i> 	<ul style="list-style-type: none"> ▪ Research cruises collected data on juvenile salmon growth and prey resources along transects in the nearshore ocean and plume. Data from these studies and others were used to assess environmental effects in the estuary and ocean on juvenile salmonid survival and adult return rates.
	<ul style="list-style-type: none"> ▪ <i>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)</i> 	<ul style="list-style-type: none"> ▪ BPA-funded two projects. The Ocean Survival of Salmonids project addressed the plume component of this subaction, while the estuary component was addressed through several projects focused on avian and piscivorous predators (see the predation RPAs). Annual surveys of predation on juvenile salmonids were conducted. Data showed the most common predators and, in some cases, predation rates were estimated.

RPA No.	Action Description	2008 Actions/Accomplishments
RME Strategy 4—Estuary Habitat and Ocean Research, Monitoring, and Evaluation		
59	<p>Monitor and Evaluate Migration Characteristics and Estuary/Ocean Conditions <i>The Action Agencies will monitor and evaluate selected ecological attributes of the estuary, which include the following or equivalent:</i></p>	
	<ul style="list-style-type: none"> ▪ <i>Map bathymetry and topography of the estuary as needed for RM&E. (Initiate in FY 2007-2009 Projects)</i> 	<ul style="list-style-type: none"> ▪ Several projects completed this RME work, which included collection of site-scale elevation data and light detection and ranging (LIDAR) data for topography.
	<ul style="list-style-type: none"> ▪ <i>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)</i> 	<ul style="list-style-type: none"> ▪ This RPA subaction was addressed as a primary objective of the BPA-funded Lower Columbia River/Estuary Ecosystem Monitoring project. Development of the classification system continued during 2008.
	<ul style="list-style-type: none"> ▪ <i>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)</i> 	<ul style="list-style-type: none"> ▪ Planning within the AFEP process was initiated during 2008 for a project addressing this RPA subaction.
	<ul style="list-style-type: none"> ▪ <i>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)</i> 	<ul style="list-style-type: none"> ▪ This RPA subaction was covered by four Action Agency projects that involved study of juvenile salmon in various shallow-water habitats from Bonneville Dam to Astoria.
	<ul style="list-style-type: none"> ▪ <i>Monitor habitat conditions periodically, including water surface elevation, vegetation cover, plant community structure, primary and secondary productivity, substrate characteristics, dissolved oxygen, temperature, and conductivity, at representative locations in the estuary as established through RM&E. (FY 2007-2009 Projects, then annually)</i> 	<ul style="list-style-type: none"> ▪ BPA-funded nine projects. One—the Lower Columbia River/Estuary Ecosystem Monitoring project—monitored habitat conditions at four sites in the reach between Bonneville Dam and Washougal, Washington. The data characterized the relationships between plant communities, elevation, and hydrology. Other BPA-funded projects involved study of juvenile salmon in various shallow-water habitats from Bonneville Dam to Astoria. The data increased understanding of specific habitat use and the relative importance of different habitats to juvenile salmonids.
60	<p>Monitor and Evaluate Habitat Actions in the Estuary <i>The Action Agencies will monitor and evaluate the effects of a representative set of habitat projects in the estuary, as follows:</i></p>	

RPA No.	Action Description	2008 Actions/Accomplishments
RME Strategy 4—Estuary Habitat and Ocean Research, Monitoring, and Evaluation		
	<ul style="list-style-type: none"> ▪ <i>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)</i> 	<ul style="list-style-type: none"> ▪ BPA-funded four projects. The Lower Columbia River/Estuary Habitat Restoration project includes a component to evaluate reference sites as part of action effectiveness monitoring in the lower Columbia River and estuary. Data were collected from four sites during 2008 to assess the structure, function, and condition of a suite of tidal freshwater wetland habitats, for comparison of restoration and reference site to determine the effectiveness of habitat restoration.
	<ul style="list-style-type: none"> ▪ <i>Evaluate the effects of selected individual habitat restoration actions at project sites relative to reference sites and evaluate post-restoration trajectories based on project-specific goals and objectives. (Initiate in FY 2007-2009 Projects, annually review and modify as appropriate or until complete)</i> 	<ul style="list-style-type: none"> ▪ Site-scale restoration effectiveness monitoring occurred under ten projects. Projects intensively monitored water surface elevation, bathymetry and topography, substrate, vegetation composition and percent cover, and juvenile salmon density at three sites where tidal reconnections were restored: Mirror Lake, Scappoose Bottomlands, and Fort Clatsop.
	<ul style="list-style-type: none"> ▪ <i>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)</i> 	<ul style="list-style-type: none"> ▪ Six projects were continued to support this subaction. The Corps-funded multi-year project (2004-2010) is developing and applying a methodology to evaluate the cumulative effects of multiple habitat restoration projects intended to benefit ecosystems supporting juvenile salmonids in the lower Columbia River and estuary. During 2008, the levels-of-evidence approach and ecological theory underpinning the analysis, synthesis, and evaluation of cumulative effects was finalized and a preliminary analysis of restoration cumulative effects was initiated.
61	<p><i>Investigate Estuary/Ocean Critical Uncertainties</i> <i>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:</i></p>	

RPA No.	Action Description	2008 Actions/Accomplishments
RME Strategy 4—Estuary Habitat and Ocean Research, Monitoring, and Evaluation		
	<ul style="list-style-type: none"> ▪ <i>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.</i> 	<ul style="list-style-type: none"> ▪ Six multi-year projects collectively investigated the relationships between juvenile salmonid condition, growth, and survival indicators.
	<ul style="list-style-type: none"> ▪ <i>Continue work to define the causal mechanisms and migration/behavior characteristics affecting survival of juvenile salmon during their first weeks in the ocean.</i> 	<ul style="list-style-type: none"> ▪ Four projects addressed this subaction. As an example, juvenile salmon were sampled with trawls as the fish transitioned between riverine and marine waters. Data such as species, age class, abundance, stock origin, size, and diet were collected to determine how juvenile salmon change as they move between environments.
	<ul style="list-style-type: none"> ▪ <i>Investigate the importance of early life history of salmon populations in tidal fresh water of the lower Columbia River.</i> 	<ul style="list-style-type: none"> ▪ Seven projects conducted research to address this subaction. See RPA Action 61 in Section 3 or Table 1 of Section 4 for more information.
	<ul style="list-style-type: none"> ▪ <i>Continue development of a hydrodynamic numerical model for the estuary and plume to support critical uncertainties investigations.</i> 	<ul style="list-style-type: none"> ▪ Four projects conducted research to address this subaction. Modelers worked to develop an advanced observatory for the Pacific Northwest coastal margin, including the Columbia River estuary and plume.

RPA No.	Action Description	2008 Actions/Accomplishments
RME Strategy 5—Harvest Research, Monitoring, and Evaluation		
<i>The Action Agencies' strategy is to support performance monitoring and adaptive management related to harvest actions.</i>		
62	<p><i>Fund Selected Harvest Investigations</i></p> <p><i>The Action Agencies will fund selected harvest investigations linked to FCRPS interests:</i></p>	

RPA No.	Action Description	2008 Actions/Accomplishments
RME Strategy 5—Harvest Research, Monitoring, and Evaluation		
	<ul style="list-style-type: none"> ▪ <i>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)</i> 	<ul style="list-style-type: none"> ▪ BPA identified seven projects to implement. One seeks to use PIT tags to better assess Chinook, steelhead, and sockeye salmon adult migratory timing and survival through the hydrosystem. Another project will improve the monitoring and catch sampling of the Zone 6 tribal fisheries by increasing the sample rates and employing the use of additional data collection methods, including PIT-tag technology.
	<ul style="list-style-type: none"> ▪ <i>Evaluate methods to develop or expand use of selective fishing methods and gear. (Initiate in FY 2007-2009 Projects)</i> 	<ul style="list-style-type: none"> ▪ BPA-funded three projects including the project “Evaluate Live-Capture Fishing Gear for Salmon,” which evaluated the feasibility and efficacy of various types of live-capture, selective fishing gear to harvest hatchery-origin Chinook while protecting natural-origin Chinook to promote the recovery of ESA stocks. In 2008, this project tested beach seines, purse seines, and tooth-tangle nets in the mainstem Columbia below Chief Joseph Dam and in the mainstem and tributaries of the Okanogan River. In addition, the BPA Select Area Fisheries Evaluation project investigated the use of off-channel terminal fishing locations in concert with hatchery rearing and acclimation protocols to offer commercial and sport fishers harvest opportunities.
	<ul style="list-style-type: none"> ▪ <i>Evaluate post-release mortality rates for selected fisheries. (Initiate in FY 2007-2009 Projects)</i> 	<ul style="list-style-type: none"> ▪ The BPA-funded project “Evaluate Live-Capture Fishing Gear,” which is being implemented by the Colville Tribe, incorporated monitoring protocols to assess fish condition after capture, holding, and release. Results of these evaluations are contained in the Colville Tribe’s 2008 annual report.
	<ul style="list-style-type: none"> ▪ <i>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)</i> 	<ul style="list-style-type: none"> ▪ BPA funded ten projects that implemented recovery efforts in ocean and in-river fisheries, as well as some limited spawning ground surveys.

RPA No.	Action Description	2008 Actions/Accomplishments
RME Strategy 5—Harvest Research, Monitoring, and Evaluation		
	<ul style="list-style-type: none"> ▪ <i>Investigate the feasibility of genetic stock identification monitoring techniques. (Initiate in FY 2007-2009 Projects)</i> 	<ul style="list-style-type: none"> ▪ The Action Agencies implemented 18 projects to implement this subaction. For one project, work began in 2008 to address single nucleotide polymorphism (SNP) discovery, genetic baseline expansion, genetic stock identification (GSI) to evaluate catch, and genetic stock evaluation of salmon and steelhead passing Bonneville Dam.

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RPA No.	Action Description	2008 Actions/Accomplishments
RME Strategy 6—Hatchery Research, Monitoring, and Evaluation		
<i>The Action Agencies' strategy is to support performance monitoring and adaptive management related to hatchery actions.</i>		
63	<p><i>Monitor Hatchery Effectiveness</i> <i>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:</i></p>	
	<ul style="list-style-type: none"> ▪ <i>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)</i> 	<ul style="list-style-type: none"> ▪ All of the ongoing BPA-funded safety-net and conservation program projects to implement RPAs 41 and 42 have monitoring and evaluation elements to evaluate effectiveness. In some cases there is a separate project to monitor effects on viability and recovery of targeted populations. See Chapter 4 for further discussion.
	<ul style="list-style-type: none"> ▪ <i>Determine the effect that implemented hatchery reform actions have on the recovery of targeted salmon and steelhead populations. (Initiate in FY 2007-2009 Projects)</i> 	<ul style="list-style-type: none"> ▪ The BPA-funded project "Salmon Studies Idaho Rivers" completed data analysis of brood year 2007 juvenile production by estimating outmigration of naturally produced Chinook salmon collected in calendar years 2008 and 2009. The interim production comparison was

Research, Monitoring, and Evaluation Actions

RPA No.	Action Description	2008 Actions/Accomplishments
RME Strategy 6—Hatchery Research, Monitoring, and Evaluation		
		completed, with products incorporated into annual progress reports.
64	<p><i>Investigate Hatchery Critical Uncertainties</i> <i>The Action Agencies will continue to fund selected research directed at resolving artificial propagation critical uncertainties:</i></p>	
	<ul style="list-style-type: none"> ▪ <i>Continue to estimate the relative reproductive success (RSS) of hatchery –origin salmon and steelhead compared to reproductive success of their natural-origin counterparts for ESA-listed spring/summer Chinook population in the Upper Grande Ronde, Lostine River, and Catherine Creek; listed spring Chinook in the Wenatchee River; and listed steelhead in the Hood River. Continue to fund the ongoing RRS feasibility study for Snake River fall Chinook to completion in 2009. (Initiate in FY 2007-2009 Projects)</i> 	<ul style="list-style-type: none"> ▪ In 2008, BPA continued to fund six projects including relative reproductive success (RRS) studies for listed spring/summer Chinook salmon in the upper Grande Ronde River, Lostine River, and Catherine Creek; for listed spring Chinook in the Wenatchee River; for listed steelhead in the Hood River; and for listed fall Chinook in the Snake River.
	<ul style="list-style-type: none"> ▪ <i>Determine if properly designed intervention programs using artificial production make a net positive contribution to recovery of listed populations. (Initiate in FY 2007-2009)</i> 	<ul style="list-style-type: none"> ▪ Thirty-four projects were funded by BPA to support Subaction 2. The BPA-funded project called Evaluate the Relative Reproductive Success of Wild- and Hatchery-Origin Snake River Fall Chinook Spawners Upstream of Lower Granite Dam conducted comparative genetic data analyses between and among all project samples by brood year. The relative reproductive success of Snake River hatchery and wild fall Chinook was evaluated against the proportions of hatchery and wild fall Chinook estimated to be on upper Snake River spawning grounds.
	<ul style="list-style-type: none"> ▪ <i>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)</i> 	<ul style="list-style-type: none"> ▪ Four projects were implemented in 2008 to support this subaction. See discussion in Chapter 4 for details.

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RPA No.	Action Description	2008 Actions/Accomplishments
RME Strategy 6—Hatchery Research, Monitoring, and Evaluation		
65	<i>Investigate Hatchery Critical Uncertainties</i> <i>The Action Agencies will fund research directed at resolving critical uncertainties:</i>	
	<ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> Four BPA projects were initiated. This subaction was addressed through the BPA-funded project Spawning Distribution of Snake River Fall Chinook Salmon. See discussion in Chapter 4 for details.
	<ul style="list-style-type: none"> Estimate fall Chinook hatchery program effects on the productivity of the fall Chinook salmon ESU. 	<ul style="list-style-type: none"> The projects associated with Subaction 1 of RPA 65 (see above) were also implemented to support Subaction 2.
	<ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> No action in 2008. NOAA is expected to provide the necessary technical assistance to BPA in 2009.

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RPA No.	Action Description	2008 Actions/Accomplishments
RME Strategy 7—Predation and Invasive Species Management Research, Monitoring, and Evaluation		
<i>The Action Agencies' strategy is to support performance monitoring and adaptive management related to predation management actions.</i>		
66	<i>Monitor and Evaluate the Caspian Tern Population in the Columbia River Estuary</i> <i>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.</i>	Caspian tern monitoring was conducted in 2008. Colony size, reproduction rates, diet composition, and predation rates were monitored to determine the effect of the colony on juvenile salmonids.

Research, Monitoring, and Evaluation Actions

RPA No.	Action Description	2008 Actions/Accomplishments
RME Strategy 7—Predation and Invasive Species Management Research, Monitoring, and Evaluation		
67	<p><i>Monitor and Evaluate the Double-Crested Cormorant Population in the Columbia River Estuary</i></p> <p><i>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.</i></p>	Cormorant monitoring was conducted in 2008. Colony size, reproduction rates, diet composition, and predation rates were monitored to determine the effect of the colony on juvenile salmonids.
68	<p><i>Monitor and Evaluate Inland Avian Predators</i></p> <p><i>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.</i></p>	Inland avian monitoring was conducted in 2008. In addition, meetings were initiated in 2008 between the Action Agencies and the USFWS to begin discussing the development of an avian management plan for Corps-owned lands. The development and implementation of avian management plan(s) will continue through collaborative discussions with the USFWS in 2009.
69	<p><i>Monitoring Related to Marine Mammal Predation</i></p> <p><i>The Action Agencies will:</i></p>	
	<p><i>Estimate overall sea lion abundance immediately below Bonneville Dam. (Initiate in FY 2007-2009 Projects)</i></p>	<ul style="list-style-type: none"> ▪ Sea lion abundance below Bonneville Dam was estimated in 2008. See the discussion in Section 3 for details.
	<ul style="list-style-type: none"> ▪ <i>Monitor the spatial and temporal distribution of sea lion predation attempts and estimate predation rates. (Initiate in FY 2007-2009 Projects)</i> 	<ul style="list-style-type: none"> ▪ Spatial and temporal distribution of predation attempts and predation rates were monitored in 2008 through BPA- and Corps-funded efforts.
	<ul style="list-style-type: none"> ▪ <i>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)</i> 	<ul style="list-style-type: none"> ▪ The effectiveness of deterrent actions and the timing of application on spring runs was determined in 2008 through BPA- and Corps-funded efforts.
70	<p><i>Monitoring Related to Piscivorous (Fish) Predation</i></p> <p><i>The Action Agencies will:</i></p>	
	<ul style="list-style-type: none"> ▪ <i>Continue to update and estimate the cumulative benefits of sustained removals of northern pikeminnow since 1990. (Initiate in FY 2007-2009 Projects)</i> 	<ul style="list-style-type: none"> ▪ The BPA-funded Northern Pikeminnow Management Program (NPMP) has an extensive biological evaluation component that annually collects and validates biological field data and updates the benefit model with the latest

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RPA No.	Action Description	2008 Actions/Accomplishments
RME Strategy 7—Predation and Invasive Species Management Research, Monitoring, and Evaluation		
		year’s data. The 2008 estimated reduction in potential predation was 38 percent, based on the 2008 exploitation rate of 19.5 percent for pikeminnow 250 millimeters in fork length or larger.
	<ul style="list-style-type: none"> ▪ <i>Continue to evaluate if inter and intra compensation is occurring. (Initiate in FY 2007-2009 Projects)</i> 	<ul style="list-style-type: none"> ▪ The evaluation of the NPMP annually assesses whether compensation is occurring as a result of cumulative removals to date. Program evaluation gives no indication that compensation by smallmouth bass, walleye, or channel catfish is occurring.
	<ul style="list-style-type: none"> ▪ <i>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)</i> 	<ul style="list-style-type: none"> ▪ Systemwide exploitation in 2008 of northern pikeminnow was 19.5 percent, the highest rate since program inception in 1990. Exploitation rates since the implementation of the monetary incentive increase in 2004 have significantly exceeded the average exploitation rate of the previous 14 years.
	<ul style="list-style-type: none"> ▪ <i>Develop a study plan to review, evaluate, and develop strategies to reduce non-indigenous piscivorous predation. (Initiate in FY 2007-2009 Projects)</i> 	<ul style="list-style-type: none"> ▪ BPA sponsored a 1-day workshop to develop strategies. Results of the facilitated workshop and follow-up topic areas were compiled and presented to NOAA Fisheries. Work will continue in 2009 and beyond.

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RPA No.	Action Description	2008 Actions/Accomplishments
RME Strategy 8—Coordination and Data Management Research, Monitoring, and Evaluation		
<i>The Action Agencies are committed to making coordination and data management more effective, since FCRPS RME is part of the overall RME for recovery of salmon in the Columbia River Basin.</i>		
71	<p><i>Coordination</i> The Action Agencies will coordinate RM&E activities with other Federal, State and Tribal agencies on an ongoing annual basis, including:</p>	
	<ul style="list-style-type: none"> ▪ Organizing and supporting the Corps AFEP. 	<ul style="list-style-type: none"> ▪ The Corps again implemented its Anadromous Fish Evaluation Program (AFEP). The selection and development of experimental design and methodology of research projects to be carried out in 2009 was extensively coordinated with other federal agencies, states, and tribal interests through their involvement in the Studies Review Work Group (SRWG), which met several times through the year. The AFEP program also includes the Fish Facility Design and Review Work Group (FFDRWG) and the Fish Passage Operations and Maintenance (FPOM) work group. Federal, state, and tribal fishery agencies are invited to participate in FFDRWG and FPOM meetings, both of which generally occur monthly.
	<ul style="list-style-type: none"> ▪ Supporting and participating in the Council's Columbia River Basin Fish and Wildlife Program project planning and review efforts. 	<ul style="list-style-type: none"> ▪ BPA continued to participate in the Northwest Power and Conservation Council's project planning and review efforts for 2008, including the Wildlife Project categorical review.
	<ul style="list-style-type: none"> ▪ Supporting the standardization and coordination of tagging and monitoring efforts through participation and leadership in regional coordination forums such as PNAMP. 	<ul style="list-style-type: none"> ▪ Five BPA projects were initiated to support the standardization and coordination of tagging and monitoring efforts.
	<ul style="list-style-type: none"> ▪ 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. 	<ul style="list-style-type: none"> ▪ Thirteen BPA projects were implemented to support this RPA.

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RPA No.	Action Description	2008 Actions/Accomplishments
RME Strategy 8—Coordination and Data Management Research, Monitoring, and Evaluation		
	<ul style="list-style-type: none"> ▪ <i>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.</i> 	<ul style="list-style-type: none"> ▪ Five BPA projects were implemented to support the ongoing BiOp RPA RME work group implementation processes.
	<ul style="list-style-type: none"> ▪ <i>Coordinating implementation with other appropriate regional collaboration processes. This includes coordination related to statutory provisions for the Federal government (BPA/Council), voluntary coordination among Federal agencies (Federal Caucus), and coordination with regional processes for Federal/non-Federal engagement (Technical Management Team (TMT), System Configuration Team (SCT), PNAMP, Northwest Environmental Data-Network (NED)), and others.</i> 	<ul style="list-style-type: none"> ▪ Six BPA projects were implemented to support regional collaboration processes. BPA and Reclamation co-funded PNAMP coordinators and a PNAMP data management specialist. Reclamation dedicated staff to the PNAMP Steering Committee.
72	<p>Data Management <i>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:</i></p>	
	<ul style="list-style-type: none"> ▪ <i>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)</i> 	<ul style="list-style-type: none"> ▪ Twelve projects were implemented to support development of a coordinated and standardized information management network.
	<ul style="list-style-type: none"> ▪ <i>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)</i> 	<ul style="list-style-type: none"> ▪ Three BPA projects were implemented, including the BPA-funded Streamnet project, which coordinated the maintenance of the database portion of the Pacific Northwest Hydropower Database and Analysis System (NWHS).

Research, Monitoring, and Evaluation Actions

RPA No.	Action Description	2008 Actions/Accomplishments
RME Strategy 8—Coordination and Data Management Research, Monitoring, and Evaluation		
	<ul style="list-style-type: none"> 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) 	<ul style="list-style-type: none"> Nine BPA projects were implemented to support participation in coordination efforts to implement a regional data management strategy. Reclamation co-funded a PNAMP data management specialist, completed its Protocol Manager project, and provided staff time to incorporate the product into a regional data management system.

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RPA No.	Action Description	2008 Actions/Accomplishments
RME Strategy 9—Project Implementation and Compliance Monitoring Research, Monitoring, and Evaluation		
<i>The Action Agencies have identified specific commitments or actions for each of the hydrosystem, estuary/ocean, tributary habitat, hatchery, and predator control strategies, providing clear programmatic-level measures for evaluating progress, subject to adaptive management. Implementation details will be updated in 3-year cycles. Projects will be monitored for implementation of planned deliverables and compliance to performance expectations.</i>		
73	<i>Implementation and Compliance Monitoring</i> <i>The Action Agencies will:</i>	
	<ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> BPA implemented the Pisces program to track project implementation to support compliance and project effectiveness evaluations.
	<ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> BPA implemented the Pisces program to track project implementation for all projects and started development of the BPA Dashboard and Taurus program to track action implementation for the FCRPS RPAs.

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RPA No.	Action Description	2008 Actions/Accomplishments
RME Strategy 9—Project Implementation and Compliance Monitoring Research, Monitoring, and Evaluation		
	<ul style="list-style-type: none"> ▪ <i>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)</i> 	<ul style="list-style-type: none"> ▪ In addition to implementing the Pisces tracking program for all BPA-funded projects, BPA implemented nine projects that support effectiveness monitoring evaluation efforts.